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Quantitative Data and the Economy

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# ***Quantitative Data and the Economy***

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**ABSTRACT:** Economic historians of the Ottoman empire have recently made great progress in the study of quantitative data and the economy. They have used data from various sources, including tax registers, court records, and other types of surveys and financial accounts. Applying state of the art analytical techniques to the data, they have examined numerous interesting questions regarding the Ottoman economy, population, and institutions in regions ranging from Anatolia and the Balkans to Syria, Palestine, and Egypt in the south, Georgia in the east, and Hungary and Poland in the north. We offer a basic introduction to the literature by surveying important developments since the beginning of the twenty-first century. The survey shows that this area of research has become a mature subfield of both Ottoman history and economic history.

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## **QUANTITATIVE DATA AND THE ECONOMY**

### **1. INTRODUCTION**

Quantitative data and the economy have long been principal areas of scholarship in Ottoman historiography. Thanks to rich archival sources, scholars have gathered vast amounts of quantitative data regarding the structure, efficiency, and historical evolution of the Ottoman economy. They have used these data to study the population characteristics, tax systems, market prices, and various other indicators of economic activity at the town, regional, and imperial level.

The dominant type of scholarship has changed significantly over time. Writing in the middle decades of the twentieth century, the pioneering scholars laid the foundations by discovering fundamental documents in the archives and introducing them to the historical community. Focusing on a single document or a series of documents, they outlined the basic features of the Ottoman economy and provided the first estimates of certain key indicators, such as the level of population, rates of taxation, and the volume of international trade. Barkan, for example, provided the first estimate of the population, based on an empire-wide survey of taxable resources and households in 1520-30.<sup>1</sup> Inalcik similarly explored the tax system of the Empire by analyzing and publishing a copy of one of the earliest tax registers of the Empire, that of Albania in the fifteenth century.<sup>2</sup> Following their lead, numerous other historians published transliterated copies of the tax registers of various districts and provided estimates of the population and agricultural production at the local level.

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<sup>1</sup> Ömer Lütfi Barkan, "Tarihi demografi arařtırmaları ve Osmanlı tarihi," *Türkiyat Mecmuası*, X (1951), 1-26.

<sup>2</sup> Halil İnalçık, *Hicri 835 tarihli suret-i defter-i sancak-i Arvanid* (Ankara: Türk Tarih Kurumu, 1954).

Whereas the pioneering scholars naturally focused on the essential tasks of discovering fundamental documents and estimating basic indicators, later contributions gradually moved towards a problem-oriented approach in the collection and analysis of data. As new aspects of recent developments, economic historians of the Ottoman Empire increasingly engaged in interdisciplinary reach and collaboration, applied state of the art analytical techniques, and contributed to important historical questions and theoretical developments in related disciplines. Using the data in novel ways, they introduced new questions concerning the Ottoman economy and attempted better answers to outstanding questions. For example, they examined the long-term patterns of market prices, analyzed the basis for regional variations in tax systems, compared Ottoman real wage rates with major European cities, estimated regional differences in agricultural productivity, studied the resolution of legal disputes in Shariah courts, charted the temporal evolution of wealth inequality, comparatively assessed the central state's extractive capacity, and so on.<sup>3</sup>

Proliferating works in Ottoman quantitative history should be considered in the context of the growing revisionist historiography of the last three decades. A new generation of researchers employed quantitative data to challenge some of the established ideas and to test certain presumptions regarding the Ottoman society and economy, including the decline paradigm and the uniqueness of the development path of the Empire. This new line

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<sup>3</sup> See for eg. Şevket Pamuk, "Prices in the Ottoman Empire, 1469–1914," *International Journal of Middle East Studies*, 36 (2004), 451-468; Metin M. Coşgel, "The Ottoman empire," in Andrew Monson and Walter Scheidel (eds.), *Fiscal regimes and the political economy of premodern states* (Cambridge: Cambridge University Press, 2015), 404-428; Süleyman Özmucur, and Şevket Pamuk, "Real wages and standards of living in the Ottoman empire, 1489–1914," *The Journal of Economic History*, 62 (2002), 293-321; Coşgel, "Agricultural productivity in the early Ottoman empire," in Gregory, Clark, Alexander J. Field, and William A. Sundstrom (eds.), *Research in economic history* (Bingley: Emerald, 2006), 161-187; Boğaç Ergene, *Local court, provincial society and justice in the Ottoman Empire: Legal practice and dispute resolution in Çankırı and Kastamonu (1652-1744)* (Leiden: Brill, 2003); Hülya Canbakal and Alpay Filiztekin, "Wealth and demography in Ottoman probate inventories: A database in very long-term perspective," *Historical Methods: A Journal of Quantitative and Interdisciplinary History*, 54 (2021), 94-127; K. Kivanç Karaman and Şevket Pamuk, "Ottoman state finances in European perspective, 1500–1914," *The Journal of Economic History*, 70 (2010), 593-629.

of research helped the Ottomanists relocate the Empire in the early modern Eurasian context by emphasizing the common dynamics and constraints of the economic and sociopolitical environment. Going beyond state-centered narratives of the past decades, they highlighted the role of market dynamics and non-state actors in shaping the economy's trajectory. This approach allowed researchers to use information from primary sources to make new "discoveries" about the Ottoman world, such as the existence of lively credit markets; the emergence of an early modern Ottoman consumerism; the presence of pronounced economic inequality in a society long thought to have been egalitarian, and the selective nature of state interventions in the economy.<sup>4</sup>

In this survey, we examine the recent literature on quantitative data and the Ottoman economy, focusing on main developments since about the beginning of the twenty first century. The main objective is to provide a basic introduction to important developments in the field. Given space limitations, we offer a brief review of representative developments rather than a comprehensive survey of the literature. As we discuss below, the literature on quantitative data and the economy has become a mature subfield of Ottoman historiography, too vast to cover fully in a single essay. We nevertheless hope to provide a sufficiently broad introduction for the reader to start exploring their own interests.

## 2. SOURCES & LITERATURE

Important economic questions of the past, such as those concerning the levels and growth rates of the population and incomes, typically require quantitative data for

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<sup>4</sup> See for eg. Haim Gerber, *Economy and society in an Ottoman city: Bursa, 1600-1700* (Jerusalem: Hebrew University, 1988); Eminegül Karababa, "Investigating early modern Ottoman consumer culture in the light of Bursa probate inventories," *The Economic History Review*, 65 (2012), 194-219; Hülya Canbakal, "Reflections on the distribution of wealth in Ottoman Ayntab." *Oriens*, 37 (2009), 237-252; Şevket Pamuk, "Institutional change and the longevity of the Ottoman Empire, 1500–1800," *Journal of Interdisciplinary History*, 35 (2004), 225-247.

satisfactory answers. In searching for answers to such questions, Ottoman historians have had the enviable advantage of having numerous sources at their disposal. These sources include a rich variety of imperial financial records, court registers, foundation accounts, trade documents, and foreign consulate archives.<sup>5</sup> The availability of these records has grown significantly in recent decades, along with improvements in technologies that make it possible to disseminate them widely.

