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TOWARDS A NEW HISTORICAL GEOGRAPHY: THE POSSIBILITIES OF GIS-AIDED HISTORICAL STATISTICS AND FINE-SCALE, LONGUE DURÉE AND SUPRANATIONAL COMPARISONS IN CROATIAN HISTORY [*]

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In the last decade a number of serial sources were processed by several research groups separately for the Medieval, Ottoman and Early Modern

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periods in Hungary. However, the structure of these allow them both to be integrated to each other and be visualized on maps with the aid of GIS-techniques. The character of these integrated databases thus allow researchers (1) to map and investigate territorial patterns, regional inequalities of different scale, (2) the temporal changes in territorial patterns and (3) to run multivariate statistics on bulk data. The success of the GISta Hungarorum in Hungary (www.gistory.hu, http://gistahungarorum.abtk.hu) drove the different research groups to unify their forces and create a longue-durée, fine-resolution (settlement or parish-level) database for the Kingdom of Hungary (1330-2010) in order to analyze history from a different perspective and to help regional planning by assessing path dependency, drawing optimal landuse, etc. Furthermore, broadening the cooperation the investigation area was extended to Croatia for several time horizons to be processed in the future with the aid of Croatian colleagues involved in Hungarian projects (1330, 1500, Ottoman period, 1780s). This article of methodological focus introduces the first results of the joint work on Croatian examples – with the aim of giving a new perspective in historical geography and historical statistics.

Keywords: hGIS; databases; longue durée; historical geography; quantitative analysis; regional inequalities in Croatia; 14-19th c.

Introduction

As a result of the dynamic expansion of spatial datasets and the improvement of processing methods, the possibilities of comparative or longue durée regional analysis in history have broadened considerably since Braudel's first attempts.[1] The digital accessibility of raw materials, such as serial sources (see the *Adatbázisok Online in the National Archives of Hungary*[2]), has accelerated the processes of database creation and thus also given new impetus to the disciplines of historical statistics and historical geography. By applying methods originally used in regional science, economics, etc., not only quantitative research began to flourish again in Hungary (its golden age in the 1980s was characterised by scholars like Perjés, Benda, and Katus),[3] but also cliometric

[1] See Hugh D. Clout, *The Land of France 1815–1914*, Routledge Library Editions: Rural History 3, (London: Allen and Unwin, 1983 [2018]).

[2] https://adatbazisokonline.mnl.gov.hu/ Accessed November 25, 2024.

[3] Géza Perjés, "Az 1728. évi adóösszeírás adatainak feldolgozása," *Statisztikai Szemle* 52, no. 11–12 (1974), 1068–1100; Géza Perjés, "Jelentés az 1728. évi összeírás gépi feldolgozásáról," *Agrártörténeti Szemle* 20, no. 1–2 (1978), 11–80; Géza Perjés, "Bihar megye 1728. évi adóösszeírásának gépi feldolgozása," *A Hajdú-Bihar Megyei Levéltár Évkönyve* 6 (Debrecen: Hajdú-Bihar Megyei Levéltár, 1979), 33–109; Gyula Benda, *Statisztikai adatok a magyar mezőgazdaság történetéhez 1767–1867*. Számok és Történelem 1 (Budapest: Központi

approaches (using multivariate statistics on bulk data, pioneered also by Perjés in the 1970s and Eddie in the 1980s)[4] experienced a revival.

Moreover, the widespread use of GIS in historical research allowed a shift in focus from vertical (societal) to horizontal (regional) structures, thus providing valuable material for geographers who rarely tried to go back in time when dealing with socio-economic processes of the present and peripheralization.[5] Cooperation between the two disciplines also enables researchers to trace path dependencies,[6] while at the same time quantitative (and, of course, reinterpreted) historical data can help modern regional planning by identifying the temporal roots and factors of backwardness.

The methods and approaches outlined here, on the one hand, allow mapping the patterns of regional diversity (spatial variability) and its changes over time. On the other hand, the large databases enable the researcher to explore the relationship between socio-economic indicators, going far beyond the traditional approach characterised by statistical parameters such as 'average' or by extrapolation of regional data to the whole country. The vast literature on the "most popular topics", such as regional inequalities, GDP or HDI reconstruction, long-run trend analysis– and their combination at different territorial levels, longitudes and using different variables[7] – has expanded since the 1990s.[8]

Statisztikai Hivatal, 1973); László Katus, "Public Finance and Economic Growth in Hungary During the Age of Dualism (1867–1913)," *Acta Historica Academiae Scientiarum Hungaricae* 29, no. 2/4 (1983): 257–263; László Katus, "Economic growth in Hungary during the age of dualism (1867–1913): a quantitative analysis," in *Social-Economic Researches on the History of East-Central Europe / Sozial-ökonomische Forschungen zur Geschichte von Ost-Mitteleuropa,* Studia Historica 62, ed. E. Pamlényi (Budapest: Akadémiai Kiadó, 1970), 35–127.

4 Scott M. Eddie, *Ami „köztudott", az igaz is? Bevezetés a kliometrikus történetírás gondolkodásmódjába,* (Debrecen: Csokonai, 1996).

5 Róbert Győri, György Mikle, "A fejlettség területi különbségeinek változása Magyarországon, 1910–2011," *Tér és társadalom* 31, no. 3 (2017): 144–164.

6 Daron Acemoğlu, James A.Robinson, *Why Nations Fail: The Origins of Power, Prosperity, and Poverty*, New York: Crown Publ. Group, 2012).

7 Lee Soltow, "Wealth distribution in Denmark in 1789," *Scandinavian Economic History Review* 27, no.2 (1979), 121–138; Johan Söderberg, "A long-term perspective on regional economic development in Sweden, ca. 1550–1914," *Scandinavian Economic History Review* 32 no. 1 (1984): 1–16.

8 Ian Scargill, "Regional Inequality in France: Persistence and Change," *Geography* 76, no. 4 (1991), 343–357; Serge Dormard, "Economic development and regional disparities in France," *Employment and regional development policy: Market efficiency versus policy intervention,* ed. Helmut Karl and Philippe Rollet (Hannover: Verlag der ARL – Akademie für Raumforschung und Landesplanung, 2004), 50–67; Pierre-Philippe Combes, Miren Lafourcade, Jacques-François Thisse and Jean-Claude Toutain, "The rise and fall of spatial inequalities in

This approach could also add new aspects to the historical geography of Croatia, since the most recent historical geography of Croatia has mainly applied the environmental history approach,[9] and regional historical geographical aspects of socio-demographic changes have generally remained in the shadows, as well as Slavonia from the main historical regions. In this study, we argue that we have sufficient data to provide a fine-scale picture of Croatia from both an environmental and regional perspective.

In Hungary, the systematic construction of databases at the level of settlement began in the 2010s, following the attempts of the above-mentioned pioneers in the 1980s. First, the main variables of the 1910, 1900 and 1880 censuses were integrated into a single database.[10] This was followed by the linking the so-called "GISta Hungarorum" database with present-day data – both focused on the area of the Kingdom of Hungary as it appears in statistical publications. For 2010, however, it was a real challenge to produce the same variables for the successor states of the Kingdom of Hungary in order to cover the same territory as in 1910 using the same settlement level approach. The success gave new impetus and, on the one hand, new shapefiles with better resolution (the original 1:400,000 was replaced by 1:144,000, which means that the accuracy of the maps increased from 1-2 km to 200-300 m) were created for the country thanks to the cooperation with the National Archives.[11] On the other hand,

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France: A long-run perspective," *Explorations in Economic History* 48, no. 2 (2011): 243–271; Daniel, A. Tirado-Fabregat, Alfonso Díez-Minguela, Julio Martinez-Galarraga, "Regional inequality and economic development in Spain, 1860–2010," *Journal of Historical Geography* 54, Oct. (2016): 87–98; Kees Terlouw, "A general perspective on the regional development of Europe from 1300 to 1850," *Journal of Historical Geography* 22, no. 2 (1996): 129–146; Kees Terlouw, "Transnational regional development in the Netherlands and Northwest Germany, 1500–2000," *Journal of Historical Geography* 35, no 1 (2009): 26–43; Kerstin Enflo, Anna Missiaia, "Regional GDP estimates for Sweden, 1571–1850," *Historical Methods* 51, no. 2 (2018): 115–137; Kerstin Enflo, Anna Missiaia, "Regional GDP before GDP: A methodological survey of historical regional accounts. In: *Regional Economic Development and History*, eds. Marijn Molema, Sara Svensson. (Routledge, 2019), 82–97; Leandro Prados de la Escosura, "World Human Development: 1870–2007," *Review of Income and Wealth* 61, no. 2 (2015): 220–227.

[9] Borna Fuerst-Bjeliš, Nikola Glamuzina, *The Historical Geography of Croatia: Territorial Change and Cultural Landscapes* (Springer, 2021).

[10] Financed by the National Research, Development and Innovation Fund of Hungary K 117766, led by Gábor Demeter (2014–2017).

[11] Financed by the National Research, Development and Innovation Fund of Hungary K K 132723, led by Csaba Reisz T.

an attempt was made to create a medieval[12] and Ottoman database[13] – and to harmonise it with the existing 19th -century data structure –using the first GIS-supported digital map (not only for the medieval era but for Hungary in general), the so-called, Engel-map.[14] Meanwhile, the database for 1880–1910 was not only enriched with other serial data at the settlement level, but it was extended to the 18th conscriptions with the support of the Hungarian Academy of Sciences.[15] The 9 million data of the GISta Hungarorum for the period between the 18th and 20th centuries were visualized on more than 300 cartograms available online on a webmap server,[16] whereas data for the 19th and 20th can be downloaded from another website with shape files at 1:400,000.[17] As the 'Adatbázisok Online' website of the National Archives broadened in parallel and the scanned sheets of the 1828 conscription were uploaded for public use, National Archives decided to create a new shapefile for the 1840s. Our team applied for financial support to digitize this raw data-series and integrate it into the GISta Hungarorum, as this would allow to fill the gap between the 1780s and the 1870s, offering a new time horizon, a denser sampling in time.[18]

Up to now we have data-series covering the Kingdom of Hungary for the following time-horizons: 1330, 1550, 1720, 1780, 1880, 1910, 2010, and the dataset for 1500 is also partially consultable. For the 1930s data were not digitized by the statistical bureaus whereas data for the 2010s are available online in digital form, thus research requires digitizing paper-based data of six countries with different attitude towards statistics and different phenomena in focus, which is really challenging to harmonize. The time-horizon for the 1550s is still under construction, because it partly relies on Ottoman *defter*s (tax-conscriptions) which are hard to read out.

