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Abstract

This study examines the evolution of regional income inequalities and its causes within present day borders of Turkey since 1880. We construct indices for value added per capita for agriculture, industry and services as well as GDP per capita for each of the 58 administrative units for about one dozen benchmark years. For the recent period since 1987, we make use of the official series for the same 58 units. We find that the overall trend from the 1910's to the present has been convergence for the country as a whole. We also find an inverse U shaped pattern for the regional disparities in Turkey since 1880. While all other regions began to move towards country averages, the differences between the East and the rest of the country persisted and even increased. Our comparisons also suggest that regional disparities in Turkey have been and are still larger than those in European countries of similar size such as Italy, France and Spain. Problems of endogeneity make it difficult to establish causality at this stage of the research. Nonetheless, we are able to offer an interpretation consistent with our empirical findings. We argue that not a single cause but a combination of causes led by geography, structural change, industrialization and agglomeration economies, and ethnic conflict and demographic movements are behind this pattern for the country as a whole and for the fact that the East has continued to lag behind.

JEL Classification: N14, N15, N94, N95, O18, O53, O54, R12

Keywords: Regional Development, Regional inequalities, Industrialization, Ethnic Conflict, Turkey, Ottoman Empire

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Regional Inequalities and the West-East Divide in Turkey since 1880

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1. Introduction

Since the onset of modern economic growth two centuries ago, regional disparities have been an important part of the development experience of most countries. Different strands of the theoretical literature suggest different explanations for the emergence of regional economic inequalities and make different predictions about their evolution over time. While the neoclassical models focus on "first-nature geography" such as physical geography and resource endowments or locational fundamentals, in recent decades the new economic geography models have explored the role of "second-nature geography", i.e. locational choices of economic actors and their interactions in the context of urbanization and concentration of industries. These models emphasize market access as a key determinant of industrial location and are built around the idea that product differentiation, increasing returns to scale and declining transport costs may generate pecuniary externalities for firms and workers' location choices. The new economic geography models thus emphasize a cumulative causation process that tends to increase income differences and are less optimistic about the long-term trends in regional disparities. (Krugman 1991; Kim 1998; Redding 2013)

A growing economic history literature on the long term patterns of regional inequality has shown that in the United States, in many Western and Southern European countries, regional disparities have exhibited an inverse U pattern, increasing during the early stages of industrialization during the nineteenth century and declining later with continued structural change and national integration. Studies also show that regional inequalities have been rising once again in recent decades. In contrast, very few studies are available on the long-term evolution of regional inequalities in today's developing countries.

This study aims to begin filling that gap. It will examine the evolution of regional income inequalities and their proximate causes within present day borders of Turkey since 1880. Regional inequalities have been a central part of the development experience of Turkey going back to the Ottoman era. Even though development policy, and more generally, politics at both the local and national levels have focused on these inequalities during the last century, East-West income inequalities in Turkey today are still amongst the largest anywhere in the world. Equally important, differences between the West and East regions of the country in human development, health as

measured by life expectancy at birth and education as measured by years of schooling, have also remained large (Gezici and Hewings 2007).

The long-term pattern of regional disparities in Turkey since the nineteenth century is likely to show significant differences from that observed in most of today's developed countries. For one thing, the economic strategies followed by governments in Turkey since the nineteenth century have been different than those followed by the developed countries. In addition, the timing as well as intensity of urbanization, structural change, industrialization and economic growth have been different than those of developed countries but broadly similar to those of other developing countries. For these reasons, the case of Turkey should help us better understand long-term patterns of regional income disparities in developing countries and how they compare with those of today's developed countries.

Recent work by economists suggest that ethnic polarization and conflict can be important sources of inequality in both developed and developing countries. Because different regions are often homelands to different ethnic groups, ethnic inequalities and conflict may also be a source for and may interact with existing regional inequalities ((Horowitz 2000; Esteban and Ray 2008; Alesina, Michalopoulos, and Papaioannou 2016). Regional inequalities in Turkey have been accompanied by ethnic polarization and conflict and large demographic movements associated with these since the late Ottoman era. Until the outbreak of the World War I, most of the Armenian population in the Ottoman Empire lived in what is today Eastern Turkey. It has been argued that the forceful removal of the Armenians from the region and the massacres of many of them had long lasting impact on the subsequent course of development at least in the region and possibly across the country. Another large demographic shock after World War I was the exchange of the Greek Orthodox population in Anatolia with the Muslim population in Greece arranged by the two governments during the early 1920s. Kurds have been the largest ethnic group living in Turkey's Eastern region since. Since the 1980s, Kurds in the region have been seeking greater autonomy, and at times independence, by military and political means. Kurdish movements have always emphasized the large and persistent regional differences between the East and the rest of the country.

Most of the existing studies on the pattern of regional disparities inequalities in Turkey focus on the recent period since the 1970s for which data is more readily available. Our study aims to document, for the first time, the evolution of the regional income inequalities since the late Ottoman era when regional statistics became available. We make use of Ottoman statistics and other sources of data for the decades before World War I as well as the official statistics and other data from modern Turkey since the 1920s. For the period 1880 to 1910, we rely on Ottoman tax revenue and urbanization data since production data is not available at the local level. For the period after 1910, we construct indices for value added per capita for agriculture, industry and services as well as GDP per capita for each of the 58 administrative units for about one dozen benchmark years. For the recent period since 1987, we make use of the official series for GDP per capita for each of the same 58 administrative units which can easily be aggregated into Turkey's 26 NUTS 2 regions.

Based on the first estimates of the income per capita at provincial level, we calculate the coefficient of variation and Theil decomposition indices, and find an inverse U shaped pattern for the regional GDP per capita in Turkey since 1913. We also find there were already large regional income inequalities, including West-East inequalities, in Turkey in the decades before World War I, well before industrialization gained momentum. Ethnic conflict and industrialization likely to have increased the regional disparities further in the first half of the twentieth century. While other regions began to move towards country averages and the disparities in GDP per capita for the country as a whole began to decline after the end of World War II, the East remained outside this trend of convergence. The GDP per capita differences between the East and the rest of the country persisted and even increased during the second half of the twentieth century. The average incomes in the East has converged somewhat to the mean of country since the beginning of the present century, but the differences are still very large. Our comparisons also suggest that the regional disparities in Turkey during the last century have been and are still larger than those in Western and Southern European countries such as Italy, France and Spain.

The next section will briefly review the existing literature and the evidence on the long term evolution of regional disparities mostly for developed countries as well as the empirical literature on regional disparities in Turkey since the 1960s. Section 3 will summarize our methodology and the data we have used. Section 4 presents our findings regarding the pattern of regional inequalities

since late nineteenth century including a brief comparison of Turkey's pattern with those of three European countries of similar size. Section 5 will discuss the leading causes of the pattern of regional income inequalities: geography, structural change, industrialization and agglomeration economies, ethnic conflict and demographic movements and human capital. The penultimate section will present the results of a preliminary set of regressions which seeks to learn more about the predictive power of our leading causes. Section 7 provides a brief conclusion and an agenda for further research. The Appendix presents more details on our data and methodology and the GDP per capita estimates for the 58 provinces.

2. Theory and Evidence

The theoretical literature suggests different explanations for the rise of regional economic inequalities and make different predictions about their trajectories. The results and predictions depend closely upon the assumptions of the models. Neoclassical economic models have explained regional income disparities in terms of differences in the distribution of endowments, for example, natural resources, factors of production and technology. This literature does not offer a clear-cut prediction on the long-term trends in regional incomes, however. The Heckscher–Ohlin trade model and the factor–price–equalization theorem predict that, under certain assumptions, the increase in trade and factor movements will lead to per capita GDP convergence across regions. However, market integration may also lead to increasing regional specialization if differences in factor endowments persist between regions. (Samuelson 1949; Slaughter 1997; Rassekh and Thompson 1998) Growth theory also offers insights about the causes and long term evolution of regional inequality. In the closed-economy Solow model, differences in capital per worker lead to slow convergence in per capita incomes across regions. Convergence rates may increase if capital and labor move from regions where they are abundant to regions where they are scarce. (Barro et al. 1991) The more recent endogenous growth theory, on the other hand, predicts that in the presence of increasing returns, capital movements may lead to regional divergence rather than convergence (Romer 1986).

In recent decades the new economic geography models have explored the role of "second-nature geography", i.e. locational choices of economic actors and their interactions in the context of urbanization and concentration of industries. These models emphasize market access as a crucial

determinant of industrial location and are built around the idea that product differentiation, increasing returns to scale and declining transport costs may generate pecuniary externalities for firms and workers' location choices (Krugman 1991). In the presence of factor mobility or intermediate inputs, these factors may give rise to agglomeration and uneven regional specialization. As workers tend to concentrate in a given location, the resulting shift in local demand further increases the incentive for firms to concentrate production in that location. This creates an endogeneous causation process that tends to increase income differences. As a result, the new economic geography models are less optimistic about the long term trends in regional inequality (Combes, Mayer, and Thisse 2008; Kim 1998; Ascani, Crescenzi, and Iammarino 2012; Overman, Redding, and Venables 2001)

However, dispersion forces such as the immobile factors of production or non-traded goods in inelastic supply are also at work. The interaction between the forces of agglomeration and dispersion determines the spatial distribution of economic activity. For a range of parameters of such forces, the spatial distribution is not uniquely determined and may exhibit instead multiple equilibria (Michaels, Rauch, and Redding 2012). Extending the initial arguments of new economic geography, it has also been emphasized that the relationship between the process of regional integration and the degree of concentration of economic activity depends greatly on whether or not workers move across regions in response to income differentials (Puga 1999). Industrial agglomeration tends to raise local wages in regions densely populated by firms. When higher wages lead workers to relocate from less industrialized to more industrialized regions, agglomeration intensifies but wage differentials tend to decline, leading to income convergence. The central role of agglomeration economies suggests that empirical research must take a long-term view to understand the spatial inequalities and their causes.