Contributions to the literature on quantitative data and the economy can be categorized broadly into two groups. The first group consists of contributions that have assembled large datasets and made them publicly available to other researchers. In contrast to earlier contributions that involved the direct publication of certain documents, recent contributions have tended to shift the effort towards the extraction of necessary information from multiple appropriate sources, with contents dictated primarily by research needs. The second group of contributions, ever growing in importance, have been quantitative analysis of historical economic phenomena, often in combination with the introduction of original data.

For a systematic discussion of both types of contributions to the literature, we will organize our survey based on the types of records used by researchers. Specifically, we will cover works under the *Historical Statistics Series*, early tax registers called the *tahrir defterleri*, court registers (*kadı sicilleri*), mid-nineteenth century tax surveys called the *temettuat defterleri*, and examples of various other sources found in the private, consular, or governmental archives of the Empire's successor states.

### **Ottoman State Records**

We first discuss in general terms the availability of rich archival sources resulting from the record-keeping practices of the Ottoman state and how these sources changed over

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<sup>5</sup> Suraiya Faruqi, *Approaching Ottoman history: An introduction to the sources* (Cambridge, Cambridge University Press, 1999).

time. Most data sources that provide quantitative evidence are by-products of the ordinary functioning of the Ottoman fiscal, administrative and military system. The Ottoman data collection and book-keeping practices evolved significantly over the empire's long history. Changes resulted from the shifting needs and priorities of the state, transformations in the fisco-administrative and military organization, and improvements in communication and transportation technologies.

The Ottoman state of the fifteenth and sixteenth centuries is known for its relatively well-developed administrative and fiscal capacity by the standards of the day. The success of this "precocious imperial centralization,"<sup>6</sup> owed -among other factors- to detailed surveys and record-keeping practices, essential for exercising central control over the vast territory of the empire that extended to three continents. Thanks to these records, Ottoman historians today have a considerable body of evidence on rural and urban economies, regional and inter-regional trade, and population in different parts of the empire in this early period.

The book-keeping practices of the Ottomans changed significantly during the seventeenth and eighteenth centuries as a result of deep transformations in fisco-military structure and administrative decentralization. The objective, focus and method of data collection changed considerably, as did the nature, form and content of the registers. With the shift from direct taxation to tax farming from the turn of the seventeenth century onwards, the state had reduced the need to monitor economic activities, thereby leaving fewer traces about the rural and urban economy to future generations. The socio-political "crisis" of the seventeenth-century contributed to this

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<sup>6</sup> Ariel Salzmänn, "An ancien regime revisited: "privatization" and political economy in the eighteenth-century Ottoman Empire," *Politics & Society*, 21 (1993), 393-423.

situation significantly by weakening the central government's capacity to monitor its territory.<sup>7</sup>

The modernization efforts of the nineteenth-century improved book-keeping. The Ottomans began to apply modern statistical methods, collecting detailed information regarding social and economic life, both to increase tax revenue and to boost the economy. As the government increased its involvement in the fields of education, health, culture, and transportation, it had greater needs for socio-economic data. A series of statistics, including income registers, cadastral surveys, and population censuses, were compiled. A population census was conducted in 1830, considered to be the first of a series of efforts towards modern statistical documentation to shed light on the Ottoman Empire during the nineteenth century. The statistical office was established in the late 1860s.

### ***Historical Statistics Series (HSS)***

We now turn to a discussion of how economic historians have utilized the rich archival sources of the Ottoman Empire. Largely based on these sources, products of nineteenth-century modernization efforts, the volumes published by the State Institute of Statistics (TÜİK), directed and edited by Şevket Pamuk between 1995 and 2003 constitute a milestone for Ottoman quantitative economic history. Each focusing on a particular aspect of the economy, the seven volumes of the *HSS*<sup>8</sup> aimed at making a vast body of

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<sup>7</sup> At the end of the sixteenth century, the Ottoman Empire entered an era of political difficulties, social unrest, economic turmoil, and financial crises. The first half of the seventeenth century was characterised by military revolts and conflicts among political factions in the capital; bandit campaigns and rebellious governors in Anatolia and in the Arab lands; and long and exhausting wars on the eastern and western fronts – all of which had destructive effects on the Ottoman economy and its finances. Suraiya Faroqhi, "Crisis and change, 1590–1699," in Halil İnalcık and Donald Quataert (eds.), *An economic and social history of the Ottoman Empire* (Cambridge: Cambridge University Press, 1994), 411–636. For a more recent study, see Sam White, *The climate of rebellion in the early modern Ottoman Empire* (Cambridge: Cambridge University Press, 2011).

<sup>8</sup> Şevket Pamuk (prep. by), *19. Yüzyılda Osmanlı dış ticareti (Ottoman foreign trade in the 19<sup>th</sup> century)*, *HSS Vol. 1* (Ankara: Devlet İstatistik Enstitüsü, 1995); Cem Behar (prep. by), *Osmanlı İmparatorluğu'nun*

quantitative data available to Ottomanists for developing the field. In these volumes, prepared by Şevket Pamuk, Cem Behar, Tefik Güran, A. Gündüz Ökçün and Mehmet Ö. Alkan, the authors critically engaged with a wide range of primary sources to depict a picture of Ottoman foreign trade, population, agriculture, industry, education and state finances. An eighth volume, *Data and Statistics in the Ottoman Empire*<sup>9</sup>, brought together several papers on Ottoman data collection and book-keeping.

The quantitative data employed in the series came from numerous sources reflecting the richness of the Ottoman archives: the nineteenth century foreign trade statistics of the Ottoman Empire and other countries the Ottomans traded with, population censuses of 1831, 1844, 1867, 1881-93, 1905-6; agricultural censuses of 1909, 1913 and 1914; the industrial census of 1913, 1915; the state yearbooks of 1854, 1863, 1873, 1883, 1910; the first Ottoman statistical yearbook of 1897; the statistics of education for the 1894-5 and 1913-4 school years; as well as some other official statistics, and evidence on population from the fifteenth and sixteenth century tax registers, and foreign travellers' accounts.