Since from many time horizons we had some maps and data available for Croatia, we decided to broaden our database and maps territorially and began to work on Croatian data. Our database containing the 1330 papal tithe regis-

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13 Financed by the National Research, Development and Innovation Fund of Hungary K 108919, K 132475, K, and K 132609 led by Éva Sz. Simon.

14 Pál Engel, *Magyarország a középkor végén: digitális térkép* és *adatbázis* (Budapest, 2001) (CD-ROM).

15 Financed by HAS Lendület "Ten Generations" led by Krisztián Gergely Horváth (2018-2024).

16 http://gistahungarorum.abtk.hu Accessed November 25, 2024.

17 www.gistory.hu Accessed November 25, 2024.

18 HUNRENTECH project for 18 months (2025-2026).

ter[19] was supplemented with the parishes of the Zagreb bishopry (1334),[20] the medieval map of Engel also contained the traditional Slavonian region, and during the construction of the Ottoman database, the *mufassal defter* of 1579 on Požega (Pozsega) was processed by Dino Mujadžević[21]. Finally, we had a map with 1:144,000 scale for Croatia from 1884 and 1910 indicating the settlements (unfortunately not all populated places) and we have the conscription from 1786 for Civil Croatia containing the tenant peasants' (with or without the right to move freely) and cottars lands, meadows, duties, obligations and taxes at settlement level.

The datasets available for Hungary are indicated in Table 1, by giving the date, the character of the sources, its territorial extension and the present (2024) stage of processing. This table also contains the availability of settlement-level base-maps and the Croatian datasets we have knowledge about including their stage of processing. Table 2 indicates some variables that can be derived from the raw data to illustrate socioeconomic phenomena.

The general problem with processing data referring to Croatia is that Hungarian statistics between 1870 and 1910 do not always contain as detailed data for Croatia as for north of Drava River. Another problem is that Hungarian archives did not preserve some conscriptions for Croatia. The *Conscriptio Regnicolaris* of 1720 was not executed in Croatia, while the conscription of tenant peasants and their lands and duties from 1786 is available only for Civil Croatia, not for the Military Frontier. This means that we have areas with incomparable extension for 1786 and 1910 too. Furthermore, this conscription records hundreds of settlements that lost their administrative independence by 1910 – with no data available for them in 1910. This requires new base maps for 1910 and 1780s and even the problem of settlement aggregation has to be resolved.

[19] Ladislaus Fejérpataky, *Rationes collectorum pontificorum in Hungaria. Pápai tizedszedők számadásai* [Registers of the papal tithe collectors]. Monumenta Vaticana Hungariae vol. I/1. (Budapest, 1887), 1281–1375.

[20] Josip Buturac, "Popis župa Zagrebačke biskupije 1334. i 1501. godine," *Starine* 59 (1984): 43–107.

[21] Within the framework of K 132475 and K 132609.

Table 1. Processed settlement level serial databases and basemaps available for Hungary, Transylvania and Croatia

Period	Character of serial source	Hungary	database status	basemap status	Croatia	database status	basemap status
1330	papal tithe list	full	integrated	parish point + Voronoi polygon+ higher hierarchic levels	for medieval Slavonia	integrated	parish points for Slavonia+ Voronoi polygons+ higher hiearchic polygons
1330	additional data (charters, art historical data)	full	integrated	parish point + Voronoi polygon+ higher hierarchic levels	for medieval Slavonia	integrated	parish points for Slavonia+ Voronoi polygons+ higher hiearchic polygons
1500	archival and art historical data based on the amended dataset of Pál Engel	full	under construction	parish point (Engel)+ Voronoi polygon+ higher hierarchic levels	for medieval Slavonia		parish points for Slavonia+ Voronoi polygons+ higher hiearchic polygons
1540s-1580s	Ottoman taxation data	partly	50% integrated	settlement point	for Slavonia	1.Požega ready for 1579 Srijem ready for 1546	settlement point
1550-1570s	Royal taxation data (portalis/dicalis conscriptio)	partly	paper, revision needed	settlement point	for Slavonia		settlement point
1720	Conscriptio regnicolaris	full	integrated	settlement point + polygon	n.a	-	
1728	Conscriptio regnicolaris	partly	integrated	settlement point + polygon	n.a	-	
1750	conscription	not exist	integrated	settlement point + polygon	n.a	-	
1773	religion and ethnicity	full	integrated	settlement point + polygon	n.a	-	
1767	peasant conscription	full	integrated	settlement point + polygon	n.a	-	
1785	first census	full	integrated	settlement point + polygon	Partly	paper	under construction
1786	peasant conscription	full	integrated	settlement point + polygon	Civil Croatia	partly integrated	under construction
1796	religion and ethnicity	full	integrated	settlement point + polygon	religion 1828	paper	under construction
1828	conscription	full	Partly	under construction	Civil Croatia	paper	under construction
1865	landuse and land income data	full	integrated	under construction	n.a.	-	
1880	census data	full	integrated	under construction	missing?	-	settlement polygon+district+county
1880	landuse and land income data	full	integrated	settlement point + polygon	n.a	-	settlement polygon+district+county
1880	taxation data	full	integrated	settlement point + polygon	n.a.	-	settlement polygon+district+county
1895	landuse data	full	integrated	settlement point + polygon+district+county	n.a	-	settlement polygon+district+county
1900	census data	full	integrated	settlement point + polygon+district+county	partly	paper	settlement point + polygon+district+county
1910	census data	full	integrated	settlement point + polygon+district+county	partly	integrated	settlement point + polygon+district+county
1910	landuse and land income data	full	integrated	settlement point + polygon+district+county	full	paper	settlement point + polygon+district+county
1910	taxation data	full	integrated	settlement point + polygon+district+county	n.a.	-	settlement point + polygon+district+county
2010	census data	12 variables	integrated	settlement point + polygon+district+county	12 variables	integrated	settlement point + polygon+district+county

Table 2. Socio-economic, demographic and environmental indicators derived from historical sources in the different periods

1330	1500	1550s 1570s	1786	1880-1900	1910
• paid tithe, categorised; • number of parishes; • tithe/parish • tithe/area • markets, fairs, tolls; • fiscal administration; • church hierarchy; • place of authentication, categorised; • number of mendicant friaries; • number of Pauline monasteries; • urban privilege received before 1340;	• parishes (also as 'civil' administrative units, integrating one or more settlements) • legal status, privileges • administrative indicators (central and local administration, place of authentication) • economic indicators (market, toll, mine, etc.) • ecclesiastic indicators (church hierarchy, monasteries, chapels) • cultural and social indicators (literacy, peregrination, school, hospital, artistic production, architecture, etc.)	• *Ottoman* • *hane* number • tax paid • tax/*hane* • Muslim/tax-payers • *Royal* • porta number • tax paid • tax/porta • estate size	• soil quality, 1786; • cultural infrastructure, 1775; • ratio of tenants, 1786; • ratio of the poor living in other's house (*subinquilinus*) 1786; • area of vineyard per peasant; • area of ploughland per tenant, 1786; • number of days of corvée (*angaria*) per peasant; • total sum of taxes per peasant, 1786; • ratio of strangers (*extraneus*) compared to the conscripted, 1785; • ratio of the absent compared to the conscripted, 1785; • number of families per house, 1785; • family size • closeness the market (4 intervals); • ratio of the burghers compared to the number of families, 1785; • value of in-kind services per peasant, 1786	• literacy rate • religion and ethnicity; • dwelling conditions; • distance from nearest railway station 1870, 1880, 1890; • population growth, 1870-1880 • share of industrial earners to all earners in 1900, %; • net cadastral income per capita in 1880, • dwelling conditions in 1900; • share of persons engaged in home industry • net cadastral income per ha in 1883, • landuse in % in 1883, 1865, 1895; • settlement income per capita in Kronen in 1908; • settlement wealth per capita in Kronen in 1883; • state direct tax per capita per one person in 1883, 1902; • share of smallacreers compelled to do daily wage labor, 1900	• altogether 48 original variables are available • average rate of infant mortality in 1901-1910 measured to total death, %; • birth rate • death rate • migration rate • tbc death rate, measles, scarlet fever death rate • literacy rate in 1910 • population growth 1900-1910 • deaths seen by doctors; • distance from doctor • distance from advocates • religion and ethnicity; • dwelling conditions; • distance from nearest railway station; • non-earners measured to 100 earners in 1910; • share of industrial earners to all earners in 1910, %; • share of persons engaged in home industry • net cadastral income per capita in 1910-ben, Kronen; • net cadastral income per ha in 1910-ben, • landuse in %; • Kronen • settlement income per capita in Kronen in 1908; • settlement wealth per capita in Kronen in 1908; • state direct tax per capita per one person in 1909; • average family size • share of smallholders compelled to do daily wage labor

The first census carried out for Hungary in 1785–1787 was executed for Croatia too, however, data were not published in Hungary for Croatia and even the archival material for some counties are missing. Census data of Srijem (Szerém) County has been published in Vojvodina.[22] The data for Križevci (Körös), Varaždin (Varasd) and Severin counties are available as manuscript in the documentation of the Chancellery (Kancellária, A39 - Acta Generalia). For Požega, Zagreb and Virovitica (Verőce) county-scale summaries had been published in Hungary, which definitely means that the census was executed here too, but the material is missing from the central Hungarian archives. The conscription of 1828 is available online, this together with the 1786 data are being processed by Ivana Horbec.[23]

Finally, another problem is the identification of settlement name variants (Hungarian conscriptions usually contain the names in a distorted form compared to the exact Croatian spelling), and the quick changing of terms in different conscriptions. It is also worth noting that the database from 1330-1500 and the database of 1720-2010 use different coding for settlement IDs, and their harmonization, the identification of names is not even finished in the Hungarian parts. Similar efforts for the Croatian parts haves just begun.

The question might naturally arise, what can we investigate at the recent stage of processing, if we have to face so many problems? Variables appearing in Table 2 can help investigating questions below for the period between the 1330s and 1780s:[24]

Q1. The pattern and the changes in pattern of tax per capita and tax per economic unit can be traced between 1330s and 1570s for Požega. For this we can use the papal tithe / area or papal tithe / parish values as proxies for agrarian potential in 1330 and, for the 16th century, we may use the tax/*hane* values in order to differentiate within the agrarian potential of Slavonian settlements.

Q2. The same applies to the hierarchic level (significance) of the settlements for entire Slavonia in 1330 and 1500.

Q3. the Muslim settling in the Sanjak of Požega (which does not fully equal to the territory of medieval Požega County) by the late 1570s, indicated

[22] Antal Hegediš, Katarina Čobanović, *Demografska i agrarna statistika Vojvodine 1767-1867* (Novi Sad: Filozofski Fakultet u Novom Sadu, Inst. za Istoriju, 1991).