Another strand in the literature that sheds further light on the emergence and evolution of regional inequalities have been country studies that focused mostly on the experiences of today's developed countries. The nineteenth century was a period of domestic market integration for these countries. Transport costs within countries decreased dramatically with the construction of railroads in the aftermath of the Industrial Revolution. In addition, many of the institutional barriers to trade and factor movements within countries were eliminated. As domestic movements of people, capital and goods increased, the prices of commodities and factors of production tended

to converge across locations. The creation of these national markets was often accompanied by the shift from agriculture to the urban economy and the concentration of industrialization in a small number of regions.

In one of the earliest studies on national economic development and regional inequality, Williamson (1965) posed the hypothesis that regional inequality followed an "inverted U" shaped pattern over time, with growing inequality in the early stages and convergence later. In the case of the United States, he argued, structural change and specialization favored rising inequality during the nineteenth century, but the advance in the process of structural change and integration, with associated increases in capital movements and internal migration, could account for the subsequent decline in regional income inequalities.

Later studies have confirmed the importance of structural change, industrial location and economic agglomeration in explaining the rise and decline of regional inequalities in the United States, France, Italy and Spain, and other developed countries, from the nineteenth to the twentieth century. It has also been shown that the rise and decline of regional inequalities may depend on the changes in the distribution of the different industrial sectors over time (Kim 1995; 1998; Caselli and Coleman II 2001; Combes et al. 2011; Felice 2011; A'Hearn and Venables 2013; Martínez-Galarraga, Rosés, and Tirado 2015a) More recently, a team led by Wolf and Roses examined the evolution regional employment and income inequalities for Western and Southern Europe since 1900. Along with the spread of industry and services and the declining role of agriculture across the continent, they find an inverse U shaped pattern in geographic concentration of industry and regional income disparities. However, they also emphasize that regional disparities across Europe have begun to rise once again in the most recent era of continental integration and globalization (Rosés and Wolf 2018).

The experience of today's developed countries provides important insights into the experience of developing countries in regional disparities. However, there were also important differences between the experiences of the two groups of countries with regard to the timing and intensity of structural change, trade regimes, industrialization and agglomeration economies. During the nineteenth century most of today's developing countries were integrated into the global economy as exporters of primary products. In many cases, national market integration remained weak and

industrialization did not gain momentum until the adoption of protectionism well into the twentieth century. Structural change and urbanization rates remained significantly lower than those in European countries at comparable rates of GDP per capita. As a result, the patterns of regional income disparities in the developing countries were mostly due to first order geography, in most cases until after World War II (Caruana-Galizia 2013; Reis 2014).

During the early stages of industrialization of the developing countries, rates of protectionism and rates of industrialization were often higher than those in today's developed countries in the early stages of their industrialization. At the same time, transport costs were significantly lower and rates of population growth and migration were significantly higher in the developing countries than those prevailing in Europe during the nineteenth century. As a result, the potential for agglomeration economies and market access often tended outweigh the costs of congestion, higher wages, and land prices. For these and other reasons, the tendency for a small number of urban centers to dominate the process of urbanization and industrialization has been strong in the developing countries since the end of World War II (Puga 1998; Henderson 2002; Deichmann et al. 2008). In most cases, state capacity remained limited and the effectiveness of economic policies that might be employed to address regional disparities remained modest.

In recent years, economists have also been focusing on ethnic polarization and conflict as an important source of inequalities in both the developed and developing countries. Since different regions are often homelands to different ethnic groups, ethnic polarization and conflict may also emerge as another leading source of regional inequalities and may interact with existing regional disparities or unfolding processes such as industrialization that give rise to regional disparities (Esteban and Ray 2008; Alesina, Michalopoulos, and Papaioannou 2016). In the absence of the resolution of the ethnic issues, some regions may lag behind the rest of the country for long periods of time (Montalvo and Reynal-Querol 2005; Esteban, Mayoral, and Ray 2012).

Regional income disparities in Turkey have a long history. However, there are no empirical studies for the period before 1960. The first attempts to measure the existing regional income disparities were undertaken with data beginning in 1965 (Bulutay and Ersel 1969; Ciller 1982; Özmucur 1988; Özötün, Hazinedar, and Kaya 1986; Özötün 1980). The publication of annual official series for sectoral value added at the province level beginning with the year 1987 provided

support for new research on the last quarter of the twentieth century. Most of these studies did not find convergence, some found divergence (Filiztekin 1998; Doğruel and Doğruel 2003; Yıldırım and Öcal 2006; Gezici and Hewings 2007).

3. **Data and Methods**

As part of this study, we constructed value added estimates for agriculture, industry and services for each of the 58 provinces within present day borders of Turkey for the benchmark years 1913, 1927, 1939, 1950, 1964, 1970, 1980 and 1991. The sum of the three sectoral value added estimates leads to our total income estimates. 1913 is our first benchmark year because the underlying regional production data is not available for the earlier period. The subsequent benchmark years are chosen because they were the years of industrial censuses. As we explain briefly below and in greater detail in the Appendix, we followed different data construction procedures for the three sectors and in different years, as the quantity and quality of the available data sources vary from one sector to another and from one benchmark year to another. We ended our estimates in 1991 in order to be able to compare our series with the official estimates of sectoral value added that become available on an annual basis in 1987 and link our estimates to them.[1] We begin below with a note on our spatial units and then summarize the procedure we used for each of our sectoral value estimates.

The administrative divisions within present day borders of Turkey changed often since the late Ottoman era. Nonetheless, there was a large degree of continuity from the Ottoman *sancak*s of the nineteenth century whose numbers varied between 50 to 60 to Turkey's *vilayet*s or provinces whose numbers increased from 67 to 81 since the 1980s. More recently, Turkey adopted the European Union's classification and these 81 provinces were grouped into 26 NUTS 2 and 12 NUTS 1 regions. In order to follow the evolution of the spatial distribution of economic activity as well as other basic variables within present day borders of Turkey since the late Ottoman era, we made some adjustments in the available data and defined 58 spatial units for the entire period.

[1] For the conventional national income accounting methods, see DIE (1973). For an extensive application to the early republican period, see Bulutay, Tezel, and Yıldırım (1974).

The 58 units or provinces which form the basis of our empirical work can easily be collapsed into the 26 present-day NUTS 2 regions.[2]

For agriculture, Ottoman statistics at the level of provinces and smaller units within them became available for the first time in the years before World War I. Due to the existence of missing data from the 1913 Ottoman agricultural statistics, our estimates for agricultural value added for 1913 are in fact the averages for 1909 and 1913. For the decades before 1913, we could make use only of official tax revenue data at the level of provinces, as we discuss later in the text. Agricultural statistics for Turkey at the province level and on an annual basis became available on 1928, and we have calculated three-year averages for agricultural value added for each of the provinces and the benchmark years.[3] Gross output is obtained by multiplying the crop and animal product output figures (physical output in tons) with their local prices, whenever possible. To avoid possible misreporting and errors in the original documents, physical output figures are winsorized on the basis of average yields whenever the acreage is available. We then estimate waste, seeds and additional costs separately for each province and subtracted these from our gross output estimates. At the last stage, we distributed the national agricultural value added amongst the 58 provinces in proportion to our province level estimates for each benchmark year.

We consider total industrial value added as the sum of the value added of five sub-sectors: big manufacturing, small manufacturing, mining, utilities and construction. The national value added in nominal terms are available for all these benchmark years except for small manufacturing before 1964, which was estimated separately. Big manufacturing value added data comes from the summary reports of industrial censuses. Value added in small manufacturing, mining and utilities are estimated by making use of the related employment data. Finally, value added in construction is estimated by the value of new building permits for each benchmark year. We then distribute the national industrial value added amongst the 58 provinces in proportion to our province level estimates for each benchmark year.

There is no information on the distribution of services value added at the province level for the Ottoman era or for Turkey before 1975. In estimating provincial value added in services, we made

[2] For further details on the definition of the 58 provinces, see Appendix Table A1.
[3] For agricultural value added for the second benchmark year of 1927, we used the average of the years 1928-30.

use of the estimates for agriculture, industry and services value added for the period 1975-1985 as constructed by Özötün (1980). Using Özötün data as our training sample, we estimated the following OLS model to predict the distribution of services value added at the province level for each our benchmark years:

$$Y_{it} = \beta_0 + \beta_1 S_{it}^{industy} + \beta_2 S_{it}^{agriculture} + \beta_3 S_{it}^{urbanpop} + \beta_4 (S_{it}^{urbanpop})^2 + \tau_t + \varepsilon_{i,t}$$

where i denotes province, t denotes year, Y_{it} denotes province share in total services value added, $S_{it}^{industy}$ denotes province share in total industrial value added, $S_{it}^{agriculture}$ denotes province share in total agricultural value added, $S_{it}^{urbanpop}$ denotes province share, $(S_{it}^{urbanpop})^2$ is the square of province share in Turkey's total urban population in a given year and τ_t denotes year fixed effects. We chose these variables because the empirical evidence strongly suggest that industrialization, urbanization and services growth are strongly correlated in the early stages of structural transformation before the services sector takes over (Herrendorf, Rogerson, and Valentinyi, 2014). The estimated coefficients for province shares in total industrial and agricultural value added and urban population are highly significant and are presented in Appendix Table A3. We then make out-of-sample predictions for the value added in services for earlier years based on our estimated coefficients.