Among these publications by TÜİK, Pamuk's path-breaking work, *500 Years of Prices and Wages in Istanbul and Other Cities*<sup>10</sup> deserves special mention as the first very long-term systematic research based on a large dataset of historical prices and

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ve Türkiye'nin nüfusu 1500-1927 (*The population of the Ottoman empire and Turkey, 1500-1927*), HSS Vol. 2 (Ankara: DİE, 1996); Tefik Güran (prep. by), *Osmanlı dönemi tarım istatistikleri 1909, 1913 ve 1914 (Agricultural statistics of Turkey during the Ottoman period)*, HSS Vol. 3 (Ankara: DİE, 1997); A. Gündüz Ökçün (prep. by), *Osmanlı sanayii 1913, 1915 yılları sanayi istatistikleri (Ottoman industry industrial census of 1913, 1915)*, HSS Vol. 4 (Ankara: DİE, 1997); Tefik Güran (prep. by), *Osmanlı Devleti'nin İlk İstatistik Yıllığı 1897 (The first statistical yearbook of the Ottoman Empire)*, HSS Vol. 5 (Ankara: DİE, 1997); Mehmet Ö. Alkan (prep. by), *Tanzimat'tan Cumhuriyet'e Modernleşme Sürecinde Eğitim İstatistikleri 1839-1924 (Education statistics in modernization from the Tanzimat to the Republic)*, HSS Vol. 6 (Ankara: DİE, 2000); Güran (prep. by), *Osmanlı Mali İstatistikleri Bütçeler, 1842-1918 (Ottoman financial statistics budgets)*, HSS Vol. 7 (Ankara: DİE Matbaası, 1997).

<sup>9</sup> Halil İnalçık and Şevket Pamuk, *Osmanlı Devleti'nde Bilgi ve İstatistik (Data and Statistics in the Ottoman Empire)* (Ankara: DİE, 2000).

<sup>10</sup> Şevket Pamuk, *İstanbul ve Diğer Kentlerde 500 yıllık Fiyatlar ve Ücretler, 1469-1998 (500 Years of Prices and Wages in Istanbul and Other Cities)* (Ankara: DİE, 2000).

wages. Presenting prices of food and non-food standard commodities and daily wages of skilled and unskilled construction workers in Istanbul and some other cities of the empire, Pamuk looked at the evolution of living standards in the Ottoman Empire and provided the first quantitative indicator of the Ottoman economy's performance over five centuries. In related work, Pamuk additionally presented the first complete series on monetary standards of Ottoman currencies, building upon Halil Sahillioğlu's previous studies on Ottoman monetary history. These series not only helped Ottomanists address important questions on inflation, finances and trade, but also enabled regional comparisons within and outside the empire, in the following decades.<sup>11</sup>

Methodologically, the *Historical Statistics Series* represented a clear break with the *defterology* tradition, pioneered by Ömer Lütfi Barkan, which exercised a dominant influence on Ottoman economic and social historiography until the 1970s. Diverging from previous document-oriented studies, the volumes discussed the potential, reliability and limitations of official statistics and state records for quantitative purposes; presented synthetically compiled data; made use of novel methods and techniques to exploit it; constructed series and trends and finally, interpreted these in light of existing literature and other evidence. As such, a major step was taken to align Ottoman economic history with the broader field of economic history, which was by the time, re-gaining its popularity in different parts of the world with a quantitative turn.

### **Tax Registers (*Tahrir defterleri*)**

The primary focus of the *defterology* tradition were the tax registers called *tahrir defterleri*, which according to Barkan, were "the most precious possession of the Turkish

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<sup>11</sup> Şevket Pamuk, *A Monetary History of the Ottoman Empire* (Cambridge: Cambridge University Press, 2000).

archives<sup>12</sup>.” The Ottoman government used these registers to obtain current information on the empire’s sources of revenue, mainly during the fifteenth and sixteenth centuries. With increasing adoption of tax-farming practices in the early seventeenth century, compilation of these registers was largely dropped. *Tahrirs* are available to researchers in various archives in Turkey and in other countries that were once under Ottoman domination. They include valuable information regarding the numbers and religious distribution of households and the expected tax revenues from various economic resources.<sup>13</sup>

There are three types of tax registers, called the detailed (*mufassal*), summary (*icmal*), and pious foundation and property (*evkaf ve emlak*) registers. In preparing the detailed registers, the officials surveyed each village’s households and revenue sources, and recorded the information in three main parts. The introductory section included the village name, the administrative affiliation of the district, and the name(s) of the officials who were assigned to receive tax revenues of the village. The second part provided a survey of the adult male population in the village and the amount of land possessed by each. Tax-exempted males, as well as landed and landless peasants settled in the village, were recorded here. The third part listed the amounts and expected tax revenues of various productive resources, such as the land, animals, windmills, orchards, and agricultural products. The summary registers showed the distribution of tax revenues among the recipients. For each timar holder, the register recorded his name, title, and, occasionally, his position, followed by information about the income he was assigned. Finally, the foundation and property registers were special lists that included the revenues from villages and land that were assigned to

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<sup>12</sup> Ömer Lütfi Barkan, “Research on the Ottoman fiscal surveys,” in Michael A. Cook (ed.), *Studies in the Economic History of the Middle East* (London: Oxford University Press, 1970), 163-171.

<sup>13</sup> Metin M. Coşgel, “Ottoman tax registers (tahrir defterleri),” *Historical Methods: A Journal of Quantitative and Interdisciplinary History*, 37 (2004), 87-102.

*vakıfs* and private recipients. Village entries were kept in the same form as in the detailed registers.

Tax registers have been the main sources for the fiscal and agricultural history of the Ottoman Empire during the period before the seventeenth century. Because surplus extraction took place within the fiscal system in the Ottoman land regime, the tax registers enable us to observe not only measures of land, population, production, and agricultural resources on a village basis, but also the extraction of surplus from producers and how it was shared within the surplus-extracting class. Moreover, they are available periodically for numerous Ottoman districts, allowing researchers to observe changes over time during this period.

Consistent with the *deftero*logy tradition, early studies based on the tax registers mostly restricted their use to simple quantitative descriptions of various districts in certain years or to observe changes in population and resources over time. The transcription and publication of the whole registers of a region in book form became one of the earliest and repeatedly practiced forms of scholarship. Transcriptions of dozens of *defters*, of diverse dates and regions, have been published in various languages, available for others to use as needed.