[23] Within the framework of project K 145924.

[24] We do not discuss here the age of Dualism, for which cf. the online atlas of Gábor Demeter, *Atlasz Horvátország történelmének tanulmányozásához 1870–1910 / Atlas for studying the History of Croatia (1870–1910)* (Budapest: BTK, 2019). Accessed November 25, 2024. https://www.gistory.hu/g/hu/gistory/gismaps

by their relative share from the population. We may approximate the latter by using a relative indicator (tax-paying *hane* vs. conscripted Muslim *hane*).

Q4. We may compare the features (average tax paid, inequalities in taxation, etc.) of areas under consolidated Ottoman rule (Sanjak of Szeged), partial borderlands as Požega (Orahovica and Virovitica kazas, northwestern parts of the sanjak are still considered frontiers) and the frontier (N-Hungary: Sanjak of Hatvan)

Q5. The spatial differences in peasant tenant land size, duties, etc. between rural Zagreb and Požega counties in 1786.

Q6. The statistical difference between the two counties (and Hungary proper) in 1786 may also shed light on the differences.

Medieval Slavonia

Q1–2. In medieval times, Slavonia was approximately the equivalent of the diocese of Zagreb. There are two exceptional sources for this area, both published by Josip Buturac[25], which describe the medieval parish network in 1334 and 1501, respectively. The first register is related to the papal tithe list of the medieval Kingdom of Hungary, compiled between 1332 and 1337 (*Rationes*), which also contains data on the payments of the archdeaconries of the Zagreb diocese, although the list of parishes was not included. By combining the data from the two sources, it is possible to see the regional differences in early fourteenth-century Slavonia and to compare it with the other regions of the medieval Kingdom of Hungary.

The 1501 list is different. Firstly, it is unique throughout the Kingdom as similar parish registers were compiled only decades later when Reformation and the Ottoman wars caused significant changes in the medieval institutional system. Secondly, unlike the list of 1334, it contains not only the parishes, but also the number and – most importantly – the position of the priests who served in these churches. Therefore, not only can we compare the two lists to see changes in the parish network, but we can also gain an insight, different from that of 1334, into the demographic and economic conditions in different regions of the diocese around 1500.

Since modern Slavonia also includes the southern part of the medieval diocese of Pécs and the diocese of Srijem, which belonged to the archbishopric of Kalocsa, the comparison of the two periods is extended to these areas as well. It should be noted, however, that the sources for present-day Eastern

[25] Buturac, "Popis".

Slavonia are different. The papal tithe list for this region is more detailed and contains the tithes paid by parish, but the data for the period around 1500 had to be collected from various sources, dated from a longer period between 1470 and 1530, in some cases even from 1450 and 1540.

Using the parish records from the 15th century and tithe data from the 14th c. we may reconstruct economic intensity at parish level, giving a more detailed information compared to county-scale approach.

Tithe per parish area was recalculated using Voronoi-polygons as supposed boundaries of the parishes for 1330 (Figures 1a, 1b), thus we were able to obtain tithe per area values, data similar to the "income/hectare"-type data from 1910. This is a great step forward to approximate output/unit-type variables (like GDP/capita): since exact (census) data on population are missing from the 14th century, we are unable to calculate real output/capita or output/economic unit. Thus output/estimated area remains a solution for the 14th c. to measure economic intensity. Just to draw the possibilities of fine scale approach in medieval times, the medieval map based on Voronoi-polygons indicates parishes of good tithe/area values in the northwestern parts of Zagreb County, which is remarkably similar to the pattern in 1786 (based on settlement boundaries in 1910 – caused partly by wine-growing there).

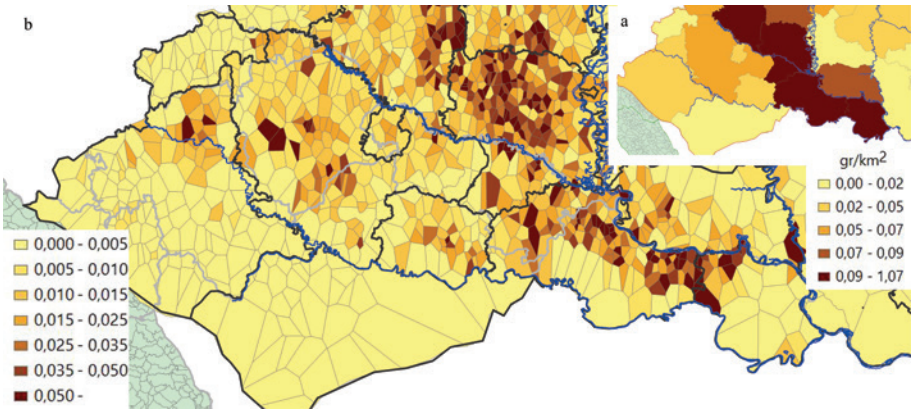

Figure 1a. Tithe/km² values (low resolution for the 14th c. at county scale (boundaries c. 1300). Compare map with Figure 1b, reconstructing parish areas, giving a finer, parish-scale approach. Note that Požega and Zagreb counties had the same output levels in 1334 well below the agrarian output per area in Srijem County (Source: Fejérpataky, *Rationes collectorum pontificorum*; Buturac, "Popis"). This definitely changed by the Ottoman period.

Figure 1b. Tithe/ha values for parishes in the 1330s as proxy for agrarian income. Unknown parish boundaries are substituted by mathematic calculations (Voronoi-polygons). Both 1300 and 1910 county boundaries are indicated.

As far as today's Eastern Slavonia is concerned, the data of the papal tithe list can be compared with another set of data, the first *defter*s of the Ottoman period. The possibilities of such an analysis are presented through the example of Požega. For the sake of consistency of analysis, therefore, only the changes in settlement hierarchy of the two medieval periods (1330s and ca.1500) is discussed here in details. The basis of qualification can be seen in Table 2.

In historical Slavonia all types of settlements of the settlement hierarchy of the 1330s are abundant, from the smallest villages to the most important towns, but there are also significant regional differences. In the Kingdom of Hungary, seven towns were at the top of the hierarchy, including Zagreb. It is worth noting that in the southern part of the kingdom there was only one other settlement in this category: Pécs. Furthermore, there were five towns of the second category (Čazma, Požega, Ilok, *Eng [Divoš] and Sremska Mitrovica), and six towns of the third category (Dubrava, Koprivnica, Virovitica, Veliki Zdenci, Osijek and Gorjani) – most of these settlements became important market towns by the end of the Middle Ages. The latter category is completely missing from Srijem and the south-eastern part of the medieval county of Vukovo (Valkó) – a phenomenon that seems to be permanent in the region. The next category consists of settlements between towns and villages. Some of them later became market towns (*oppida*), but many remained in this liminal position, and some even sank into the rank of villages. Looking at these four categories together, the difference between the regions north and south of the river Sava becomes clear. While between the rivers Drava and Sava we can see a fairly dense network of towns and urban-like settlements, in the region south of the Sava not even the fourth category was properly represented. Apart from three settlements around Zagreb (Samobor, Okić, Kravarsko), only Dubica belongs to this group. This phenomenon is accentuated by the fact that the rural parishes of this region, i.e. the archdeaconries of Dubica, Gora, and Gorica, paid the smallest sums on average. All over the Kingdom, only the villages of the Szeklerland paid similarly low sums. The reason is probably that both were relatively recently settled in the 1330s, in a hilly region with extensive forests, and animal husbandry, namely sheep herding was an important sector in both regions. This suggests that, on the one hand, none of these regions reached their economic potential yet, and on the other hand, sheep herding was not a highly lucrative source of income in this period.

Compared to the 1330s, the period around 1500 can be characterised by a boom in urban development. In Slavonia, however, the process seems to have been less spectacular. At the end of the Middle Ages, only two of the 42 most important towns were in Slavonia (Zagreb, Čazma), the second category was represented by seven settlements (Požega, Ilok, Veliki Zdenci, Moslavina,

Đakovo, Koprivnica, Križevci), while *Eng and Sremska Mitrovica lost their position. Thus, only nine towns were situated in the discussed region, representing only 10 per cent of the towns in the Kingdom of Hungary (in 1334, the ratio was one eighth). The next category of settlements (about one hundred) included market towns of varying importance. Although the share of Slavonia in all these categories combined slightly increased, it was due to the increasing number of smaller market towns.

Around 1500, the network of urban and urban-like settlements in the eastern and southern parts of the region was visibly looser than in the northern and western parts. More or less the same can be said of the rural parishes. In fact, the reason for this is obvious: we can see the effects of the Ottoman wars that ravaged this region from the beginning of the fifteenth century. Nevertheless, it is worth looking at the details. The number of parishes decreased in Srijem and in the diocese of Pécs, but in the first case the losses were compensated by the increasing number of parishes north of the Danube. Thus the diocese of Pécs was the only one in the late fifteenth-century Kingdom of Hungary where the total number of parishes in 1500 was smaller than in the 1330s. For the diocese of Zagreb, the picture is more complex. While the total number of parishes increased by about 7 per cent, there was a significant shift in the density of the network. The number of parishes decreased in the eastern archdioceses and increased in the western archdioceses. Among the eastern archdioceses, that of Dubica virtually collapsed: of the 43 parishes of 1334, only 15 remained in 1501, and even many of these were not the same as 170 years earlier. Moreover, in each parish there was only the parish priest, not a single chaplain was registered, not to mention altarists or other priests who would have been paid extra by the local population. In comparison, in the other parts of the diocese, there were 448 parishes with 137 chaplains (paid from the tithe) and 124 other priests (paid from various, regular or occasional sources), in addition to the 448 parsons (*plebanus/parochus*) and 8 vicars (*socius*). (cf. Table 3).

Table 3. Changes in the parish network of the diocese of Zagreb between 1334 and 1501, as proxy for estimating the population and its capacities to sustain priests

archdeaconry	1334, plebania	1334, capella	1501, plebanus	1501, socius	1501, capellanus	1501, altarista	1501, mag. hosp.	1501, other
Bekšin	33	0	43	0	17	1	0	7
Čazma	36	7	46	0	14	4	1	3
Dubica	43	2	15	0	2	1	0	0
Gora	42	0	47	0	0	0	0	0
Gorica	60	17	53	6	26	0	0	6
Gvešće	30	2	45	0	6	2	0	13
Kamarca	46	4	50	1	23	13	2	20
Kalnik	20	0	37	1	14	1	0	13
Senče	34	0	35	0	14	0	1	1
Varaždin	14	0	15	0	3	2	0	4
Vaška	17	2	16	0	8	8	0	19
Vrbovec	3	0	3	0	3	0	0	0
Zagorje	19	0	15	0	0	0	0	0
Zagreb	37	2	43	0	7	0	0	2
Total	434	36	463	8	137	32	4	88

Source: Buturac, "Popis", data processed by F. Romhányi.