Three caveats are in order. First, we are well aware the national income and regional income are in some ways dissimilar conceptually, even though the regional income estimation methods are derived from the national income framework. Eurostat (2013), the EU's regional accounts manual, describes the main methodological challenges of estimating regional GDP including, for instance, the difficulty of classifying the activities of the enterprises and individuals that have various operations in different locations or complex input-output linkages. Nonetheless, our procedure and estimates are in accordance with the recent studies of historical regional incomes of other countries, and provide a reliable point of comparison.[4]

[4] Some recent estimates rely on the Geary and Stark's (2002) method, which is basically the reallocation of the national incomes across locations based on the wages available at regional and sectoral level, which are assumed to represent labour productivity (Crafts, 2005). Rosés and Wolf (2018) present an extensive compilation of the regional incomes of the European states, mostly using Geary-Stark method. Some other recent works combine the wage-

Second, one drawback of the present estimates is that we do not use regional deflators to derive the constant-price incomes from nominal incomes. The procedure in the literature is often to estimate the incomes in nominal terms, as we do here, and then deflate with the single price index for all provinces (GDP deflator, or a common price index). This omission is due to the difficulty of obtaining regional deflators over a long period and across a large spatial spectrum. The use of single deflator naturally overestimates the income disparities, since typically -but not necessarily- the poorer regions tend to be the locations of the low prices. Indeed, in our case, we observe substantial differences in wholesale prices until 1970 with poor regions with lower agricultural prices.

Third, we link our own estimates for pre-1990 period with the official provincial incomes series. In addition to the Özötün estimates for 1975-86, there exist two separate official series, one for the period 1987-2000, and another for the years since 2004 (DIE 1997). The methodologies and data sources in our own work differs in some respects from those of Özötün and those of the official series. Most importantly, we use regression methods to derive value added in services instead of using direct data. In order to check for possible differences, we compared our estimates for 1980 with those of Özötün for the same year and our estimates for 1991 and with the official series. We did not find significant differences between our estimates and the others.[5] The Appendix presents our estimation procedure and data sources in greater detail.

4. Evolution of Regional Disparities

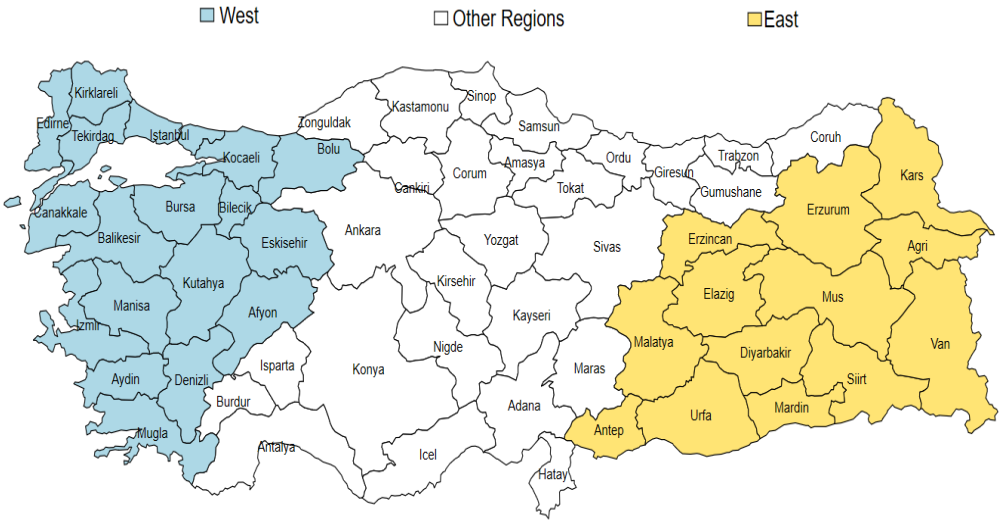
For the purposes of our empirical work, we grouped the 58 provinces into three regions West, East and the Others located between the two. As shown on Map 1, we have defined the West as consisting of the Marmara including Istanbul and the Aegean regions. The West includes 20 of our 58 provinces, 8 of the 26 NUTS 2 regions and 4 of the 12 NUTS 1 regions in the country. After World War II, the migration of millions of people from rural to urban areas and from lower income regions to higher income regions, led to growing concentration of population and economic

based methods with the traditional output-based approach, as in our study (Felice, 2018; Martínez-Galarraga, Rosés, and Tirado, 2015).

[5] Our estimates for the year 1980 are close to those by Özötün for the same year. We find the coefficient of variation in total incomes for our 58 provinces to be 1.61, while Özötün's estimate for 67 provinces is 1.81. Our coefficient of variation estimates for agriculture, industry and services are 0.72, 2.08 and 2.27, respectively, while the corresponding coefficients in the Özötün estimates are 0.66, 2.17 and 2.43.

activity in the northwest of the country. Istanbul, the largest urban center and the leading center for industry since the nineteenth century became the favorite destination for the migrants. As summarized in Table 1, share of Istanbul in total population increased from 6 percent in 1913 and 5.6 percent in 1950 to 10.6 percent in 1980 and 18.5 percent in 2015. The share in the total population of the 20 provinces in the West remained little changed from 1913 to 1950 but increased from 35.3 percent in 1913 to 45.6 percent in 2015.

Map 1



The region we define as the East consists of Eastern Anatolia and Southeastern Anatolia. 13 of the 58 provinces, 7 of the 26 NUTS2 regions and 3 of the 12 NUTS 1 regions in the country are located in the East. While the population shares of the different provinces in the East changed over time and despite the large volume of net emigration from the East to the rest of the country since 1950, share of the East in total population of the country did not change very much due to higher fertility rates. Population share declined from 21.2 percent in 1913 to 18.4 percent in 1950 and 18.2 percent in 2015. There was, however, a large shift within the East, as the population share of North and Central East declined and Southeast increased (Table 1).

Table 1 Population Shares of Regions, 1913-2015, in percent

	1913	1927	1950	1980	2000	2015
İstanbul	6.0	5.9	5.6	10.6	17.0	18.5
Marmara incl Ist	21.1	21.5	21.0	23.4	30.5	32.7
Aegean	14.3	15.2	14.3	13.3	13.4	12.8
All West	35.4	36.7	35.3	36.7	43.9	45.6
Central Anatolia	13.9	15.4	16.0	16.7	14.8	14.6
Mediterranean	8.1	9.1	9.8	11.8	12.4	12.7
Black Sea	21.4	20.7	20.5	16.3	10.6	8.9
All Other	43.4	45.2	46.3	44.7	37.8	36.2
North-Central East	14.3	11.6	12.0	11.5	8.6	7.6
South East	6.9	6.8	6.4	7.2	9.7	10.6
All East	21.2	18.4	18.4	18.6	18.3	18.2
Total Population (mil.)	16.5	13.8	20.8	44.7	64.7	78.7

We will refer to the remaining three regions of the country, the Black Sea, Central Anatolia and the Mediterranean regions as Other regions. These regions include of 25 of the 58 provinces, 11 of the 26 NUTS 2 regions and 5 of the 12 NUTS 1 regions in the country. Share in the total population of the country of other regions located at the North, Central and South of the country (Black Sea, Central Anatolia and Mediterranean regions respectively) increased from 43.4 percent in 1913 to 46.3 percent in 1950 and then declined to 36.2 percent in 2015 (see Map 1)

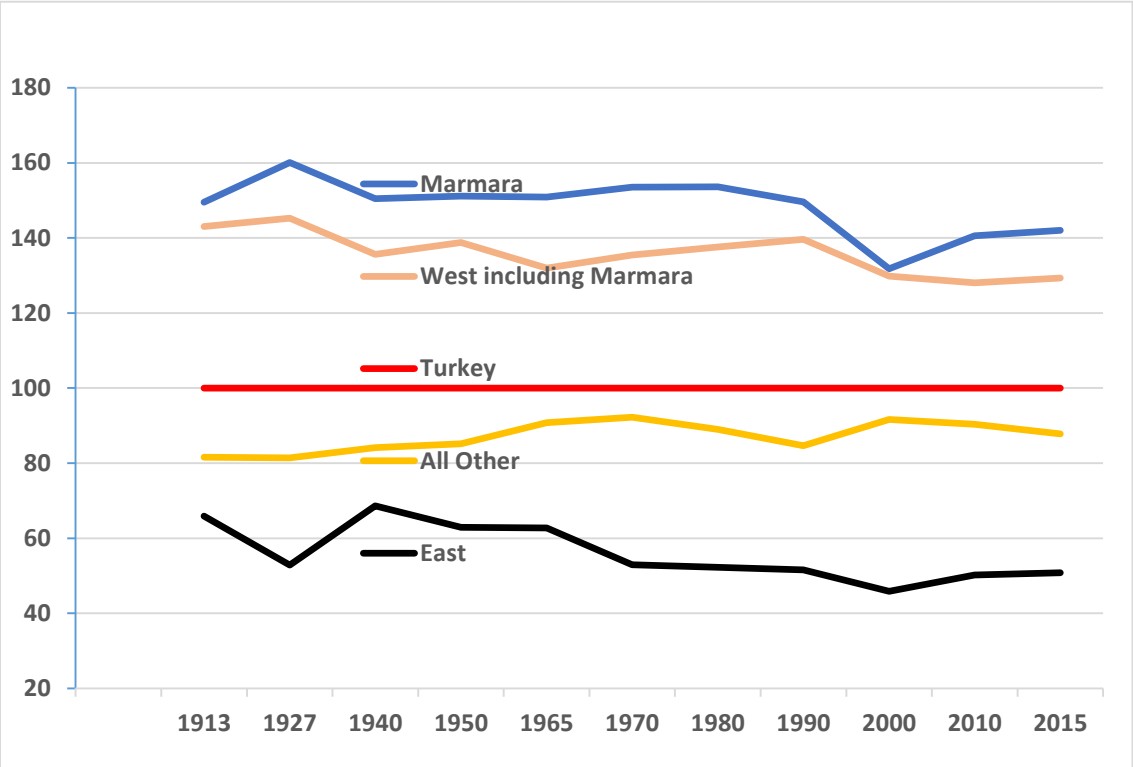
Before we continue with additional tables and figures, we should emphasize there has been considerable economic growth in Turkey during the century since 1913. GDP per capita for the country as a whole increased close to 10 fold between 1913 and 2015. As was the case for most developing countries, long-run rates of economic growth were lower until 1950 and significantly higher since. GDP per capita increased at annual rates below 1 percent until 1950 and around 3 percent since 1950 (Pamuk 2018, 29–36). As a result, GDP per capita levels usually increased from one benchmark year to another for all regions and provinces even if the levels relative to the country average may have declined for some regions.