Although early publications in this genre generally had modest objectives, with mere transcriptions of the data and little or no analysis, some of the early contributions broke the trend by using the data from these documents to answer more general questions. Cook, for example, examined the economic implications of the pressure created by the significant increase of population in the sixteenth century.<sup>14</sup> İslamoğlu-Inan similarly analyzed state-

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<sup>14</sup> Michael A. Cook, *Population pressure in rural Anatolia, 1450-1600* (London: Oxford University Press, 1972).

peasant power relations and regional economic development in Anatolia during the same time period.<sup>15</sup>

More recently, scholars have pushed the agenda even further by using the data from tax registers in novel ways to examine various questions of broad historical importance and social-scientific relevance.<sup>16</sup> In a series of articles, Coşgel examined the efficiency and regional diversity of the Ottoman system of taxation, tested competing arguments regarding the basis for the discriminatory taxation of villages in the Fertile Crescent, and provided first estimates of regional differences in agricultural productivity in various Ottoman districts during the fifteenth and sixteenth centuries.<sup>17</sup> Similarly, Coşgel and Miceli examined the economic basis (risk versus transaction costs) for the assignment of tax revenues between the local, provincial, and central government officials.<sup>18</sup>

In parallel developments, researchers have used data from the Ottoman tax registers to address various important unresolved questions, or to chart new areas of inquiry. Özel, for example, used the tax registers in conjunction with other sources to examine whether there was a general crisis and a collapse of the rural order at the turn of the seventeenth century.<sup>19</sup> Kuru linked data from these registers to historical climate data to explain over-time change and regional differences in agricultural growth over

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<sup>15</sup> Huricihan İslamoğlu-Inan, *State and peasant in the Ottoman empire: Agrarian power relations and regional economic development in Ottoman Anatolia during the sixteenth century* (Leiden: Brill, 1994).

<sup>16</sup> This contrasts sharply with the premature criticism of tax registers as having significant “pitfalls and limitations.” See Heath W. Lowry, *Studies in Defterology* (Istanbul: The Isis Press, 1992). For a reply to Lowry’s criticism see Coşgel, “Ottoman tax registers.”

<sup>17</sup> Metin M. Coşgel, “Efficiency and continuity in public finance: The Ottoman system of taxation,” *International Journal of Middle East Studies*, 37(2005), 567-586; “Taxes, efficiency, and redistribution: discriminatory taxation of villages in Ottoman Palestine, Southern Syria, and Transjordan in the sixteenth century,” *Explorations in Economic History*, 43(2006), 332-356; “Agricultural Productivity.” ; Metin M. Coşgel and Sadullah Yıldırım, “The Economic geography of Ottoman Anatolia: People, places, and political economy around 1530,” in Ebru Boyar and Kate Fleet (eds.), *Making a living in Ottoman Anatolia* (Leiden; Boston: Brill, 2021), 58-77.

<sup>18</sup> Metin M. Coşgel and Thomas J. Miceli, “Risk, transaction costs, and tax assignment: government finance in the Ottoman Empire,” *The Journal of Economic History*, 65 (2005), 806-821.

<sup>19</sup> Oktay Özel, *The collapse of rural order in Ottoman Anatolia: Amasya 1576–1643*, (Leiden: Brill, 2016).

the sixteenth century.<sup>20</sup> Ceylan similarly used the tax registers of Manisa to compute agricultural productivity and to find that the demographic growth of the sixteenth century did not bring about a subsistence crisis in this part of Ottoman Anatolia.<sup>21</sup>

In addition, several new projects are currently underway that use tax registers in innovative ways towards new avenues of research. For example, in an ongoing project, Palaeo-Science and History Research Group at the Max Planck Institute is combining data from Ottoman *tahrirs*, some Venetian archival sources, and data on pollen accumulation to study interactions between humans and environment in Chalcidice (Halkidiki) and the Peloponnese in Greece. Likewise, Hadjikyriacou, et al. have combined information from the 1572 tax register of Cyprus with other Ottoman and British sources for a geospatial analysis of long-term patterns in the Cypriot economy, environment, and landscape.<sup>22</sup>

### **Court Registers (*Kadı Sicilleri*)**

Another set of widely available documents, used heavily by Ottoman historians to examine various legal and socio-economic questions, are the court registers known as *kadı sicilleri*. Court registers typically include various types of documents prepared by local officials as well as those sent by the imperial and provincial authorities for local attention. The local documents include summary accounts of all disputes brought to court, copies of contracts, probate estate inventories (*tereke*), and records related to suretyship (*kefalet*), spousal support after divorce (*nafaka*), guardianship (*vesayet*), and lists of price ceilings

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<sup>20</sup> Mehmet Kuru. "A magnificent climate: Demography, land and labour in sixteenth-century Anatolia," in Onur İnal and Yavuz Köse (eds.), *Seeds of power: Explorations in Ottoman environmental history* (Cambridge: White Horse Press, 2019), 35-57.

<sup>21</sup> Pınar Ceylan, "Productivity in arable farming in the sixteenth century: evidence from the Eastern Mediterranean," *Agricultural History Review*, 69 (2021), 1-24.

<sup>22</sup> Antonis Hadjikyriacou, Evangelos Papadias, Christoforos Vradis, and Christos Chalkiasb, "Combining historical maps and censuses of Cyprus from the sixteenth to the twentieth century: A geospatial approach," in *Proceedings of the International Cartographic Association*, 3, 7 (2021).

(*narh*). The documents received from elsewhere include imperial correspondence regarding taxation, troop deployment during times of war, internal security, and various other orders and procedures for local implementation.

Historians of the Ottoman Empire have used these registers for various types of research, such as to learn about court functions and procedures, to evaluate how legal disputes were resolved in court through settlements and litigations, to estimate changes in the inequality of wealth over time, and to use the contents of probate inventories to extract information regarding the consumption patterns of individuals. In an early pioneering attempt at the quantification of information from court registers, Jennings calculated various indicators, such as the numbers of women involved in economic and social legal matters and the types and frequencies of financial transactions, to study the legal position of women and the loan and credit markets in eastern and central Anatolia during the seventeenth century.<sup>23</sup> Similarly, Raymond introduced a quantitative approach to the use of probate inventories recorded in the court registers of Cairo,<sup>24</sup> and Rafeq published quantitative studies based on the registers of Damascus.<sup>25</sup> The variety of documents found in court registers have allowed scholars to develop several different avenues of research over time.

Since a basic function of the court was to resolve disputes, scholars have always been interested in the question of how effectively it fulfilled this function and whether the results varied among groups of clients, across regions, and over time. In a pioneering development in quantitative analysis of dispute resolution in Ottoman

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<sup>23</sup> Ronald C. Jennings, "Loans and credit in early 17th century Ottoman judicial records: The Sharia court of Anatolian Kayseri," *Journal of the Economic & Social History of the Orient*, 16 (1973), 168-216; "Women in early 17th century Ottoman judicial records--the Sharia Court of Anatolian Kayseri," *Journal of the Economic and Social History of the Orient*, 18 (1975), 53-114.