Based on the parish network, we can have a broad idea about population sizes in the respective periods, too. Around 1300, a few decades before the papal tithe list of the Kingdom of Hungary, a series of similar lists were compiled all over Europe. The best analysed are the English *Taxatio* (1291-1292) and the French État des *paroisses et des feux* (1328).[26] In both cases the average population per parish was around 520 – in England slightly below, in France slightly above. The data for the Kingdom of Hungary seems to be closer to the French data, corresponding to the contemporary number of the mendicant friaries.[27] In late medieval France and England, the average population per parish (in this case in the sense of the early modern French *commune* or German *Gemeinde*) was about 750-760 souls. The same rate was applied in the late eighteenth century, when the modern administrative system was established

[26] "Taxatio"; accessed on November 25, 2004, dhi.ac.uk/taxatio/; Ferdinand Lot, "État des paroisses et de feux de 1328", *Bibliothèque de l'École des chartes* 90 (1929): 51–107.

[27] Beatrix F. Romhányi, "Plébániák és adóporták – a Magyar Királyság változásai a 13–14. század fordulóján", *Századok* 156, no. 5 (2022): 893–909.

in France.[28] According to these data, the population of the Slavonian counties can be estimated as follows:

Table 4. Estimation on population for Slavonia proper[29]

A	B	C	D	E
County	**1330s**	**c. 1500 (a)**	**c. 1500 (b)**	**change in %**
Križevci	87,500	149,500	148,300	69–71%
Varaždin	19,900	26,300	22,200	12–32%
Virovitica	5,800	13,100	11,100	91–126%
Zagreb	75,500	100,700	98,100	30–33%
Požega	36,700	36,100	37,200	-2–+1%
Vukovo	78,100	105,900	104,900	34–36%
Srijem	20,400	27,000	27,700	32–36%
Total	323,900	458,600	449,500	38–42%

Calculated by Beatrix F. Romhányi based on data given in table 3.

Compared to the entire Kingdom, the population of Slavonia grew slower (56% vs. 40%). The case of Požega seems to be the most interesting, even more so, since both in 1494 and 1495 the rate of unpaid tax was by far the highest there,[30] and the population stagnated. For better understanding of the tendencies, we have compared the data of six medieval counties, namely three South-Transdanubian counties (Baranya, Somogy, Tolna) and three East-Slavonian counties (Požega, Srijem, Vukovo) in three time sections (1330s, ca. 1500, 1570s). (Table 5) As there is no processed *defter* from the 1570s for Srijem yet, but as the *defter* of 1546 also contains data for settlements of Vukovo and even Baranya County, we have decided to include these data. The possible discrepancies are indicated in the notes.[31]

[28] Serge Brunet, "Les prêtres des campagnes de la France du XVII^{e} siècle : la grande mutation," *Dix-septième siècle* 234, no. 1 (2007): 49–82; Lot, "État des paroisses".

[29] The values in column B are all based on the parish churches registered in the 1330s. The values in column C are based on the parishes (the term used in its modern meaning), while those in column D either on the number of permanent parish priests and chaplains (for the diocese of Zagreb), or on the number of parish churches (for the counties Požega, Vukovo, and Srijem).

[30] Tibor Neumann (coll.), *Registrum proventuum regni Hungariae* (Budapest: BTK TTI, 2022).

[31] Using the medieval ID, the so-called Engel-code, that contained the abbreviation of the medieval name of the county too, Ottoman data were reclassified into these medieval counties instead of using the Ottoman sanjaks as territorial units. That way we managed to make data from the 1330s, 1500s and 1570s comparable, on the basis of medieval administration.

Focusing on the strange situation in Požega, it is visible that it never belonged to the best-off ones in the broader region. Both in the 1330s and around 1500, its taxability was slightly below the average of the six counties. In addition, we know that a large part of the war subsidy levied could not be collected either in 1494 or 1495. However, in the 1570s, the territory of the medieval county performed better, and its taxability was slightly above the average of the five counties for which we have data of the 1570s. When analysing the data in a broader context, we can see that in the 1330s, the average tithe of Požega County was close to the neighbouring diocese of Zagreb where most parishes paid below the average of the kingdom. In this case, it can be explained by the relatively late settlement of the region, but probably also by the fact that the basis of tithe was mainly grain and wine, which was less productive in Požega, characterised by extensive forests that time. Around 1500, the backward situation of Požega can be explained by the constant threat coming from the south,[32] especially if we consider not only the relatively low taxability of the county, but also its stagnating population.

This situation clearly changed after the first decades of the Ottoman occupation when the population seemed to grow due to immigration from the south (from the estimated 37,000 in the 1500s, Table 4, to over 9500 *hane* in Table 6 – see also the increasing number of settlements and the presence of Muslim civil population), that is reflected in the higher level of taxability registered in the Ottoman *defter*.

[32] Medieval Požega surrounded by mountains was opened to the south and rather locked from the north. Ottoman raids from the south might result in weakening public security.

Table 5. Changes in the taxability of six southern counties of the medieval Kingdom of Hungary between 1330 and 1580. Rankings are based on the tax per parish or tax per settlement (in the Ottoman period only the western part of Vukovo county was considered, see below)

Medieval county	area (km²)	Medieval parishes (1330s)	Total tithe (den.)	Titue/parish (den.)[33]	Tithe/area (den.)[33]	Medieval parishes (c. 1500)	Medieval settlements (c. 1500)	War subsidy in 1494/1495 (florins)	War subsidy /parish (den.)	War subsidy /area (den.)	Settlements registered in defters[34] (1546, 1570–1580)	Tax imposed in the defter in akçe (with manors, farmsteads, and deserted settlements)	Tax/settlement (akçe)[35]	Tax/area (akçe)	Parishes (1500/1330)	Settlements (1570/1500)	Ranking 1330	Ranking 1500	Ranking 1570
Baranya	5718	203	10857.3	53.5 (8557)	1.90 (304)	196	551	15,018	7662	262.6	666	4,067,172	6107	711.3	97%	121%	3	1	2
Somogy	6339	243	9360.6	38.5 (6163)	1.48 (236)	274	606	11,012	4019	173.7	724	2,726,316	3766	430.1	113%	119%	4	4	5
Tolna	4503	144	4666.3	32.4 (5185)	1.04 (166)	155	374	9,925	6403	220.4	404	3,206,143	7936	712.0	108%	108%	6	2	1
Požega	1935	67	2261.3	33.8 (5400)	1.17 (187)	48	198	3,648	7600	188.5	214	1,079,831	5046	558.1	72%	108%	5	3	3
Srijem[36]	3121	36	3722.4	103.4 (16,544)	1.19 (191)	36	108	n.d.	n.d.	n.d.	169	462,250	2735	148.1	100%	156%	1	-	6

[33] In the 1330s, parish priests were to pay one tenth of their income as papal tithe. Since parish priests could keep only a part of the tithe, in Transdanubia usually $^{1}/_{16}$, the presumed amount of the entire tithe, paid by the peasants, is given in parenthesis.

[34] The inhabited settlements are not always identical in the two periods. Due to various reasons, some settlements could not be identified with any medieval settlement, but in a number of cases it could be proven that villages mentioned in the defters had no medieval predecessor. Further research is needed to detect the possible shifts in the settlement network.

[35] 1 golden florin in the 1490s equalled to 60 *akçe* and 102 *denarius*. After the Ottoman monetary depreciation in the 1580s the value of 1 *akçe* was 1 denarius. This may help convert and compare late pre-Ottoman and Ottoman data given in *akçe*.

[36] In the 1330s, the inhabited area of the county was smaller than in the 1570s. The southeastern part began to be settled from the mid-fifteenth century when Serbs from the right bank of the Sava and Danube Rivers fled in large numbers to the Kingdom of Hungary. Their settlement area reached the Fruška Gora before 1500, and it continued expanding to the north during the Ottoman period. This explains the discrepancy of the county's position when comparing the tithe per parish and the tithe per area for the 1330s. Indeed, the parishes of the region belonged to the richest in the early fourteenth century all over the kingdom. Also, it has to be noted that the *defter* for Srijem County and the eastern half of Valkó County dates from 1546, from a period of intense

Medieval county	area (km²)	Medieval parishes (1330s)	Total tithe (den.)	Titue/parish (den.)[33]	Tithe/area (den.)[33]	Medieval parishes (c. 1500)	Medieval settlements (c. 1500)	War subsidy in 1494/1495 (florins)	War subsidy /parish (den.)	War subsidy /area (den.)	Settlements registered in defters[34] (1546, 1570–1580)	Tax imposed in the defter in akçe (with manors, farmsteads, and deserted settlements)	Tax/settlement (akçe)[35]	Tax/area (akçe)	Parishes (1500/1330)	Settlements (1570/1500)	Ranking 1330	Ranking 1500	Ranking 1570
Vukovo[37]	5507	146	9598.8	65.7 (10,519)	1.74 (279)	141	420	n.d.	n.d.	n.d.	447	1,652,042	4981	300.0	97%	106%	2	-	4
Total / average	**27123**	**839**	**36744.2**	**43.8 (7007)**	**1.35 (217)**	**850**	**2257**	**39,603**	**5885**	**214.1**	**2624**	**12,731,504**	**4852**	**469.4**	**101%**	**116%**			

Sources: Simontornya 1570: TT 563, Koppány 1570: BOA TT d 563, Szekcső 1580: BOA TT d 593, Szekszárd 1580: BOA TT 593, Mohács 1567: DKBK Cod Turc Rot V, Pécs 1579: BOA TT 585, Szigetvár 1579: BSB Cod Turc 138, Görösgál 1552: BOA TT 646, Požega 1579: BOA TT.d 672. Digitized data for each settlement are available online at Adatbázisok Online: Oszmán összeírások gyűjteménye: https://adatbazisokonline.mnl.gov.hu/adatbazis/oszman (accessed on November 25, 2024).[38]

warship. This certainly influenced their taxability, therefore the tax per settlement and tax per area data are significantly lower than in the other counties the *defter*s of which were compiled after 1570. In 1579, the values for the western half of Vukovo Caunty are 5237 *akçe*s and 400 *akçe*s, respectively, while the averages of the five counties (without Srijem) are 5155 (per settlement) and 519 *akçe*s (per km²).

[37] The settlements belonging to the medieval Valkó County are only partially registered in Požega sanjak. The eastern part of the county belonged to Srijem as early as in the sixteenth century. The tax per area is adjusted to the part of the county registered in 1579 in Požega Sanjak. On changes in the administration of the sanjak of Srijem, see Miklós Fóti, Gábor Demeter, "The Role of the Sanjak of Semendire (Smederevo/Szendrő) in the Establishment of Turkish Administration in the Southern Part of Hungary". Belgrade (forthcoming).