Table 2 and Figure 1 summarize the evolution of GDP per capita for different regions of the country in relation to the country average for each benchmark year based on our estimates. They show that already in the years before World War I, at early stages of industrialization, there existed large disparities between the provinces and the regions in terms of GDP per capita. İstanbul and to a lesser extent İzmir, and more generally the West, had GDP per capita well above the country average in this early period. The peak in spatial inequalities for the country as a whole was reached sometime around mid-century. While GDP per capita in the West remained above but converged to the country average, the Other Regions consisting of the Black Sea, Central Anatolia and the Mediterranean regions remained below but also converged to the national averages over time. While the disparities in GDP per capita between the West and the Other regions declined, the East lagged behind and the differences between the East and the rest of the country persisted until the end of the twentieth century. The differences between the East and the rest declined since the turn of the present century but they are still very large.

Table 2 GDP Per Capita of Regions, 1913-2015; Country Average = 100

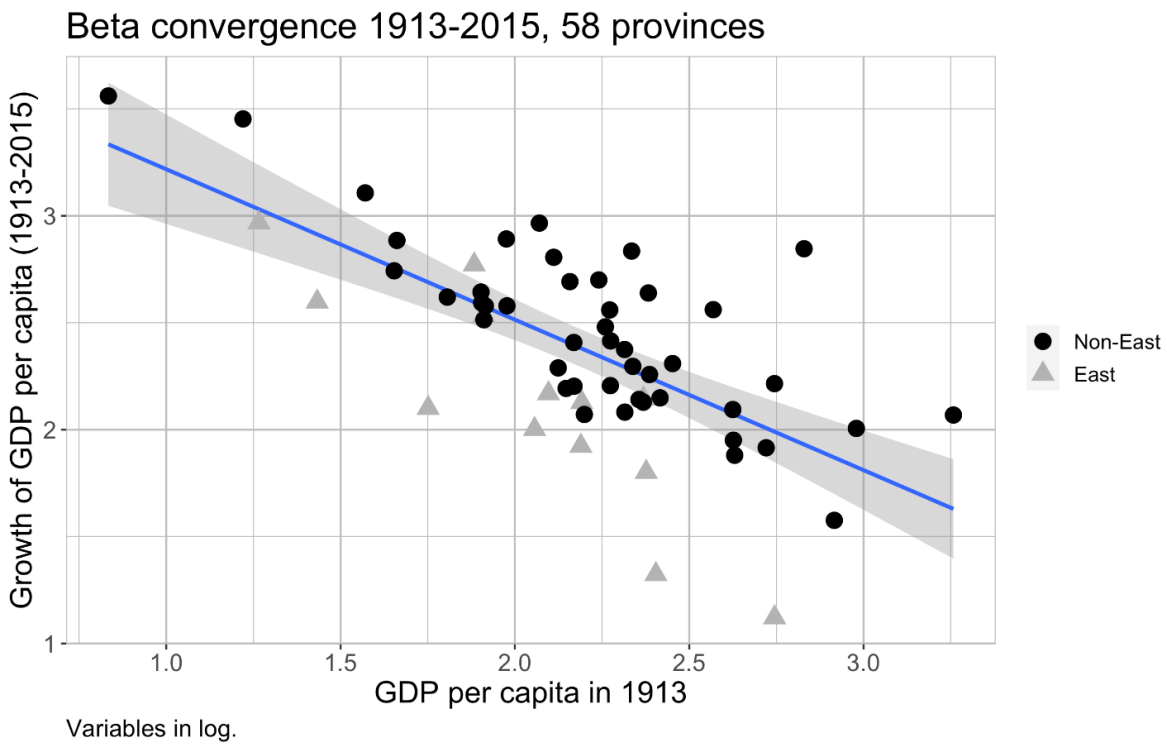
	1913	1927	1939	1950	1964	1970	1980	1990	2000	2010	2015
İstanbul	**249.8**	**293.1**	**329.0**	**307.6**	**251.2**	**222.5**	**184.7**	**161.7**	**133.0**	**167.0**	**168.5**
Marmara incl Ist	149.5	160.1	150.4	151.1	150.9	153.5	153.6	149.6	131.8	140.6	142.0
Aegean	133.5	124.2	112.9	120.6	103.4	107.0	109.6	120.6	125.3	97.4	97.0
All West	**143.0**	**145.2**	**135.7**	**138.7**	**132.0**	**135.5**	**137.6**	**139.7**	**129.8**	**128.0**	**129.4**
Central Anatolia	98.7	67.3	93.7	99.9	110.7	110.5	105.0	94.4	99.0	108.2	104.2
Mediterranean	113.6	130.3	116.4	97.7	108.6	100.4	97.3	95.7	94.3	84.4	79.9
Black Sea	58.4	69.8	62.9	67.9	63.5	70.4	66.7	63.6	78.1	70.8	72.2
All Other	**81.6**	**81.4**	**84.1**	**85.2**	**90.8**	**92.2**	**89.0**	**84.7**	**91.6**	**90.4**	**87.8**
North-Central East	54.5	41.1	66.8	56.6	54.9	41.7	41.2	43.9	42.9	55.6	55.1
South East	89.4	71.3	71.7	74.7	76.8	72.2	70.0	61.3	48.5	46.1	47.8
All East	**65.9**	**52.8**	**68.6**	**62.9**	**62.7**	**52.9**	**52.3**	**51.6**	**45.9**	**50.2**	**50.9**
West / East (ratio)	2.2	2.7	2.0	2.2	2.1	2.6	2.6	2.7	2.8	2.5	2.5

Figure 1 Regional Inequalities in GDP Per Capita in Turkey, 1910-2015; Country Average = 100



In the rest of this section we will use three basic measures, beta and sigma convergence and the Theil index to trace and further analyze the evolution of regional disparities in GDP per capita. Our first measure is beta convergence which shows whether the provinces with lower GDP per capita in the initial period tended to catch up with those with higher GDP per capita income by experiencing higher rates of growth (Cowell 2011; Shorrocks and Wan 2005; Chanda and Kabiraj 2020). Figure 2 shows that there was beta convergence for the period for the country as a whole between 1913 and 2015. Provinces with lower GDP per capita in the initial period experienced higher average growth rates than the provinces with lower GDP per capita in the initial period.

Figure 2



While Figure 2 presents a simple comparison of growth rates of individual provinces between the first and last benchmark years, it does not necessarily mean the convergence applies to each sub-period. To calculate the beta convergence coefficients for each sub-period, we obtain OLS estimates from equation (1):

$$\left(\frac{y_{i,t}}{y_{i,t-1}}\right)^{\frac{1}{k}} - 1 = \alpha + \beta \log\left(y_{i,t-1}\right) + \sum_i \gamma_i \, NUTS1_i + \epsilon_{it} \quad (1)$$

where, the left hand side is the annualized compound growth rate in each period, *k* is the length of observation interval, *i* the province, β the convergence coefficient of main interest, *y* real income per capita, and NUTS1 the dummy variables for each NUTS 1 region. The additional dummies produce the conditional convergence estimates, allowing each NUTS 1 region to behave differently, in order to determine if the initially poorer provinces still perform better in the subsequent period.