<sup>24</sup> André Raymond, *Artisans et commerçants au Caire au xviiiè siècle*. 2 vols (Damas: Institut Français de Damas, 1973-4).

<sup>25</sup> Abdul-Karim Rafeq, "Les registres des tribunaux de Damas comme source pour l'histoire de la Syrie," *Bulletin d'études orientales*, 26 (1973), 219-226.

courts, Ergene used data from the court registers of Çankırı and Kastamonu during the period between 1652-1744 to advance a novel framework, one that presented a systematic categorization of the information regarding the types of cases brought to court, socioeconomic characteristics of clients, and their strategies for litigation.<sup>26</sup> Expanding on this framework, Coşgel and Ergene introduced new methodological tools and theoretical insights from the law and economics literature to systematically investigate the questions of which disputes went to trial and who won.<sup>27</sup> Using information from court records in a different context, Kuran and Lustig examined a large sample of legal disputes from the registers of Galata and Istanbul courts from the seventeenth century to demonstrate the presence of pro-plaintiff bias in these courts.<sup>28</sup> More recently, Coşgel, et al have used data from the registers of the Galata and Üsküdar courts in Istanbul and the provincial courts of Konya and Kütahya in the early nineteenth century to examine the relationship between gender and justice in Ottoman courts.<sup>29</sup> Their results show that the source of women's disadvantage in litigation came from the difference in their ability to use evidence (witness testimony, written documents, legal opinions) at trial.

A specific type of dispute resolved by the Ottoman courts concerned the distribution of inheritance (*tereke*). Inventories are obligatory in the Islamic law under certain conditions, such as when there are minor heirs, a pregnant wife or any of the heirs is missing. Prepared by court officials at the request of the heirs, or in certain cases by the *emin-i beyt-ül-mal* (the local representative of the state treasury), these registers have been essential sources for the historians of the Ottoman empire. Probate inventories are to be found in

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<sup>26</sup> Ergene, *Local court*.

<sup>27</sup> Metin Coşgel and Boğaç Ergene, *The economics of Ottoman justice* (New York: Cambridge University Press, 2016).

<sup>28</sup> Timur Kuran and Scott Lustig, "Judicial biases in Ottoman Istanbul: Islamic justice and its compatibility with modern economic life," *The Journal of Law and Economics*, 55 (2012), 631-666.

<sup>29</sup> Metin M. Coşgel, Hamdi Genç, Emre Özer, and Sadullah Yıldırım, 2022. "Gender and Justice: Women's Participation, Settlement, and Victory in Ottoman Courts," Working papers 2022-03, University of Connecticut, Department of Economics.

judicial court records or in separate books known as *tereke defterleri* (probate books). Often, probate inventories for the *askeri* (tax-exempt military and administrative class) and *beledi* classes (common people) were registered separately and by different officials, the *kadiasker* (top administrative official), and the *kadı* (judge).<sup>30</sup>

The probate inventories provide detailed information regarding the wealth of individuals at the time of their death and the names and inheritance shares of the heirs. The wealth information is typically given in an itemized inventory, along with appraisal values, of the cash, property, and debt that belonged to the deceased.

Historians of all societies have generally recognized inheritance inventories as vital sources for the study of wealth, prices, consumption, and property ownership in the past. Since probate inventories were required for essentially the same function in most legal systems, they can be found in the historical archives of many societies, for example those pertaining to early modern Europe and the colonies. Scholars have developed various tools to extract information regarding the possessions of individuals and to quantify this information for analyzing issues related to various legal and socio-economic phenomena. A huge international and interdisciplinary literature has grown that uses data from probate inventories to examine numerous important questions, such as those concerning agricultural productivity, wealth inequality, gender differences, personal debt, and intergenerational transmission of wealth.

A distinct feature of inheritance inventories among Ottoman records is the broad coverage of the population. Unlike other sources that were typically focused on government agents and official business, inheritance inventories include information regarding what ordinary people possessed and consumed, where they sheltered and worked, and how they used their spare time. Rather than being reserved for the ruling

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<sup>30</sup> Karababa, "Investigating early modern," 217.

class, they encompass all echelons of the society: villagers and urban inhabitants, rich and poor, Muslims and non-Muslims, men and women alike. Therefore, despite being official records, inheritance inventories do not necessarily present a state-centric picture of the Ottoman society and economy. This may explain why these records were largely neglected during the “golden age” of the Ottoman socioeconomic historiography colored by the Weberian and Marxian approaches in the 1960s and 70s. It would not be misleading to argue that a full appreciation of these sources required a certain understanding of the Ottoman society and economy that surpassed the limits of the dominant paradigms of these decades.

In recent decades, however, historians of the Ottoman Empire have made significant advancements in using inheritance inventories for innovative analysis of the economy. A straightforward area of application has been the transmission, distribution, and temporal evolution of individual wealth. Well-known early contributions in this regard include Pascual and Establet’s pioneering study of the wealth of Damascene families around 1700.<sup>31</sup> More recently, Canbakal used data from inheritance inventories to discuss the social status and sources of economic power of the urban elite and the polarity of wealth in the seventeenth-century Ottoman town of Ayntab.<sup>32</sup> Using data from the inheritance inventories of eighteenth-century Kastamonu, Coşgel and Ergene measured patterns of wealth accumulation and intergenerational (father-son) transmission in Ottoman Anatolia, and they estimated how aggregate measures of wealth inequality, such as the Gini Coefficient and the coefficient of variation, changed over time.<sup>33</sup> These studies paved the way towards a

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<sup>31</sup> Colette Establet and Jean-Paul Pascual, *Familles et fortunes à Damas, 450 foyers damascains en 1700* (Damascus: IFEA, 1994). See also by the same authors, *La gent d’état dans la société ottomane damascène: les ‘askar à la fin du XVIIe siècle* (Damascus: IFPO, 2011).

<sup>32</sup> Hülya Canbakal, *Society and Politics in an Ottoman Town: Ayntāb in the 17th Century* (Leiden: Brill, 2007); “Reflections on the distribution.”