[38] Data on settlements and parishes for the period around 1500 is based on the database of Pál Engel, amended and further developed in the research project NKFI K 145924. As the focus of Engel was the estate system, he regularly registered different parts of one and the same settlement as separate entities. In the database constructed for c. 1500, these data appear under a single settlement. Similarly, settlement parts distinguished with the particles Lower/Upper, Little/Great or any similar which were, however, very close to each other if not contiguous were also unified. These settlements may appear separately in the Ottoman *defter*s in which case no similar evaluation of the data was done.

This temporal comparison leads us to our next investigated question, that is regional disparities and differences during the Ottoman period, an era, where statistical approach is disturbed by constant warfare and belonging to two different political entities (the effect of condominium and wars on statistical data-availability). The question is whether this catching up of Požega County was relative (compared to previous centuries) or absolute (compared to other regions under Ottoman rule).

The First Century of the Ottoman Rule: Restructuration

Q3-4. The main serial sources for the Ottoman era that contain numeric (quantitative) data beside qualitative ones are the *mufassal defter*s, the processing of which for the territory of the Kingdom of Hungary are supervised by the National Archives of Hungary.[39] The research group led by Éva Simon, composed of osmanists cooperate with IT-experts, archeologists, geographers, Serbian and Croatian historians. *Mufassal defter*s were detailed protostatistical censuses of the Ottoman revenues that list tax income per settlements and land parcels, and include names of individual taxpayers (usually heads of households) and of estate owners too. In the territory of the successor states of the Kingdom of Hungary and elsewhere in the Ottoman realms, *mufassal defter*s were produced until the beginning of the 17th century. For the territory referred to as Slavonia in modern sense there are several such *defter*s of the Ottoman *sanjak*s of varying territorial sizes: *mufassal* censuses of the *Sanjak* of Požega (1540, 1545, 1565, 1579), Syrmia/Sirem/Srijem (1546, 1553)[40] and Pakrac (1565, 1584). In this article we will present the data from the 1579 *mufassal* census for the Požega sanjak which at that time covered most of what is now considered Slavonia. Its manuscript is exceptionally well written and very readable.[41] The manuscript and its Croatian translation[42] were both checked and compared by Dino Mujadžević when extracting the data on the settlement types, names, numbers of households, landholders, and the amount of tax income per settlement.

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[39] Adatbázisok Online: Oszmán összeírások gyűjteménye (Collection of Ottoman defters), accessed on November 25, 2024; https://adatbazisokonline.mnl.gov.hu/adatbazis/oszman

[40] On the *tahrir defteri*s of Srijem, see Miklós Fóti, "The *Nahiye* of Morovit' in the *Sancak* of Sirem According to the *Tahrir Defteri* of 1578," *Archivum Ottomanicum* 41 (2024).

[41] BOA TT.d 672.

[42] Stjepan Sršan (ed.), *Popis sandžaka Požege 1579. godine*. Translated by Fazileta Hafizović. Topography by Ive Mažuran. (Osijek: Državni arhiv u Osijeku, 2001).

We should stress also that this and other Ottoman 16th century censuses for this region do not refer to the medieval parish system anymore.[43] From Christian sources, we learn that this system largely collapsed around the time of the Ottoman conquest in the area of modern Slavonia and started to recover in the late and, especially, in the 17th century.

As *mufassal defter*s contain quantitative data on tax-unit numbers and taxes (belonging to the prebend-holders', i.e. *timariot*s revenues), tax/*hane* values can be calculated to approximate the economic performance of the settlements. This tax was mostly a production-based proportional tax (natural *tithe* or cash substitute) on main agricultural products (various grain cultures, grapes, pigs, goats, etc.) with additional taxes like per household "door tax" (*resm-i kapu*) for Christians[44] and "land tax" (*resm-i çift*) for Muslims or various smaller fees paid in cash (*bad ü heva*). Additionally, there is a strong presence of population that paid their taxes completely as cash lump-sums, notably in the northwestern, frontier kazas of Orahovica and Virovitica. Most of this population were pastoralist or formerly pastoralist immigrant communities from the south of river Sava (*vlach*s).[45] This phenomenon was also characteristic for Srijem.

In other words, the tax recorded in this type of *defter* is very similar to the medieval tithe we used above (the basis of Ottoman taxation was also the economic unit of unknown size and population number,[46] not land size, or production or the number of tax-heads).[47] That reasons our attempt to compare these revenues at least in macro-scale for the 15th and 16th c., before and after the Ottoman penetration (Table 5).

In order to characterize the features of Ottoman presence better in the Sanjak of Požega, first we give a general outline of the region based on the statistical data collected from the *defter* of 1579, aggregated at sanjak level. Then we go deeper and analyse internal inequalities using the data of the Sanjak

[43] It is very interesting that in the Danube-Tisza interfluve, in Solt County from the early Ottoman conscriptions in the 1540s, the researcher may (still) reconstruct the former parish system.

[44] The usual amount for this tax was 50 akçe in the Hungarian sanjaks.

[45] For the survey of the vlach population of Požega, see Codex Gothanus, Türkische Urkunden no. 142, Landeshauptarchiv Weimar: *Rüsum-i eflakan-i liva-i Pojega*.

[46] Old literature often tends to multiply *hane* numbers by 5 to get approximate population in the Balkans, but we do not agree with this method. In Hungary *hane* number has to be multiplied by 6, or first by 1.4 adding adult males not under taxation, then multiplied by 5,

[47] In the 16th century there was no *cizye* in the Požega sanjak, but instead of it a tax named *filuri* was collected from Christians. The difference is that *filuri* was given per household not per head. However, this tax was not recorded in the 1579 census.

of Hatvan, representing the norther frontier of Ottoman occupation in the 1570s, and the Sanjak of Szeged, representing a consolidated area remote from the frontier zone. After calculating the *sanjak* level average values (*hane*, tax, tax/*hane*) we calculate the same average values for the upper 25% and lower 25% of the settlement and compare Požega with Sanjaks of Szeged and Hatvan. Finally, to illustrate the territorial versatility of tax units, sum of tax and tax per *hane* settlement level-maps were also created for Požega comparing it with its northern neighbours (Tables 6-9, Figures 2-3-4).

The *hane* number in the Sanjak of Požega in 1579 was very similar to that of the Sanjak of Szeged after Ottoman accommodation (the territorial extent of the latter was much greater) and exceeded the value of the Sanjak of Hatvan (the territorial extent of which was similar to Požega's value). The number of settlements (omitting *chiftlik*-manors, which were rarely conscripted separately in Hungary)[48] was also similar to the Szeged values after 1570. The tax levied to Požega was similar to that levied in the Sanjak of Hatvan, after the changes introduced by the new *defterdar* at Buda, which made burdens heavier in the frontier region of Hungary too. (This was done partly to balance the depreciation of *akçe* in the 1580s, partly to prove that the region is not a frontier any more). Despite the similar *hane* and village numbers the value of tax levied to the Sanjak of Szeged (ranging from the Vojvodina to Csongrád covering a large area with low settlement density) was still a bit higher than the value of tax in Požega. This means that despite the fact that average *hane* number per settlement was around 15 in each sanjaks, average tax per settlement was way higher in the consolidated area (Sanjak of Szeged), whereas this value in Požega, despite the 40 year-old Ottoman presence (the town was captured in 1537, Osijek in 1526) was not higher than the tax/settlement value in the Sanjak of Hatvan in 1590, which was a frontier zone in its similarly 40 year old Ottoman history. We should stress that around 1579 the Požega sanjak was also partially a frontier sanjak facing the Habsburg-controlled areas, especially in its northwestern *kazas* Orahovica and Virovitica. On the other hand, these values compared to the tax/settlement values measured in the neighbouring sanjak of Srijem (Sirem) shortly after its conquest, in the 1540s, were definitely higher in Požega by 1580 (Table 6). Though Srijem was a relatively wealthy county in the 15th c. (which is confirmed by the fact that the Ottomans imposed heavier taxes here on wine-growing, than elsewhere, and the *resm-i kapu* was 60 *akçe* instead of the regular 50 in Hungary), we have evidence on recurring Ottoman complaints, that the population fled to the Bačka. This might lead to the decrease of tax burdens – our evidence in Table 6 suggests that in the initial phase of Ottoman accommodation taxes were

[48] In Požega we had more than 1700 entries, including fields, meadows, woods, and wine-hills.

lower due to the unconsolidated circumstances, inaccurate conscriptions and population movements. However, the tax/*hane* values (representing supposed economic capacity) in Srijem in 1546 were even lower than in the Sanjak of Szeged located north of Srijem also occupied by1546, which was functioning as a refuge and frontier area. The great difference in the synchronous data also refers to unstable conditions in Srijem.

What is said in connection with tax/settlement values were also true for the tax/*hane* values. The average value for Požega sanjak in the 1570s was similar to the value in the Sanjak of Hatvan in the 1570s, just before a heavier burden was imposed on it in order to prove self-sustainability and negating its frontier character – but it was lower than in the Sanjak of Szeged in the 1570s. Paradoxically, the 1579 Požega tax-conscription even represents an increase in tax burden in comparison to previous decades. The 40 *akçe* "door tax" for Christians was introduced in that year. This increase of tax-burden can be also interpreted as the end of frontier status in Ottoman official perspective, at least for the majority of the sanjak. The large settled (non-military) Muslim population of the sanjak (ca. 3500 *hane* around 1/3 in 1579,), may have actually contributed to its weaker tax revenues in comparison to the similarly populated sanjaks with much larger share of Christian population – at least slightly – as Muslims were generally paying less taxes on land in form of *resm-i çıft*.

Table 6. Basic data on demography and taxation for four sanjaks (rounded values)

Sanjak, year	**Ottoman tax**	**average tax/ settlement**[49]	***hane***	***hane* per settlement**	**tax/*hane***	**settlements and mezraa**	**Character**
Szeged, 1546	877,000	3500	3575	15	245	260	frontier in 1546
Szeged, 1578[50]	4,840,000	7250	10,770	15	450	739	core by 1578
Features	*increasing tax till 1570*	*increasing tax/ settlement*	*stagnating hane number after 1570*	*stagnating econ. Power*	*increasing burden*	*expansion till 1570*	
Hatvan, 1570	2,107,000	4622	6208	14 to 20	340	459	frontier in the 1570s
Hatvan, 1591[51]	3,146,000	5568	5574	10 to 18	560	550	core by 1590
Features			*decreasing hane number after 1570*	*increasing hane per settlement values*	*increasing burdens*	*continuous expansion, increasing oppression*	
Požega, 1579	**3,733,000**	**5100**	**10,926**	**14-15**	**340**	**770+800**	frontier based on income from agrarian production
Srijem, 1546	893,490	1500	7380	13	120	561+150	

Sources: Szeged, 1546: BNF Turc Suppl 76; Szeged 1578: BOA TT.d 570 and 572; Hatvan, 1570: BOA TT.d 550; Hatvan 1591: BOA TT.d 823. Požega, 1579: BOA TT.d 672. Srijem, 1546: BOA TT.d 437

[49] Records where tax value was zero are omitted from calculations.