Figure 3

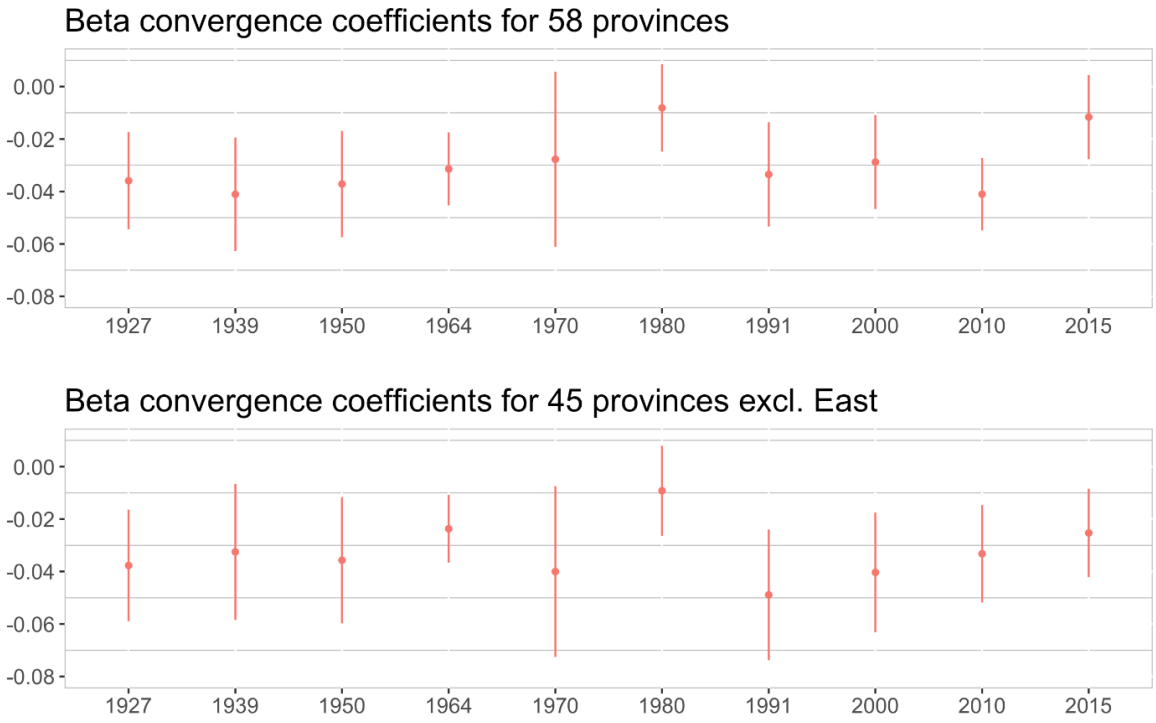
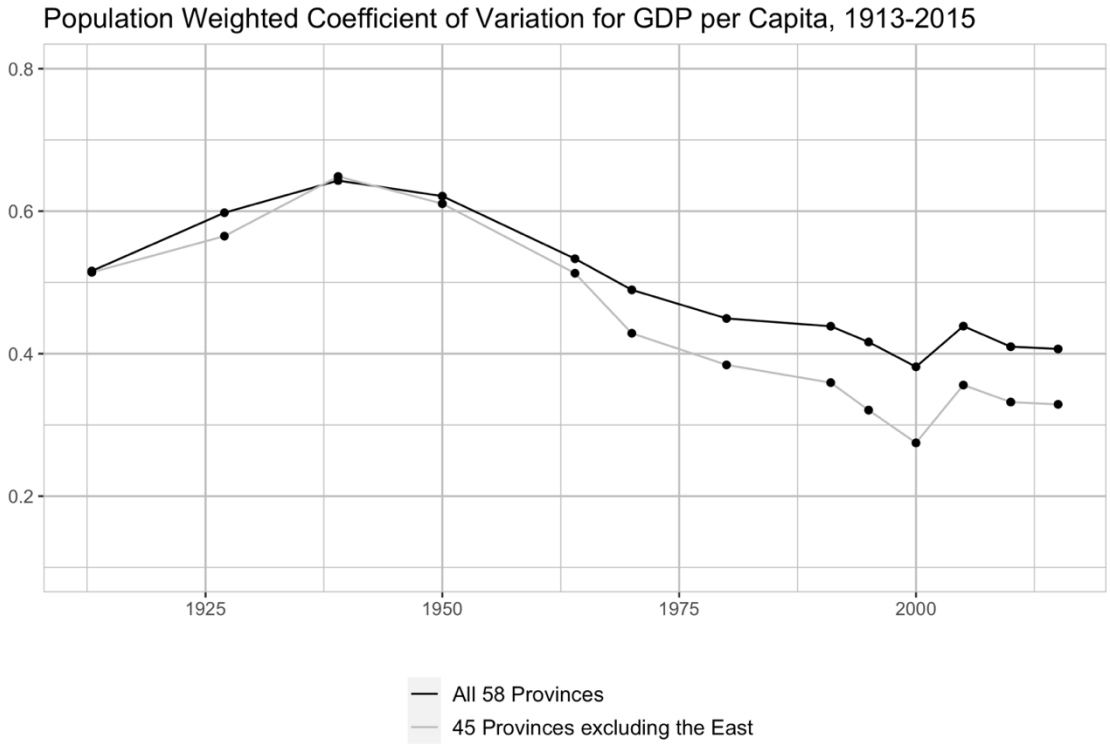


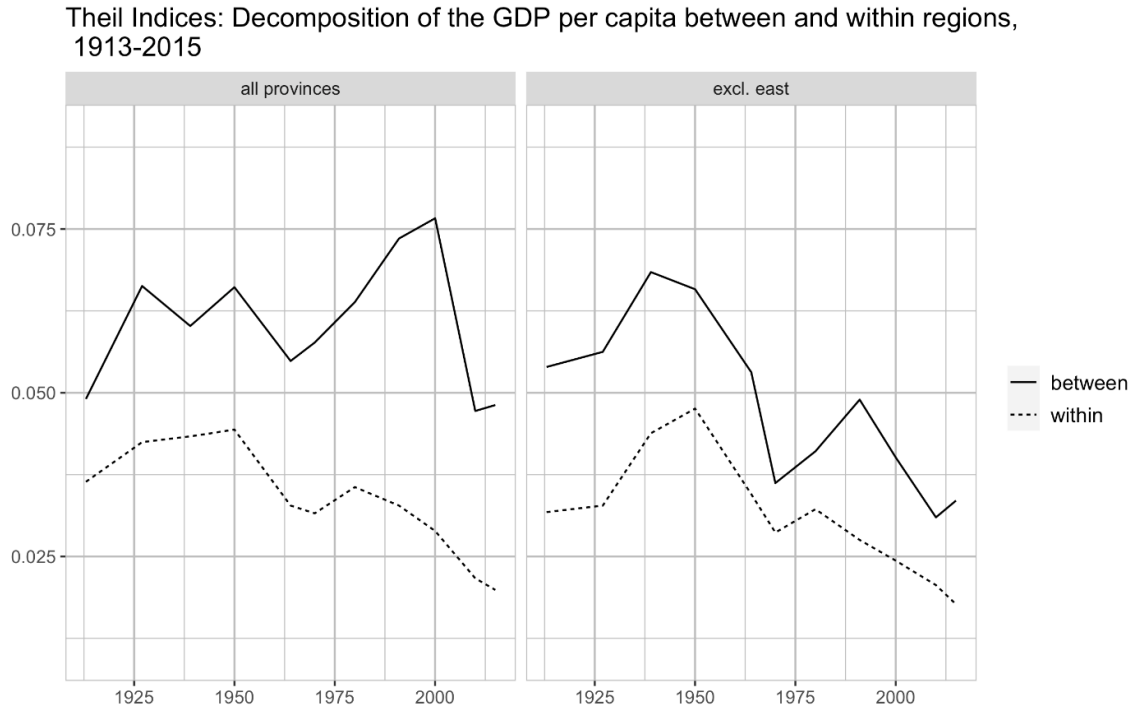
Figure 3 traces the evolution of the rates of beta convergence in per capita incomes between each consecutive pair of benchmark years since 1913 for all provinces and also for those outside the East. Negative values indicate the better performance of the initially poorer regions. We find that convergence coefficient for all provinces is negative and significant smaller at 95 percent level in most periods, notably except 1964-1980 and after 2015. We also observe U-shaped convergence, as the absolute values of the estimated rates declined until 1964 and started to increase again after 1980. When we leave out the East provinces, there is no much difference until 1964. Yet, we observe significant convergence between 1964-1970 and convergence coefficients rise slightly after 1980. The period with fastest convergence is 1980-1991 for the non-East provinces, and it is 2000-2010 for all provinces. In both cases, 1913-1950 saw more rapid beta convergence.

Figure 4



Our second measure, sigma convergence examines the evolution of cross sectional dispersion in GDP per capita between provinces. Figure 4 summarizes the evolution of the population-weighted coefficient of variation for the GDP per capita both for the 58 provinces and also for the 45 provinces excluding the 13 provinces in the East. Dispersion of GDP per capita in the 58 provinces reached its peak in the first half of the twentieth century and declined during the second half of the century. One important reason was the decline in GDP per capita in Istanbul in relation to the country average because of large migration flows during the decades after World War II. Figure 4 also shows that sigma convergence during the second half of the twentieth century was stronger between the 45 provinces excluding those in the East. In other words, because Istanbul converged towards the country average and the East lagged behind, the dispersion between the provinces in the East and the rest of the country began to account for a larger share of the overall dispersion in GDP per capita.

Figure 5



Our third measure, the Theil Index provides additional insights for beta and sigma convergence by decomposing total variation in GDP per capita into variation between regions and within regions. Figure 5 presents two sets of curves for the period 1913 to 2015. One set shows between regions variation and within region variation series for all twelve of the country's NUTS 1 regions and the other set shows between and within variation for the nine NUTS 1 regions excluding the three that make up the East. In both the twelve region series and the nine region series, variation between the regions was greater than the variation within the regions. Figure 5 also shows that the two sets of curves for the twelve and nine NUTS 1 regions was similar during the first half of the twentieth century. However, as the three NUTS1 regions making up the East lagged further during the second half of the century, the two pairs of curves began to diverge. Variation between the nine NUTS1 regions excluding the East declined significantly while variation between the twelve NUTS1 regions remained high after 1950. In other words, variation between the three NUTS1 regions of the East and the nine NUTS1 regions of the rest of the country emerged as the largest component of total variation between the 58 provinces during the second half of the twentieth century.

In view of the findings suggesting that the East did not participate in the trend for beta and sigma convergence, we decided to also test for convergence clubs in Turkey. It has been suggested that if economies or regions start with different initial conditions, they might converge to different steady state income levels, forming separate convergence clubs (Azariadis and Drazen 1990; Galor 1996). Following Phillips and Sul (2007), we used the log t test to try to identify the convergence clubs in Turkey on the basis of our GDP per capita estimates at the level of provinces for the benchmark years since 1913.[6] Our findings summarized in Table 3 suggest that Turkey has two distinct long run convergence clubs. Turkey's nine NUTS 1 regions making up our West and our Other Regions belong to the first club. Our results suggest the second convergence club consists of the three NUTS 1 regions that we label as East. Our results show that the Other Regions have converged to the West but the East did not. Our convergence clubs tests are thus consistent with the evidence we presented in this section on beta and sigma convergence and the Theil Index.