<sup>33</sup> Metin Coşgel, and Boğaç A. Ergene, "Intergenerational wealth accumulation and dispersion in the Ottoman Empire: observations from eighteenth-century Kastamonu," *European Review of Economic History*, 15 (2011), 255-276; “Inequality of wealth in the Ottoman Empire: War, weather, and long-Term

new generation of studies based on Ottoman inheritance inventories with a problem-oriented approach and integrative methodology. In a significant geographic and temporal expansion of the data used for analysis, Canbakal and Filiztekin have built a vast database of Ottoman probates in several districts spanning the period between 1460 and 1920.<sup>34</sup> Addressing some of the methodological difficulties that arise in very long-term analysis, they employed various descriptive statistics to examine whether the inverted U-shaped temporal pattern found by Coşgel and Ergene and other studies was present in their sample.

Some types of documents included in the court registers have attracted much less scholarly attention than dispute resolution and probate inventories. Among these are the transaction documents, such as the notarial deeds of real estate (*mübayaa hücceti*), which include information on the characteristics, location, and price of real estate. Using these notarial deeds, Karagedikli and Tunçer have recently constructed a dataset to examine trends in house prices, market segmentation, and urban wealth inequality in Edirne during the period between 1720 and 1814.<sup>35</sup> Another type of transaction document is the official correspondence concerning sales of *gediks*--entitlements to usufruct rights over the factors of production in urban economic activity.<sup>36</sup> Ağır used about 900 *gedik* transactions from the early-nineteenth century

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trends in eighteenth-century Kastamonu," *The Journal of Economic History*, 72 (2012), 308-331. For levels of inequality among Muslims in Kastamonu and a description of the relationship between economic privilege and social, political, religious, and occupational status and gender identity, see also Boğaç A. Ergene and Ali Berker, "Wealth and inequality in 18th-century Kastamonu: Estimations for the Muslim majority," *International Journal of Middle East Studies*, 40(2008), 23-46;

<sup>34</sup> Canbakal and Filiztekin, "Wealth and demography."

<sup>35</sup> Gürer Karagedikli and Ali Coşkun Tunçer, "House prices in the Ottoman Empire: evidence from eighteenth-century Edirne," *The Economic History Review* 74 (2021), 6-33.

<sup>36</sup> *Gediks* emerged in the early 18th century and turned into tradable assets in the later part of this century.

Istanbul court records to analyse the functioning of *gedik* markets and the barriers on tradability of these financial instruments.<sup>37</sup>

Whereas the practice of *narh* (price ceiling) has been widely discussed in the literature, data from *narh* records in the court registers and the separately compiled *narh defters* was rarely used in a systematic manner for price history. Ekin et al prepared the first long-term price series since Pamuk's analysis of *narh* prices in Istanbul, covering the period from 1540s to 1840s for Rodosçuk, Manisa, Konya and Ayntab.<sup>38</sup>

### **Property and Income Registers (*Temettuat Defterleri*)**

Compiled between 1840 and 1845, *temettu* registers were the results of surveys conducted by local commissions in selected provinces of eastern Balkans, western and central Anatolia and Aegean islands. They include information regarding "income-yielding assets" (land, animals and all other income-generating resources) on a household basis. These surveys were intended to serve as the basis for a new tax on profits introduced in 1844–45, under the stimulus of the Tanzimat reform era. The collected information, however, was never used in actual taxation.<sup>39</sup> Almost 18,000 registers that exist are considered as the "first in a long series of land and property registers<sup>40</sup>" of the nineteenth century and provide Ottoman historians a wealth of information on rural life.

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<sup>37</sup> Seven Ağır, "The rise and demise of *gedik* markets in Istanbul, 1750–1860," *The Economic History Review*, 71(2018), 133-156.

<sup>38</sup> Ümit Ekin, Tufan Turan, Vedat Turgut, Mehmet Zeki Ak, Veli Yılcı, *Rodosçuk/Tekirdağ, Manisa, Konya Ve Ayıntab/Gaziantep'te Tüketilen Malların ve Fiyatlarının Analizi (16.-19. Yüzyıllar)*, Sakarya University, <https://acikerisim.sakarya.edu.tr/handle/20.500.12619/95075>.

<sup>39</sup> Huri İslamoğlu, "Politics of administering property: Law and statistics in the 19th century Ottoman Empire," in İslamoğlu (ed.), *Constituting modernity: private property in the East and West* (London, New York: I.B. Tauris, 2004), 276-319.

<sup>40</sup> *Ibid.*, 296

Despite the rich detail included in *temettu* registers, until recently they have been among the least systematically used sources in Ottoman archives. Pioneered by Güran, and Kütükoğlu,<sup>41</sup> researchers have used these sources in studying the socio-economic history of various regions. But these studies have generally remained limited to descriptions of certain socio-economic features of a particular village or region based on aggregate tables, typically without the benefit of a comparative perspective or critical methodological engagement. Paradoxically, the presence of extensive details and the vast amount of information on a household basis may have prevented researchers from initiating comprehensive and systematic analysis based on these surveys, at least until the recent development of advanced computing technologies and analysis software.

Several new initiatives show great promise towards the full utilization of *temettu* registers for research in economic history. In an unpublished PhD thesis, Kaya compared Ottoman *temettuats* with French agricultural surveys of 1836 and 1852 to reveal the areas of convergence and difference between the two states in administrative practices of registering economic wealth.<sup>42</sup> In an ongoing project, Kabadayı is currently building a vast database of *temettu* registers of several regions in Turkey. Constituting a preliminary example of how these data can be used for systematic analysis, Kabadayı and Güvenç have extracted occupational information from the registers to examine ethno-religious division of labor in several Ottoman towns during the nineteenth century.<sup>43</sup>

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<sup>41</sup> Tevfik Güran, *19. Yüzyıl Osmanlı Tarımı* (Istanbul: Eren, 1998); Mübahat Kütükoğlu, "Osmanlı'nın Sosyal ve İktisadi Kaynaklarından Temettü Defterleri," *Bellefen*, 59 (1995), 395–418.

<sup>42</sup> Alp Yücel Kaya, *Les enquêtes agricoles de la France et de l'Empire ottoman au milieu du XIXe siècle*, unpublished PhD thesis, Ecole des Hautes Etudes en Sciences Sociales, Paris (1999).

<sup>43</sup> M. Erdem Kabadayı and Murat Güvenç, "Ethno-Religious division of labour in urban economies of the Ottoman empire in the nineteenth Century," in Leda Papastefanaki and M. Erdem Kabadayı (eds.), *Working in Greece and Turkey: A Comparative Labour History from Empires to Nation States, 1840 – 1940* (New York, Oxford: Berghahn Books, 2020), 204–29.