[50] Territorial extension as well as the number of settlements may change, limiting the validity of temporal comparisons!

[51] Just before the outbreak of the Fifteen-Years War, right after the „unfamous" depreciation of the *akçe*.

Regarding inequalities, while both the absolute and normalized tax/*hane* values were high in the upper 25% of the settlements in Požega sanjak (even higher than in Szeged, but a bit lower than in Hatvan sanjak), the average tax/*hane* value, was the lowest in Požega Sanjak (apart from Srijem), because the lowest 25% of the settlements were also paying the least tax/*hane*. Thus, the difference between the lowest 25% and the top 25% was the greatest in Požega sanjak (Tables 7 and 9).[52] This was partly caused by the different taxation of the Muslim population as discussed in Table 10.

We may also measure settlement-level inequalities on absolute tax values at settlement level. In this case – not calculating with *hane* number as weighting factor – the inequalities in Požega are very similar to that in Szeged (Tables 8 and 9)!

It is also worth pointing out that inequalities in taxation (based on normalized values) are not equal to differences in absolute tax incomes (economic potential of the sanjaks). We also calculated the real value of tax/*hane* and tax/settlement in these sanjaks for the top and bottom quartile of the settlements (Table 9). Based on these values, Požega represented extreme values: tax/*hane* (expressed in *akçe*) of the top 25% of the settlements was the highest of all sanjaks compared, while the bottom 25% produced a really low tax income. This put the average of tax/*hane* similar to Szeged and Hatvan sanjaks. Though inequalities in Srijem in the 1540s were similar to the above outlined, its income (tax/*hane*) values were way lower, than in the other three sanjaks, despite the similar hane/settlement values. The indicators are low even compared to the just occupied region around Szeged, where not only the *hane* number was half of that in Srijem (the sanjak of Szeged was a large but rarely populated area), but tax/*hane* and tax per settlement values were twice as high, resulting in the same amount of tax levied to cover the *spahi*s' needs.[53]

[52] Normalized values (rescaled between 0 and 1 to make comparisons more reliable) are given in Table 7, absolute values in Table 9.

[53] Data may refer to depopulation and devastation. Comparing late medieval map on parish density (Figure 1b) and the dot map of Ottoman occupation in 1546 (not published here) one may calculate with 8-10,000 newcomers filling the gaps left empty by refugees and devastations In the late medieval period the county's population was ca. 30,000 persons (1500). Based on *hane* numbers (over 7000) the number of total population did not decrease below this by 1546. Calculating with 3 ‰ increase per year, a 11% increase is expected by 1540 under undisturbed circumstances. However, the population loss was greater than this 11% (if we suppose the same population numbers for 1500 and 1540), because we have to calculate with migration too. In Požega the number of Muslims – evidently newcomers there – refer to a 30% replacement rate by 1579. This could have been even higher if newcomer orthodox are added. So, calculating with the loss and replacement of 30% of the population in Srijem, that is the 10,000 persons mentioned in the beginning of the footnote, is plausible.

Table 7. Inequalities in tax/*hane* values for the four investigated sanjaks (normalized values)

Tax/*hane* values (normalized)	**Szeged, 1578**	**Hatvan, 1570**	**Požega, 1579**	**Srijem, 1546**
bottom 25% of settlements	0.122	0.13	0.10	0.128
total average	0.21	0.256	0.198	0.20
upper 25% of settlements	0.326	0.43	0.38	0.33
bottom 25% per top 25%	0.37	0.3	0.24	0.39
top 25% per average	1.55	1.67	1.90	1.65
bottom 25% per average	0.58	0.51	0.46	0.64

Sources: cf. Table 6.

Table 8. Inequalities at tax/settlement level for four sanjaks

	Szeged 1570s	**Hatvan, 1570s, frontier type**	**Požega 1579**	**Srijem, 1546, frontier type**
top 25% per average	2.68	3.1	2.61	2.8
bottom 25% per average	0.12	*0.08*	0.14	*0.08*

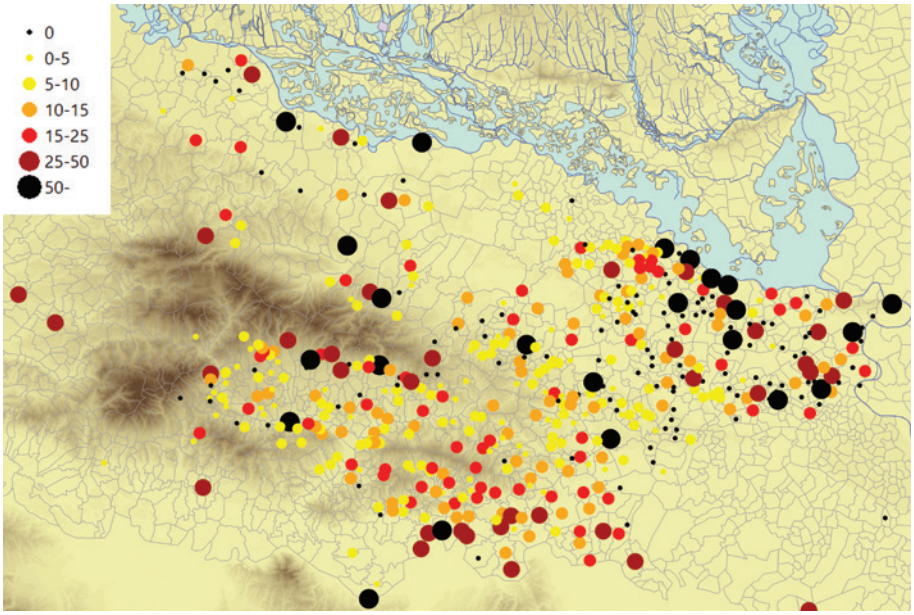
Sources: cf. Table 6.

Table 9. Tax/*hane* and tax/settlement values in the investigated sanjaks

	Tax/settlement (*akçe*)					Tax/*hane* (*akçe*)			
(with *mezraa, chiftlik, etc.*)	Požega, 1579	Szeged, 1578	Hatvan, 1570	Srijem, 1546		Požega, 1579	Szeged, 1578	Hatvan, 1570	Srijem, 1546
top 25% of the settlements	6925	19,200	14,815	3380	top 25% of the settlements	806	665	467	165
bottom 25% of the settlements	610	883	250	120	bottom 25% of the settlements	180	244	223	64

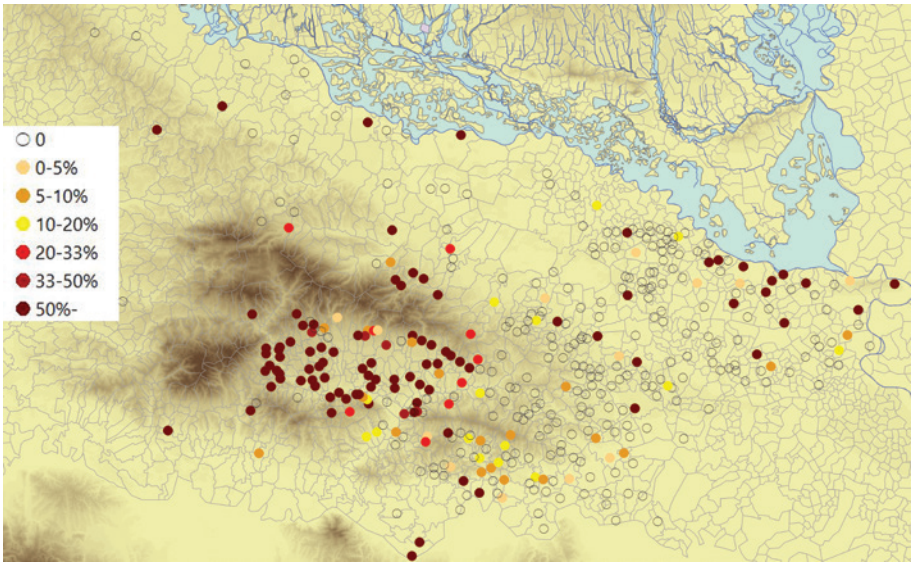
Sources: cf. Table 6.

Figure 2. The tax-payer *hane* number in the Sanjak of Požega and its nahiyes in 1579



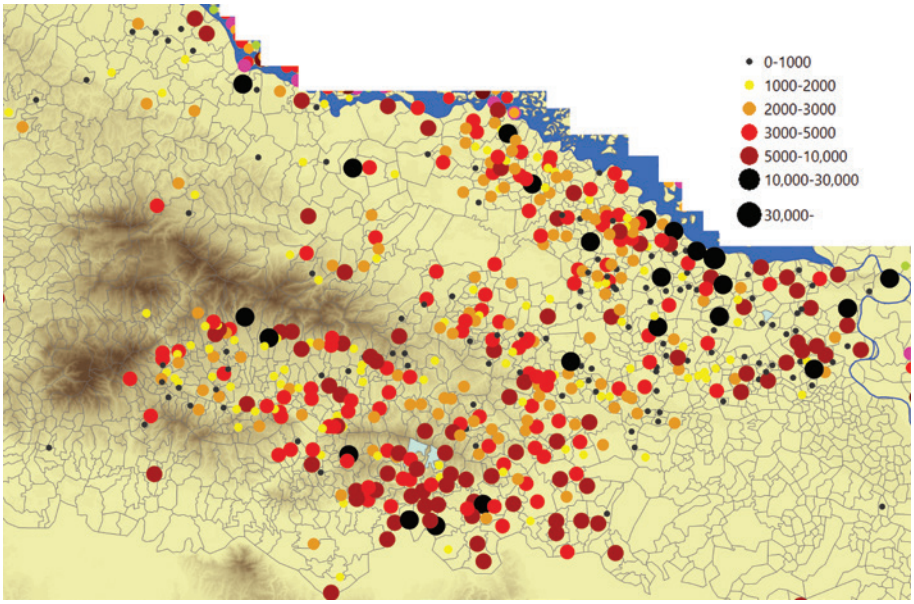
Source: BOA TT.d 672.