Table 3 Long Run Convergence Clubs in Turkey, 1913-2015

Clubs	Beta	t_stat	NUTS 1 Regions
Club 1	-0.738	-1.179	TR1-TR9
Club 2	0.019	0.015	TRA, TRB, TRC

Figures 1 through 5 and our convergence club tests thus present a consistent picture regarding the evolution of regional inequalities during the last century. They show that an inverse U shaped pattern for the regional disparities in Turkey since 1913. In the years before World War I, well before industrialization gained momentum, there already existed large differences in the GDP per capita of different regions. The peak in spatial inequalities for the country as a whole was reached sometime around mid-century. While the disparities in GDP per capita for the country as a whole

[6] The log t test is based on the decomposition of a variable of interest into a common growth factor and an idiosyncratic part that varies over time across units. Hence it is possible to measure whether a unit departs from the common growth path in a variety of macroeconomic and microeconomic settings. Recently, Bartkowska and Riedl (2012) applied this approach and identified six distinct convergence clubs in Europe. Following the same methodology, we first ranked our 58 provinces on the basis of highest income per capita in 2015. In the second step, starting with the two highest income provinces, we ran log t tests by adding the provinces one at a time until the one-sided t statistics fell outside the 5 percent significance level (<-1.65) and the null hypothesis of convergence was rejected. This procedure was then repeated for the remaining provinces.

began to decline after the end of World War II, the East began to lag further behind from the 1960s until the end of the twentieth century. The differences between the East and the rest of the country declined somewhat since the beginning of the present century but these differences are still very large today.

We also have information about the regional disparities and their evolution during the decades before World War I. We do not have agricultural or industrial production statistics at the province level for the period before 1913. However, we can make use of agricultural tax revenue data of the Ottoman central government to learn more about the trends in regional income inequality. Table 4 presents per capita agricultural tithe revenues of the Ottoman government for the decades before World War I for our three groups of regions. We should emphasize that per capita agricultural tax revenues of the government do not only reflect underlying productivity. They also reflect the differences in the state capacity to collect taxes in different regions. For example, we should expect higher tax collection capacity for the central government in the West which was close to the capital as compared to the East. Nonetheless, the divergence in the tax collection series between the West and the East as presented in Table 4 is striking. The agricultural tax revenues of the government were significantly higher in the more commercialized and export oriented West in comparison to the less commercialized provinces in the East and the Other regions and these differences tended to increase during the decades before World War I.

While Industrial Censuses are not available for this period, there is a good deal of other evidence that shows that a small number of new factories in food processing, construction materials and textiles were being established in the Istanbul and İzmir urban regions in the West during these decades. For these reasons, we believe that the period 1880 to 1910 was a period of rising East-West differentials in per capita income in both agriculture and the urban economy (Panza 2014).[7]

[7] Our estimates of higher than national average levels for agricultural value added per capita, industrial value added per capita and total income per capita for the West and lower than national average levels for all three for the East are quite similar to the estimates by Eldem on the basis of Ottoman tax revenue data for the years before World War I. The latter study remains the most detailed statistical survey of the Ottoman economy in the years before World War I (Eldem 1970, 69–87 and 270–309).

Table 4 Agricultural Tithe Revenues of the Government per Rural Population, 1882-1902 (5-year averages in current Ottoman Liras; West, 1898-1902 = 100)

	1882-86	1898-1902
West	88.2	100.0
East	61.9	63.6
Other regions	39.3	45.2
East as % of West	76.6	63.6
Other regions as % of West	48.7	45.2

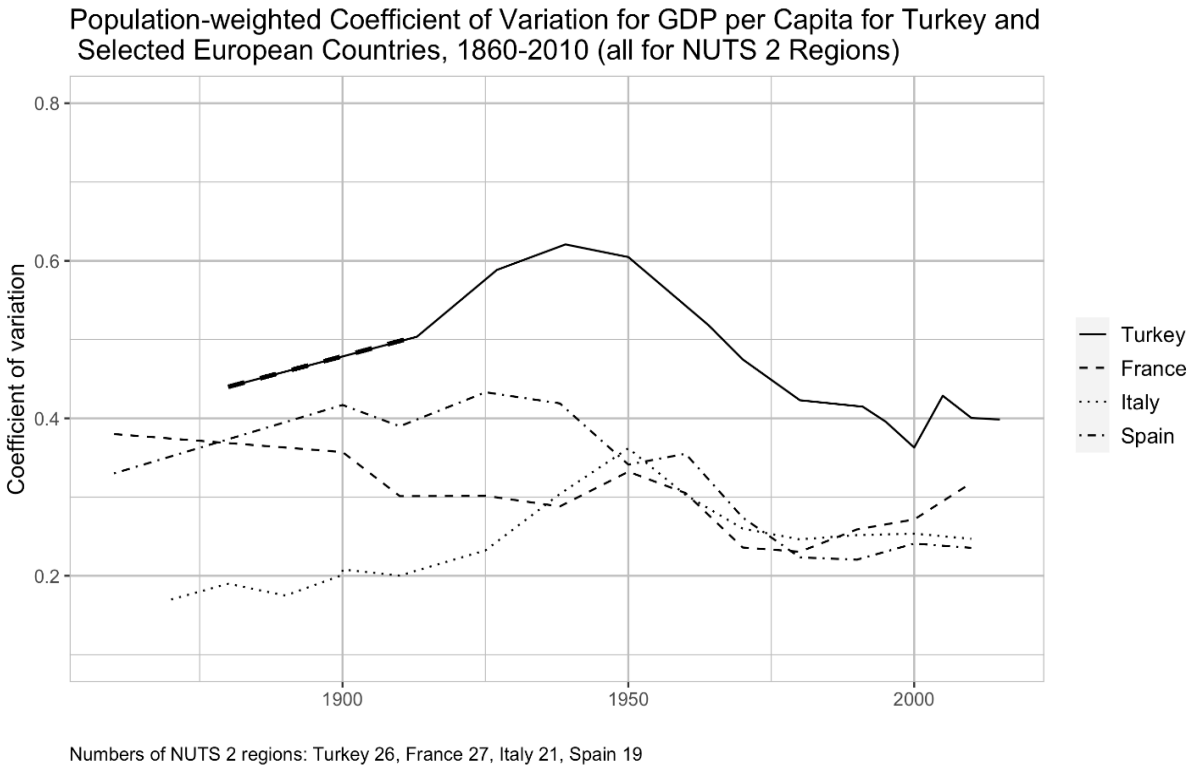
Sources: Quataert (2008, 279–89) for tithe revenues; Karpat (1985) for total population and Behar (1996) and Issawi (1980) for urban population. For definitions of the three region groupings, see the previous section and Map 1.

A Comparison with Three European Countries

Recent studies make it possible to compare the evolution of regional disparities in Turkey since the nineteenth century with those of more developed countries of similar size and population in Western Europe (Rosés and Wolf 2018). Figure 6 summarizes the evolution of population-weighted coefficient of variation for GDP per capita in the NUTS 2 regions in Turkey and in three European countries, Italy, France and Spain since the second half of the nineteenth century. The curves for all four countries have a similar inverse U shape, indicating that regional disparities between the NUTS 2 regions increased with the beginning of economic growth in the nineteenth century and declined in the twentieth century. However, there are also some important differences between the curve for Turkey and those of the other three European countries. First, because economic growth was slower in the earlier period and because industrialization gained momentum later, the peak in regional disparities occurred later in Turkey than in France and Spain and at about the same time as in Italy, around middle of the twentieth century. Secondly and perhaps more importantly, Figure 6 also suggests that regional disparities in GDP per capita at the level of NUTS 2 regions have been higher in Turkey compared to those in the three European countries since the nineteenth century. Part of the difference between Turkey and the other three countries is due to the fact that Turkey's three NUTS 2 regions in the East lagged well behind the rest until recently. Our analysis also suggests that the Istanbul region accounted for a very large share of the total

variation in GDP per capita in Turkey in the period until 1980. In the three other countries included in Figure 6, only the variation in France due to Paris is comparable to that due to Istanbul (Rosés and Wolf 2018).

Figure 6



5. Leading Causes

In this section we examine the leading causes for the pattern of regional inequalities in GDP per capita in Turkey since 1880 including the lagging of the East. We will discuss them under separate headings, geography, industrialization and agglomeration economies, structural change, ethnic conflict and demographic movements, human capital and government policy. We will link each of these to the empirical evidence we have presented in the previous section. In the next section, we will present summary results of preliminary regression analysis which attempts to identify the relative predictive power of these leading causes. In view of the well-known problems with endogeneity, we do not claim to establish causalities in what follows.

Geography

Geography including climate, soil and the crop pattern as well as the proximity to western Europe and history played important roles in shaping the regional patterns of agricultural commercialization as the Ottoman economy opened to international integration after the Industrial Revolution. As a result, significant regional differences had emerged in the areas within present day Turkey by the last quarter of the nineteenth century well before industrialization gained momentum.

Turkey is surrounded by seas on three sides and has the Mediterranean climate in the West and the South, a rain-fed plateau at the center and generally higher elevations and more mountains in the East. There are some minerals but the country is not particularly rich in mineral resources or oil. Because of the significant variations in soil and climate conditions, the distribution agricultural crops always varied significantly from one region to the other (Tümertekin 1984). Istanbul, the capital city of two empires for more than a millennium, empire had a unique place within this geography. Located at the intersection of both North-South and West–East trade routes, it remained at the center of trade and migration flows between the European and Asian provinces of the empire. Before and during the nineteenth century, it accounted for close to one-third of all urban population within the present day borders of Turkey. Wages and per capita incomes in the capital city were distinctly higher than the rest of the country (Özmucur and Pamuk 2002).