## Other studies

The flourishing quantitative Ottoman economic history surely does not limit itself to the above-mentioned sources and topics. Each generation of scholars have moved the literature forward by discovering new sources of data and fresh areas of application. The seeds of this can be found in the works of earlier generations of scholars, who expanded boundaries by building on the pioneering efforts of Barkan and Inalcik. Faroqhi, for example, used a variety of documents and introduced new interpretations to study the social and economic history of Ottoman towns in Anatolia before the nineteenth century.<sup>44</sup> Similarly, Çızakça used information from the Ottoman archives to compare the evolution of business partnerships between Europe and the Islamic world, and Quataert contributed to labor history by working with materials regarding the coal miners of the Zonguldak region of the Black Sea coast in the nineteenth and early twentieth centuries.<sup>45</sup> In yet another novel combination of archival sources, Eldem used French and Ottoman documents to study French trade in Istanbul in the eighteenth century.<sup>46</sup>

Employing a wide range of archival sources in creative ways, quantitatively oriented historians of the Ottoman Empire have recently launched an ever-expanding set of research agendas, in line with the current debates and novel approaches in the broader field of economic history. For example, Ottoman economic history took its place in the literature on market integration, a field of growing scholarly interest. Making use of newly compiled datasets of historical prices, Ottoman historians measured the pace at which the empire was incorporated into the European trade networks, before and during the first wave

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<sup>44</sup> See, for example, Suraiya Faroqhi, *Towns and townsmen of Ottoman Anatolia: Trade, crafts and food production in an urban setting* (Cambridge: Cambridge University Press, 1984).

<sup>45</sup> Murat Çızakça, *A comparative evolution of business partnerships: the Islamic world and Europe, with specific reference to the Ottoman Archives* (Leiden: Brill, 1996); Donald Quataert, *Miners and the State in the Ottoman Empire: The Zonguldak Coalfield, 1822-1920* (New York, Oxford: Berghahn Books, 2006).

<sup>46</sup> Edhem Eldem, *French trade in Istanbul in the eighteenth century* (Leiden: Brill, 1999).

of globalization.<sup>47</sup> Albeit with relatively modest contributions due to the scarcity of price data, the results help to demonstrate market integration as an important source of long-term economic growth.

Quantitative researchers have recently provided deeper insights into the actors and institutions of the Ottoman economy. Among others, Orbay's study of annual revenues and expenditures compiled from waqf account books allowed a better understanding of the economic roles of waqfs, alongside their social and cultural functions in urban life.<sup>48</sup> Karagedikli and Tunçer similarly used waqf deeds to examine the destiny of Ottoman cash waqfs, as microcredit institutions, during the period between 1815 and 1915, a period that witnessed the rise of foreign banking in the empire.<sup>49</sup> In the same vein, Artunç built a novel dataset of eighteenth-century prices for the tradable licenses called *berat*<sup>50</sup> held by foreign merchants. Using the dataset, he analyzed the legal-institutional environment shaping the Ottoman commercial life.<sup>51</sup>

Significant quantitative contributions have also been made from a political economy perspective. Karaman and Pamuk evaluated the Ottoman State's extractive capacity in 1500-1914 comparatively to find that Ottoman central revenues lagged

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<sup>47</sup> Süleyman Özmucur and Şevket Pamuk, "Did European commodity prices converge during 1500–1800?," in Timothy J. Hatton, Kevin H. O'Rourke and Alan M. Taylor (eds.), *The new comparative economic history: essays in honor of Jeffrey G. Williamson* (Cambridge, MA, London: MIT Press, 2007), 59-85; Laura Panza, "Globalization and the near east: a study of cotton market integration in Egypt and Western Anatolia," *The Journal of Economic History*, 73 (2013), 847-872; Zhuo Li, Laura Panza, and Yong Song, "The evolution of ottoman–European market linkages, 1469–1914: Evidence from dynamic factor models," *Explorations in Economic History*, 71 (2019), 112-134.

<sup>48</sup> For some of Kayhan Orbay's studies on waqf account books see "Bursa'da Sultan II. Murad Vakfı'nın Mali Tarihi (1608-1641)," *İstanbul Üniversitesi İktisat Fakültesi Mecmuası*, 61 (2011), 293-322; "Gazi Süleyman Paşa Vakfı'nın mali tarihi ve 17. yüzyılda Trakya tarımsal ekonomisi," *Tarih Araştırmaları Dergisi*, 30 (2011), 145-182; "Orhan Gazi Vakfı'nın Mali Tarihinden Bir Kesit (1593-1641)," *Vakıflar Dergisi*, 38 (2012), 65-84; "Financial development of the waqfs in Konya and the agricultural economy in the central Anatolia (late sixteenth-early seventeenth centuries)," *Journal of the Economic and Social History of the Orient*, 55 (2011), 74-116.

<sup>49</sup> Gürer Karagedikli and Ali Coşkun Tunçer, "Microcredit in the Ottoman Empire: a review of cash waqfs in transition to modern banking," in Marcella Lorenzini, Cinzia Lorandini and D'Maris Coffman (eds.), *Financing in Europe* (Cham: Palgrave Macmillan, 2018), 239-268.

<sup>50</sup> *Berats* were licenses that granted foreign merchants tax exemptions and certain legal privileges.

<sup>51</sup> Cihan Artunç, "The price of legal institutions: The beratlı merchants in the eighteenth-century Ottoman empire," *The Journal of Economic History*, 75 (2015), 720-748.

behind its European counterparts during the early modern era.<sup>52</sup> Arslantaş, Pietri and Vahabi likewise used quantitative data from *muhallefat*, a specific type of probate inventory, to study the Ottoman State's practice of confiscation as a form of state predation.<sup>53</sup>

### 3. A PLURALISTIC APPROACH

Despite the immense recent growth and invaluable contributions of the quantitative approach to the Ottoman economy, this approach has not gone without criticisms. In this section, we address these criticisms briefly, from a perspective that views quantitative analysis as an essential component of a pluralistic methodology. Of course, a purely quantitative strategy is not suitable for all types of research questions concerning the Ottoman economy. It may not be possible to quantify the information from certain types of sources, and measurement errors may be too serious in the data to make them appropriate for certain types of analysis. Although these concerns may apply to certain research questions in the field, we believe that the success of recent contributions nevertheless demonstrate that quantitative methods are entirely appropriate for numerous other important research questions as part of the methodological toolkit of the economic historian.

Primary sources may have limitations that cause concern regarding the suitability of the quantitative method for analysis. The primary sources available in Ottoman archives are sometimes problematic because, for example, they have uneven geographical and temporal coverage, lack information regarding certain areas of the economy and economic activities, and omit certain social groups, such as women and children, from the records. In

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<sup>52</sup> Karaman and Pamuk. "Ottoman state finances."