Figure 3. The share of Muslim households from total in Požega Sanjak in 1579



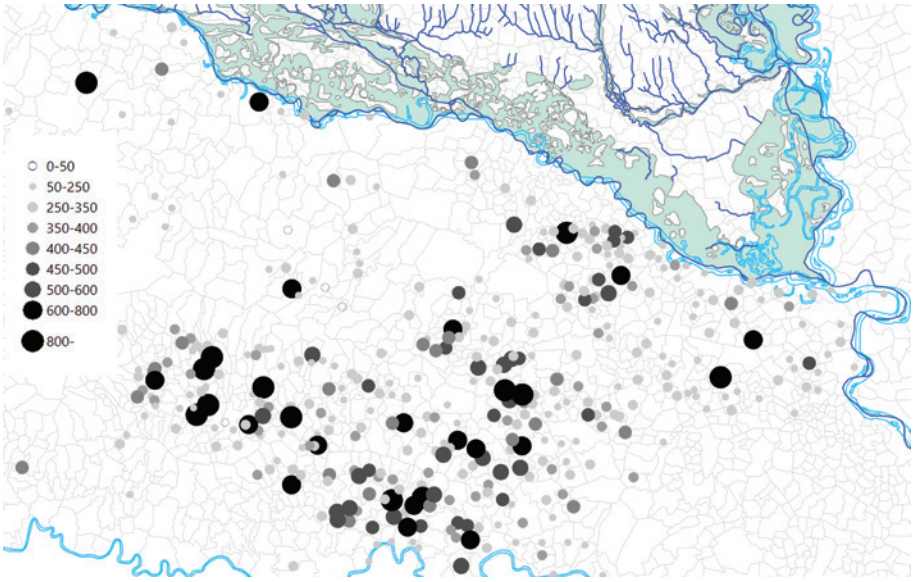
Source: BOA TT.d 672.

Figure 4. Tax imposed on settlements in *akçe* for Požega Sanjak in 1579



Source: BOA TT.d 672.

Figure 5. Relative economic power: tax per *hane* values in Požega Sanjak and its surroundings in 1579



Source: BOA TT.d 672.

We may also differentiate between the average state-tax burden of settlements dominated by Muslim population and Christian population (Figure 3, Table 10). Muslim settling characterized the strategically important surroundings of Osijek and the intramontane basin of the Papuk mountains. Generally speaking, considering all entities, *hane* number and tax levied in the *defter* was higher in non-Muslim settlements and these were even higher in the mixed settlements. However, settlements dominated by Muslims paid the highest tax/*hane*. But one should add that there were many entities, where there were only one or two *hane* recorded, especially in case of *chiftlik*s, which were dominated by Muslim landlords and had high incomes (thus high tax on production). Thus, these distort the results. If we reduce the investigation to the ca. 560. identified settlements, settlements dominated by non-Muslim population had the smallest tax unit number, whereas the tax levied was similar in both categories. Tax/*hane* averages were remarkably different in Muslim and non-Muslim settlements and this is partly because of their different taxation not because of their economic power.

Table 10. Tax unit numbers and tax paid by localized settlements with Muslim and non-Muslim majority in Požega Sanjak in 1579

Religion (number of settlements in brackets)		*Hane* number	Tax in *akçe*	Tax per hane in *akçe*
non-Muslim (258)	Mean	14.28	4003	280
	Std. Deviation	11.97	2734	
Muslim majority over 50% (96)	Mean	27.33	4317	156
	Std. Deviation	62.52	8753	
Mixed (Muslim 1-50%) (65)	Mean	18.74	5468	292
	Std. Deviation	13.81	4260	
Total (556 identitfied locations)	Mean	14.23	3651	270
	Std. Deviation	32.26	5630	

Source: BOA TT.d 672.

Reorganization and Recovery in the 18th Century.

Q5-6. Considering the 1786 conscription of peasantry[54] the level of execution of the conscriptions was quite uneven in the Croatian counties (to some extent, in the case of the state tax, this is also characteristic in the Hungarian counties). In case of Požega we hardly have anything beside the social (legal) classification of peasants, whereas in Zagreb County the data are very detailed and encompass the days of corvée, value of tax, land use categories, gifts in kind to the landlord. This allows us to reconstruct the socio-demographic features in more than 230 settlements of Zagreb County (Table 11), at the same time it also draws our attention to the problems of this source.[55]

Table 11. Averages of available socio-economic indicators in 1786 for Požega and Zagreb Counties

County (aggr. settlements)		**Land quality (max. = 1)**	**Noblemen%**	**Peasant tenant %**	**Inquilini %**	**Subinquilini %**	**Decima payers %**	**Sessio per conscripted**	**Arable lands in acre per conscripted**
Požega (160)	Mean[56]	3.1	0.0	88.4	11.5	0.1	n.a.	0.7	n.a.
Zagreb (233)	Mean	1.6	11.5	87.5	0.9	0.1	3.3	1.0	19
Hungary (8712)	**Mean**	**2.0**	**n.a.**	**74.5**	**20**	**5.5**	**n.a.**	**0.33 (0.45)**	**9**
COUNTY		Meadows per all conscripted in acre	Meadow measured to arable land	Vineyard in acre per conscripted	Corvée days on foot per conscripted	Firewood (in öl) per conscripted	Spinning (in font) per conscripted	Butter (in halb) per conscripted	
Zagreb* (233)	Mean	4.2	0.22	0.6	110	0.75	3.1	0.9	
Hungary (8712)	**Mean**	**1.7**	**0.2**	**0.07**	**42 (135)****	**0.2 (0.3)**	**0.95 (1.4)**	**0.25 (0.35)**	

*no data for Požega; ** calculated for one conscripted and one *sessio* (in brackets)

Source: MNL OL, A 39, 3688/1786

[54] Hungarian National Archives (MNL OL), A 39, Magyar Kancelláriai Levéltár, Acta Generalia (1770–1848), 3688/1786.

[55] The data from 1786 are visualized on a map showing the administrative situation in 1910 as the map for 1786 is still under construction. This involves the aggregation of several settlements existing in 1786.

[56] Unweighted average of settlement level averages, proportions and per capita values.

However, the summaries of the settlement level averages prove that while the average *sessio* size per tenant in Požega County was a bit smaller than in Zagreb County, but still higher than the Hungarian average, the Zagreb region also had better soils according to the qualification in 1786. In fact, the ca. 20 acre/conscripted was way better than the Hungarian average (twice as high). This, supplemented by the 4 acre of meadow and 0.7 acre of vineyards reaches altogether 25-26 acres, the average size of a *sessio* indeed. Vineyards allocated to peasants in Zagreb County (serving as basis for additional income) also showed higher per capita values compared to the Hungarian average (Table 11).

Better conditions of urbarial tenants in Central Civil Croatia are also confirmed by the fact in both counties the share of *inquilini* and *subinquilini* remained under 12%, which is a low value. (The Croatian conscription – unlike the Hungarian – sometimes gave the share of taxable noblemen and their ratio reached 10% in Zagreb County). The low share of landless meant that peasants usually lived off their lands and their additional income from other sectors (*subinquilini* might be involved in husbandry, viticulture, industrial activities, trade and transport etc.) was low indeed, compared to Hungary. The share of new meadows was 4.8% and for arable lands clearings in Zagreb were rated to 1.7%, which means a weak demographic pressure that time. In Hungary the same ratio was respectively 3.5 and 4.5 percent referring to a bit greater population demand in the 1780s.

The days spent on *corvée* were also more numerous in Zagreb. Whereas in Hungary - due to the different social composition of the peasantry (the many landless) - the average number of days spent on *corvée* was ca. 54 per conscripted (and over 150 per *sessio*), in Zagreb County the official was over 104 days on foot (both for conscripted and per *sessio*). On the one hand this refers to higher peasant duties in Croatia (because of the greater peasant plots), on the other, if we compare *corvée* days to the number of economic units cultivated by the peasants (total *sessio* number as state taxation unit), *corvée* to landlords was heavier in Hungary, if measured to state tax units. (This was partly compensated by the higher gift in kind values in Croatia.) As for gifts in kind for the landlord the value in Zagreb was way higher than in Hungary, even if we discount landless strata in Hungary.

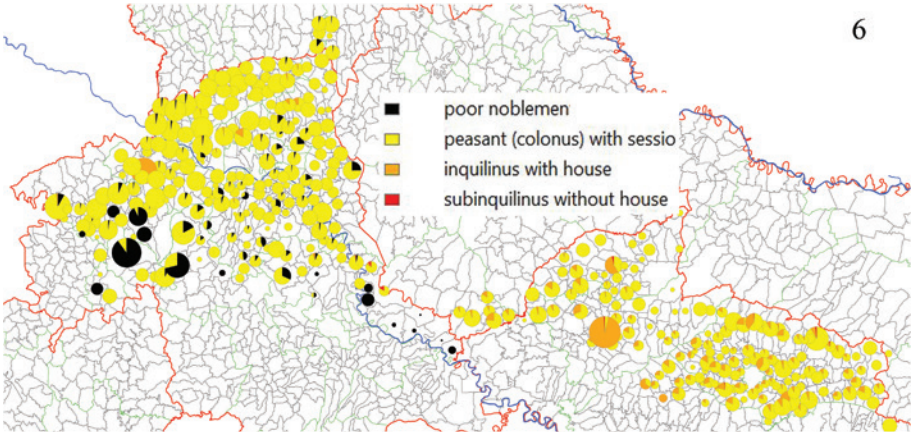
Due to the differences in the data structure of the 1786 conscription only three features of Požega and Zagreb counties can be compared (Figures 6, 7 and 8). Land quality comes first: based on the map provided here it is evident that peasant plots in Zagreb County were better, whereas in Požega soil qualified into the 4th category also appeared (Figure 7). Soil quality also counts as a factor in the quantification of state direct taxes, so, despite not having data on the real value of state direct taxes paid, and with only the number of tax-units

available, one may assume that Požega paid less calculated both for 1 *sessio* and for 1 conscripted.

Beside this the number of *sessio* (as tax units) measured to conscripted peasants was also smaller in Požega (Figure 8, Table 11).[57] *Sessio* / conscripted values were higher in Zagreb County, especially along the Sava River, where anyway the soil quality was not the best. It is useful to draw the attention to the fact that settlements with soils of first class dominated the northwestern part of Zagreb County, where *sessio* / conscripted values were a bit lower, thus the two features compensated for each other. It is also worth mentioning that the relatively good classification soils characterized not only lowlands, but hilly regions in Zagreb County too, which refers to the supplementary income from wine production (which was also under state taxation too). In the central parts of Požega County both *sessio* / conscripted values and soil quality was low, thus here these features did not compensate each other.