Due to high transportation costs, long distance trade remained limited and agriculture and manufacturing activity was more evenly distributed across different regions of Turkey before the nineteenth century. While coastal regions in Western Turkey were more oriented towards trade with different regions of Europe, Eastern Turkey was better connected to the Middle East and even South Asia. As trade with Western Europe increased rapidly after the Industrial Revolution, proximity to Western Europe emerged as an important source regional differentiation. İzmir on the Aegean coast became by far the largest port for the export of agricultural crops during the nineteenth century. Growing commercialization and export orientation of agriculture was also facilitated by the construction of railroads and other investments in trade, banking and infrastructure by western European companies around Istanbul, Izmir and other port cities. Because of their distance from the leading ports of export and the absence of railroads, the eastern

half of the country remained more connected to Syria, Iraq and the rest of the Middle East and per capita exports remained distinctly lower until World War I (Pamuk 2018, 112–33).

The division of the Ottoman Empire into nation states and the drawing of new borders after World War I had important economic consequences for some regions. Patterns of trade and social networks that had developed across the large empire over centuries were disrupted by new borders. As a result, agricultural producers and small and medium sized manufacturing establishments in the East lost their access to markets in Syria and elsewhere in the Middle East. Similar effects took place in European Turkey due to the loss of markets and networks in Southeastern Europe after the drawing of new borders. The regional differences in climate and crop pattern and proximity to Europe continued to matter during the twentieth century but their role in explaining regional differences in per capita incomes diminished after the beginning of industrialization.

Structural Change

An important feature of modern economic growth since the nineteenth century has been the shift of the labor force from lower productivity agricultural sector to the higher productivity urban economy. For this reason, it has been argued that a leading cause of the regional differences in GDP per capita and their evolution over time in the developed countries has been the differences in the extent to which the labor force leaves agriculture and joins industry or services in the urban areas (Caselli and Coleman II 2001). In developing countries, too, there are large differences between average incomes in the agricultural sector and those in the urban economy. We should expect spatial differences in GDP per capita to be strongly correlated with spatial differences in the extent of structural change or the shift from agriculture to the urban economy.

Employment statistics for the country as a whole indicate that Turkey's economy experienced slow structural change until after World War II and more rapid structural change since. It is estimated that the agricultural sector accounted for close to 70-75 percent of total employment until 1950. This share declined to 50 percent in 1980 and to less than 20 percent in 2015. Share of industry in total employment increased steadily after World War II but remained below 20 percent. The share of services in total employment increased from less than 20 percent in 1950 to more than 60 percent in 2015. It is also estimated that the shift of the labor force from

the lower productivity agriculture to the urban economy accounted for at least one third of the total increase in GDP per capita in Turkey during the decades after World War II (Pamuk 2018, 11–15 and 222–28).

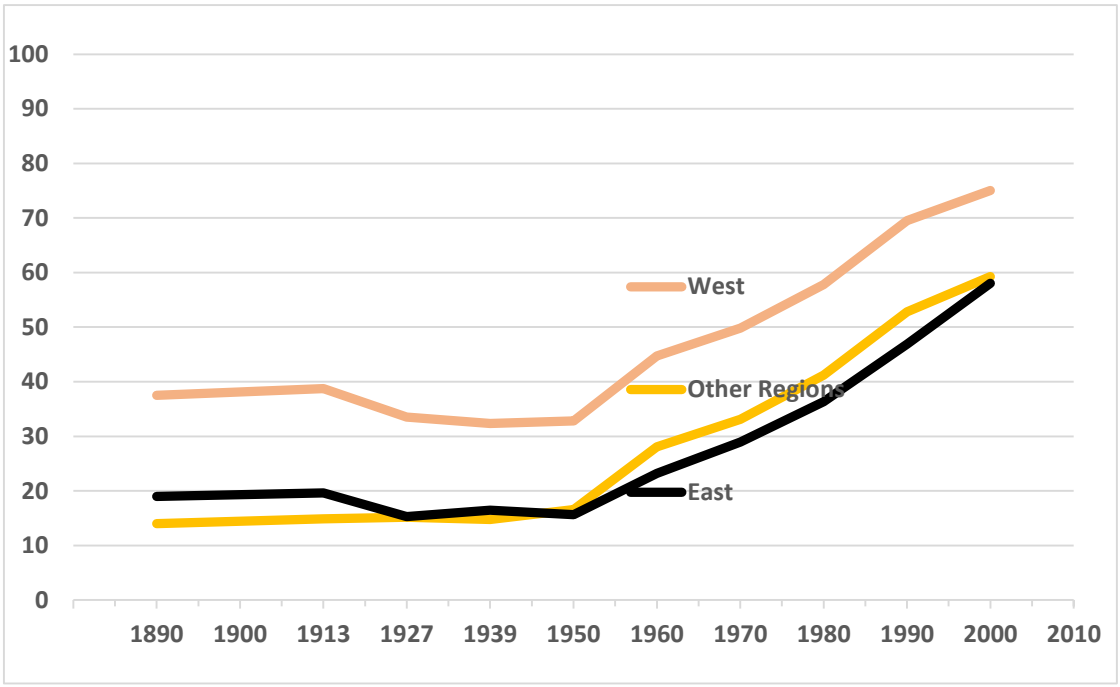
We do not have precise sectoral employment statistics at the level of provinces going back to the early part of the twentieth century for Turkey. However, it is still possible to follow the spatial distribution of structural change from the evidence on urbanization rates at the province level. Paralleling the evidence from the sectoral employment statistics for the country as a whole, Figure 7 shows that urbanization rates for all regions began to rise after 1950. However, there were significant differences in the urbanization rates of the different regions since the nineteenth century and these differences have persisted. Figure 7 also suggests that the evolution of the regional differences in the urbanization rate has been correlated with the regional differences in GDP per capita that we have established earlier. The urbanization rates in the West have been higher than the country averages since the nineteenth century. While the urbanization rate of the Other Regions began to converge towards the country average, the differences between the East and the rest of the country remained continued since late nineteenth century.[8] Since there existed large differences in labor productivity between industry and services in Turkey, the regional variation in the degree of structural change cannot by itself account for all of the spatial variation in GDP per capita. To learn more about the causes of the spatial variation in GDP per capita, we will turn next to the spatial differences in the location of industry and their evolution over time.

Industrialization

The new economic geography models and the studies on the evolution of regional inequalities for the early industrializers both point to decline in transport costs, market access, agglomeration economies and the spatially uneven process of industrialization as a leading driver of regional inequalities. Our GDP per capita and industrial value added per capita series for the 58 provinces as well as our separate calculations for Turkey's NUTS 1 and NUTS 2 regions also identify the process of industrialization as a leading cause of the pattern we have presented in the previous section.

[8] Due to changes in the way statistics are collected, urbanization rates at the level of provinces are not available for the period after 2000.

Figure 7 Regional Urbanization Rates, 1890-2000
share of population in centers above 5 thousand (percent)



The best way to begin presenting evidence regarding the key role of the spatial distribution of industry played in the evolution of regional differences in per capita income is to compare the cross sectional distribution of the sectoral values added per capita, for agriculture, industry and services for the 58 provinces and their evolution over time. Figure 8 shows that the disparities across the 58 provinces in industrial value added per capita and to a lesser extent of services have been much higher than the disparities in agricultural value added per capita until late in the twentieth century. As industrialization gained momentum and the share of industrial value added in GDP increased, the weight of the disparities in industrial value added per capita as a proximate cause of the regional disparities in GDP per capita have increased.