<sup>53</sup> Yasin Arslantaş, Antoine Pietri, and Mehrdad Vahabi, "State predation in historical perspective: the case of Ottoman *müsadere* practice during 1695–1839," *Public Choice*, 182 (2020), 417-442.

addition, some sources may be inappropriately leading historians to state-centered accounts of the Ottoman world because of their state-produced and bureaucratic nature. Aside from problems regarding sources, scholars have expressed concerns against the methodology of quantitative research.<sup>54</sup> According to such critiques, quantitative methodologies may be “innately unsuitable” for historical sources, as they are not intended for this purpose. Analysis based on quantitative variables “constructed” by the researcher, may betray the documents themselves, imposing an external logic upon them and detaching them from their historical context.

For certain research questions, quantitative data from Ottoman archives must be used in combination with other sources to complement the information required for analysis or to check the accuracy and appropriateness of the data or estimation procedure. A good example of this comes from a procedure proposed by Barkan and adopted by numerous researchers in constructing population estimates for the Ottoman Empire. In the absence of population censuses, Barkan used information regarding the number of households and bachelors reported in tax registers to estimate the total population, based on certain assumptions regarding the average household size throughout the empire. Since the household sizes could vary significantly across regions and over time, however, his procedure and estimates must be used with great caution, ideally in combination with local and contemporaneous information regarding the actual size of the households. Absent this information, numerous population estimates of Ottoman districts based on the fifteenth and sixteenth-century tax registers pose significant problems.<sup>55</sup>

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<sup>54</sup> Boğaç A. Ergene, “On the use of sources in Ottoman economic history,” *International Journal of Middle East Studies*, 44 (2012), 546-548.

<sup>55</sup> For a methodological discussion regarding the use of *tahrirs* for historical demography, see Leila Erder, “The Measurement of Preindustrial Population Changes: The Ottoman Empire from the 15th to the 17th Century,” *Middle Eastern Studies*, 11 (1975), 284-321.

Despite limitations, quantitative approaches have numerous well-known advantages that make them essential for historical research. As Coşgel and Ergene have recently argued, quantitative studies have served historians well in numerous fields of historical inquiry, as well as the economic history of the Ottoman Empire.<sup>56</sup> For example, they allow researchers to identify long term patterns in the data that may not otherwise be possible to observe, test hypotheses regarding the behavior of individuals or the performance of economies, and serve as a common language to facilitate communication and collaboration across historical fields. Rather than unduly focus on the limitations of quantitative data and analysis, historians of the Ottoman Empire would be better off benefiting from these advantages by participating in interdisciplinary conversations and by adopting a pluralistic approach that includes the quantitative method in the toolkit as appropriate.

To avoid the pitfalls of a quantitative approach, researchers obviously need to scrutinize the data and analytical techniques carefully. The appropriateness of the sources, after all, depends on the research question on hand and the reliability of the data, quantitative or not. To overcome limitations, scholars must of course engage critically with the sources, be mindful of the problems, ask the right questions, and use innovative and creative methodologies, all essential steps of a well-planned research agenda.

A particularly useful strategy in both western and Ottoman economic history has been to develop the field through interdisciplinary and collaborative studies. Integrating knowledge and skills from different areas of expertise, -especially history and economics, but also digital technologies, econometrics, climatology, anthropometrics, and cartography, among others- would not only open new prospects in the field, but also would help overcome limitations and problems associated with employing historical documents for quantitative investigation. Methodological explorations with contributions from a variety of

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<sup>56</sup> Coşgel and Ergene, *The economics of Ottoman justice*, Chapter1.

disciplines are likely to lead to innovative techniques and new perspectives to employ the great potential of historical records for quantitatively informed insights into the Ottoman economy. A good example of research agenda that has benefited tremendously from pluralistic methodologies is the recently flourishing area of digital humanities and computational tools, including those specialized in the Ottoman Empire.<sup>57</sup>

Western economic history includes numerous cases of research areas in which scholars have been able to overcome the well-known limitations and problems of certain types of historical documents. A prominent example of this is the rich literature on British and colonial American probate inventories, a mature field that has developed quantitative strategies to deal with issues with the data. Several of the recent developments discussed in this survey provide similar examples of how quantitatively oriented economic historians of the Ottoman empire have developed innovative strategies to overcome limitations of their data.

#### 4. CONCLUSION

As this brief survey of the literature has shown, economic historians of the Ottoman empire have made great progress in the study of quantitative data and the economy since the turn of the twenty-first century. They have used data from various sources, including tax registers, court records, and other types of surveys and financial

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<sup>57</sup> Numerous new initiatives are currently underway that utilize digital tools and interdisciplinary teams of researchers. See, for example, Canbakal and Filiztekin, "Wealth and demography;" Antonis Hadjikyriacou, Evangelos Papadias, Christoforos Vradis, and Christos Chalkiasb, "Combining historical maps and censuses of Cyprus from the sixteenth to the twentieth century: A geospatial approach," in *Proceedings of the International Cartographic Association*, 3, 7 (2021); Özlem Sert, "Environmental History of Rice Plantations in the Early Modern Ottoman Empire Between the 15th And 19th Centuries and Its Potential for Climate Research," *Journal of Environmental Geography*, 14 (2021), 1-14.

accounts. Applying state of the art analytical techniques to the data, they have examined numerous interesting questions regarding the Ottoman economy, population, and institutions.

Given the richness of available data and the variety of potential research areas, however, we have inevitably had to omit from discussion several important fields of investigation, such as finance, money, environment, demographics, manufacturing, labor and consumption. In these and various other fields too researchers have used quantitative data and novel methods of economic analysis to expand scholarship with invaluable insights. In addition, the rich material from the Ottoman and foreign archives is far from being fully exploited for quantitative perspectives on the Ottoman economy. For example, the European consular reports sent from coastal Ottoman cities during the nineteenth century include valuable but still underutilized information regarding trade, finance, and wages. While several sources remain underemployed, several others - including the ones most widely used until today- are waiting to be re-discovered with a fresh look and innovative approaches.

Going forward, we expect recent contributions to this field to pave the way for various new avenues of research. For example, an area of research that stands to benefit greatly from these developments is the literature on long-run global divergence. An important limitation of research in this field has been the lack of solid quantitative evidence from the developing world, which has restricted the ability to test hypotheses and to engage in empirical inter-regional comparisons. Thus, quantitatively informed insights into the Ottoman Empire have enormous potential to advance the knowledge on the timing, nature, and sources of global divergence. Given the strategic central location of the Ottoman Empire at the centre of the pre-Columbian world economy, though gradually losing ground over the early modern era, we would expect the growing literature on quantitative data and the economy to have an enabling effect on comparative analysis of paths of development.