Finally, the social (legal) composition of conscripted can also be compared in the two counties (Figure 6). The relative frequency of noblemen conscripted was higher in Zagreb County, in the southwestern parts and in southeast, along the Sava River. In Zagreb County the share of *inquilini* (peasants with garden but with 1/8 *sessio* or less) was also low, compared to Požega. The high relative share of *inquilini* in Požega compared to Zagreb reasons the lower value of *sessio* / conscripted (the *coloni* usually had their one *sessio* on the average here too, the county average falls because of the frequency of the landless layer).

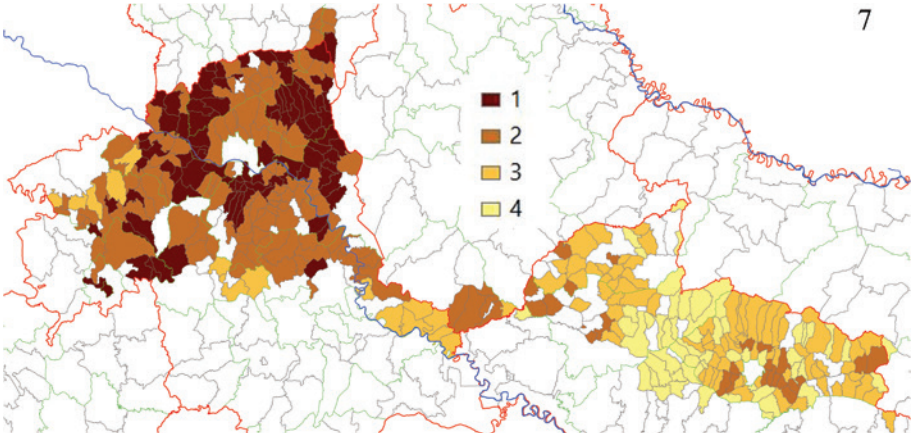
Figure 6. Social stratification and number of conscripted in Požega and Zagreb counties in 1786



Source: MNL OL, A 39, 3688/1786

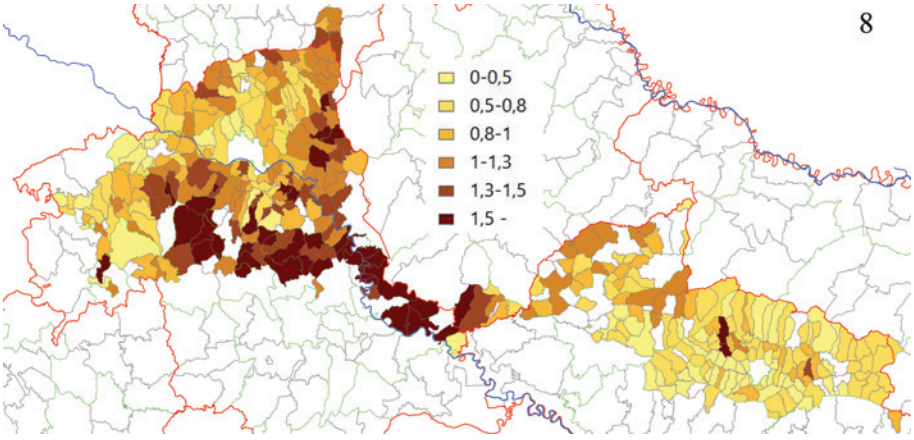
[57] Plot sizes expressed in acres only for Zagreb County are available, therefore we can compare only the number of available *sessio* – the size of which might differ by counties.

Figure 7. Pattern of land quality in Požega and Zagreb counties in 1786



Source: cf. Figure 6.

Figure 8. Patterns of *sessio*/conscripted in Požega and Zagreb counties in 1786



Source: cf. Figure 6.

As the third level of investigation, one may take a closer look on features recorded as average in Table 11. In the case of Zagreb County the spatial pattern of these can also be investigated (Figure 9a-b). For example, the lower arable land size per one conscripted value (in Zagreb County this almost equals with arable land size / *colonus*) in the western mountainous regions were accompanied by the higher price of wine selling. The higher price assumes higher wine production by peasants, thus additional incomes from wine filled the gap in the family budget caused by smaller plots. Wine-growing here was

characteristic even in the medieval ages, as indirectly testified by high tithe/area values on Figure 1. The size of vineyards in the west reached 0.6 acre/conscripted, while in the southeast it remained under 0.3 acre. The pattern of *corvée* days per one conscripted showed and inverse picture: in the southeast it was higher than in the mountainous wine-producing western areas – showing a similar pattern to that of the land size, as *corvée* was determined by plot size. The lower *corvée* allowed peasants to exploit the possibilities of wine-growing, which anyway was a very time-consuming activity. In the case of high compulsory workdays, they couldn't produce their supplementary income from grapes to subsist and impoverishment would have threatened them because of their plot sizes too small for sustainable grain production. In other words, landlords were aware of these conditions and instead of forcing these peasants to do *corvée* on manorial *allodia*, the landlord usually allowed the peasants to spend more time on their own plots and tax was levied in money instead, after their marketable wine-production. This meant a sustainable system both for peasant and landlord. This statistical analysis also highlights that there were two different land use systems in this county mainly determined by geographical conditions.

This grain versus grape-based system was further coloured by the relative weight of animal husbandry. The ratio of meadows (used as a proxy for husbandry, which was not recorded in the 1786 inquiry) was higher than the county average in the western- and easternmost parts of the county.

Figure 9a. Arable land on peasant plots per conscripted (in acre) / Price of wine-selling right in Fts, 1786

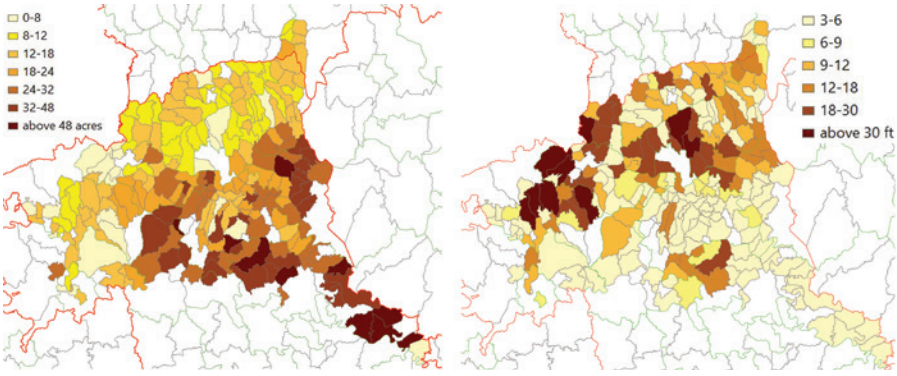
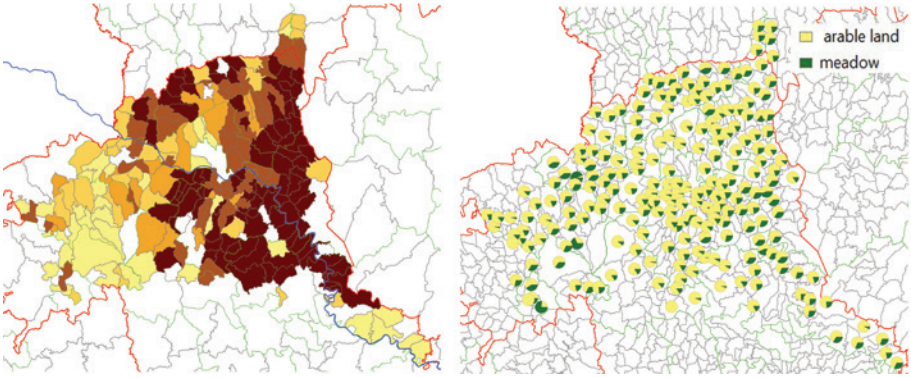


Figure 9b. Regional pattern of corvée days per conscripted / Share of meadows from peasant plots, 1786



Source: cf. Figure 6.

Conclusion

We may sum up our results around three questions concerning the possibilities of GIS. It is not the factual, quantitative results we discuss here, but rather problems that had to be resolved to reach the outputs outlined above.

The first is the problem of investigating territorial patterns. The second is tracing temporal changes and the third is statistical evaluation. Whereas the latter offer data and methods to approximate missing hardcore variables, the problems of the changing administrative units remains a great challenge. No exact data on fine-scale boundaries are known from the Middle Ages – parish areas were approximated by Voronoi-polygons, a purely mathematical calculation between points belonging to the same county or diocese. In the Early Modern period we are also able to identify locations as point type-data, but delimiting administrative boundaries of settlements is still not available for the 1780s. Therefore, any reconstruction or calculation, which requires the use of polygons (like output/area type indicators) largely relies on administrative boundaries from the 1880s and 1910. Temporal comparisons or trend analyses also have to face the problem of changing and unknown boundaries of locations. One solution may be the aggregation of the discrete values assigned to the point-type data using the available polygons from 1910. This makes different time-horizons and maps comparable to each other, however numerous territorial entities that existed separately in the 1780s, for example, disappear. This method also requires excellent skills in historical geography, because researchers need to know the exact location of a settlement existing in the 1570s in order to identify to which polygon/settlement it will belong by 1910.

We also proved through our county-scale (medium-resolution) temporal comparisons that this solution might work: trend analyses are possible even despite changing political and economic systems and their different tax-imposing practices and measurement units. This requires the technical unification of the existing medieval and Ottoman databases that use the settlement coding of Engel as ID with the early modern databases that use a different coding for IDs. It is possible with the aid of ArcGIS to write the different codes automatically in the same attribute table using overlays of different layers (different eras), but this requires not only the proper identification of settlements, with their changing (Croatian or Ottoman and Hungarian) name variants, but – as written above – their proper localization too. Another solution is – if we give up aggregation as idea, and abandon the solution of Voronoi-polygons (the pattern of which will be different for each era) – is to use gridding methods of same scaling, as offered by Pénzes and Papp, who calculated 5x5 or 10x10 km for the Kingdom of Hungary, depending on data density in different centuries, as optimal.[58]

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BOA TT.d 437 (Srijem 1546)

BOA TT 550 (Hatvan 1570)

BOA TT 823 (Hatvan, 1591)

BOA TT.d 672 (Požega 1579)

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DKBK – Det Kongelige Bibliothek, København – Cod Turc Rot V, (Pécs 1579) [59]

[58] István Papp, János Pénzes, Gábor Demeter, "A közlekedési hálózatok és a komplex területi fejlettség időbeli összehasonlító vizsgálatának nehézségei és egy megoldási lehetősége a történelmi Magyarország példáján," *Területi Statisztika* 61, no. 4 (2021): 445–465.

[59] All these data are digitized and available online at Adatbázisok Online: Oszmán összeírások gyűjteménye: https://adatbazisokonline.mnl.gov.hu/adatbazis/oszman

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