Figure 8

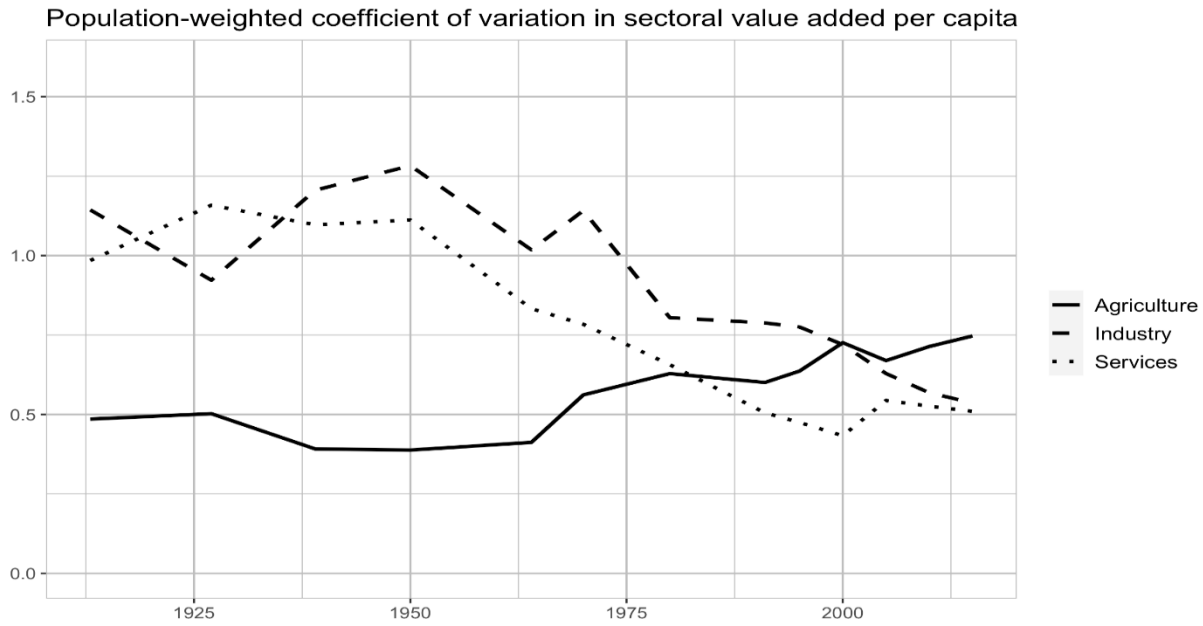


Table 5 Industrial Value Added Shares of Regions, 1913-2015, in percent

	1913	1950	1980	2000	2015
İstanbul	26.3	28.0	23.9	30.0	29.8
Marmara incl Ist	47.0	41.2	44.0	54.2	51.6
Aegean	20.9	19.5	16.2	16.3	13.4
All West	**67.9**	**60.7**	**60.2**	**70.5**	**64.9**
Black Sea	6.6	7.4	10.0	8.5	8.3
Central Anatolia	11.5	15.0	12.1	6.4	5.0
Mediterranean	5.1	11.1	12.6	9.3	14.0
All Other	**23.2**	**33.4**	**34.7**	**24.2**	**27.4**
North-Central East	4.4	4.0	3.2	2.2	2.9
South East	4.5	1.9	1.9	3.0	4.8
All East	**9.0**	**5.9**	**5.1**	**5.3**	**7.7**
Total	100.0	100.0	100.0	100.0	100.0

Table 5 summarizes the long term changes in the shares in industrial value added of the different regions. Table 6 traces the evolution over time of industrial value added per capita for the different regions. For each benchmark year, the regional values are scaled in relation to the

country average. Tables 5 and 6 show large disparities existed before World War I in the spatial distribution of the limited level of industrial activity in Turkey. Istanbul, Marmara and the West already had large shares in 1913 and their share remained high until 2015. While Other Regions slowly improved their shares in total industrial value added and per capita value added in relation to the country average, the East lagged even further behind until the end of the twentieth century.

The regional disparities in the spatial distribution of industrial activity in Turkey in 1913, as summarized in Tables 5 and 6, were, in large part, due to the developments after the Industrial Revolution. The free trade treaties signed with the European countries early in the nineteenth century led to the decline of manufacturing activities, especially of textiles across the country. The first wave of factories in Turkey was launched by the Ottoman state around the capital city in the 1830s and 1840s essentially to meet the requirements of the army and the state (Clark 1974). The decades before World War I saw the establishment of a small number of factories using the steam engine and new industrial technology, mostly in the largest urban centers Istanbul and Izmir. However, the steam engine did not spread to manufacturing activity in the rest of Turkey before World War I (Pamuk and Williamson 2011; Panza 2014; Quataert 2002, 80–104).

The new nation state gained the right to establish its own tariffs beginning in 1929. In response to the Great Depression and the collapse of agricultural prices, protectionism and state led industrialization for the domestic market were embraced as the new strategy for economic growth. The integration of the domestic market was a key goal of the new strategy and the construction of new railroads that would connect the East to the Center and the West was seen as an important step towards that goal. Rate of growth of industrial value added averaged above 8 percent per year during the 1930s (Boratav 1981; Karakoç, Pamuk, and Panza 2017). Market access remained important and the uneven spatial distribution of manufacturing activity persisted and even increased despite government policies to the contrary during this state-led industrialization era (Tables 5 and 6).

The large domestic market remained strongly protected from international competition after World War II and until 1980. With the building of the highway and road network, transport costs inside the country continued to decline. While the public sector continued to play an important role in industrialization, the private sector led by large conglomerates began to take control of the

urban economy. Urbanization and inter-regional migration gained momentum from the lower income rural areas and regions in the East and the North to higher income urban areas in the West and the South gained momentum after World War II (Table 1). Even though industrial value added per capita in Istanbul declined, market access and agglomeration economies remained important and industrialization continued to be concentrated in the Northwestern region (Tables 5 and 6).

Table 6 Industrial Value Added Per Capita of Regions, 1913-2015; County Average=100

	1913	1927	1939	1950	1964	1970	1980	1990	2000	2010	2015
İstanbul	**442.6**	**394.0**	**517.8**	**502.1**	**382.5**	**409.5**	**225.1**	**179.0**	**200.5**	**174.2**	**170.1**
Marmara incl Ist	224.2	197.3	203.5	196.2	192.4	221.8	188.4	191.9	193.1	168.0	165.0
Aegean	145.9	123.5	121.1	136.1	114.6	110.5	121.6	125.9	121.8	100.6	101.3
All West	**192.5**	**166.7**	**171.1**	**171.8**	**161.4**	**178.7**	**164.1**	**169.2**	**170.1**	**147.5**	**146.1**
Black Sea	54.0	65.9	50.4	72.8	62.4	67.1	74.6	54.7	52.2	47.3	50.1
Central Anatolia	36.3	58.4	66.8	69.3	90.8	71.6	75.5	73.9	60.6	101.0	95.3
Mediterranean	82.0	88.7	101.1	75.8	78.3	64.5	84.8	77.1	68.3	66.9	66.0
All Other	**53.6**	**68.1**	**66.2**	**72.2**	**76.2**	**68.1**	**77.6**	**68.5**	**60.4**	**74.8**	**73.3**
North-Central East	30.9	27.3	39.2	33.4	39.6	31.2	27.6	25.7	23.3	30.3	35.2
South East	65.7	71.5	48.8	29.8	50.2	29.7	27.1	26.8	34.0	45.4	48.4
All East	**42.3**	**44.4**	**42.7**	**32.1**	**43.4**	**30.6**	**27.5**	**26.2**	**28.5**	**38.3**	**42.4**
West/East (ratio)	4.6	3.8	4.0	5.4	3.7	5.8	6.0	6.5	6.0	3.8	3.4

In 1980, the economic policies and institutions of the inward-looking industrialization era began to be dismantled in favor of those associated with Washington Consensus principles, most importantly trade and financial liberalization and privatization. The customs union agreement signed with the European Union in 1994 supported the growth of exports of manufactures. Manufacturing activity expanded in the new era not only towards neighboring provinces in the Northwest but also to new centers in Central Anatolia, and to a lesser extent, to others across the country. As a result, coefficient of variation for industrial value added for the 58 provinces, and especially for those excluding the East declined rapidly (Figure 8). Nonetheless, the advantages of Istanbul and the Marmara region in terms of agglomeration economies, as emphasized by the new economic geography literature persisted (Tables 1 and 5).

While manufacturing industry gradually spread to a small number of new centers beyond the Marmara and Aegean regions during the second half of the twentieth century, the share of the East in manufacturing value added and in total industrial value added lagged well behind. During the state led industrialization era in the 1930s and in the so called-mixed economy era after World War II when the state enterprises continued to account for close to half of total manufacturing value added, industrial value added per capita in the East remained close to half of the national averages. However, rather than converging towards the national average over time, industrial value added per capita in the East declined to less than one third of the national average and to less than one sixth of the average for the west as a whole by the end of the century (Table 7). One important reason for this further decline of industrial activity in the East relative to the rest of the country was the beginning of military conflict between the Kurdish and the government forces in 1984 lasting until the de facto cease fire in 1999. The official series indicate that industrial value added per capita as well as GDP per capita in the region rebounded after the turn of the century (Tables 5 and 6, Tables 2 and 3 and Figure 1).

Ethnic Conflict and Demographic Shocks

Regional inequalities in Turkey have been accompanied by ethnic conflict and large demographic movements since the late Ottoman era. Problems of endogeneity make it difficult to establish causality at this stage of the research. Nonetheless we are able to offer an interpretation consistent with our empirical findings. Our sectoral value added and GDP per capita estimates at the province level and other evidence suggest that ethnic conflict and demographic shocks were an important cause but not the not only cause why East continued to lag behind. There were already differences between the East and the rest of the country in the decades before World War I arising from the differences in geography, degree of urbanization, proximity to urban markets and location of industry and these differences continued during the twentieth century. Moreover, ethnic conflicts and demographic movements did not lead to similar results in all regions of the country. Nonetheless, ethnic conflicts and demographic movements, both by themselves and in interaction with the other variables, contributed to the growing disparities between the East and the rest of the country until the end of the twentieth century.

Until the outbreak of the World War I, close to 40 percent of all the Armenians within present day borders of Turkey lived in the East, mostly in rural areas, and they made up approximately 16 percent of the population of the region (based on Karpat, 1985, pp. 122-98).[9] Tensions between Armenians and the Muslims often involving disputes over land ownership and taxation began to rise before World War I. These conflicts in the East most likely contributed to the growing regional differences in the decades before World War I. Large numbers of Armenians were killed during World War I after the government forced them to march to the Syrian desert. In addition, many died of disease during this walk and others fled. Large numbers of Muslims living in the region also died as a result of the war and the hostilities with Armenians and many others died or fled during the Russian occupation of most of the region until 1917. We estimate that the population of the region declined by one-third from 1913 to 1927 and approximately half of the decline was due to the loss of Armenians.[10] Our estimates at the province level suggest that GDP per capita for the East declined from 66 percent of the country average in 1913 to 53 percent in 1927 but recovered to 63 percent until 1950 (Table 2 and Figure 1).

It has been argued that the loss of the Armenian population and the sharp changes in its human capital stock and occupational structure during World War I had long lasting impact on the subsequent course of development in the region not only during the interwar period but also after World War II. While its share in total population remained little changed around 18 percent until 2015, GDP per capita of the region in fact did decline further until the end of the twentieth century to 46 percent of the country average and recovered somewhat to 51 percent in 2015 (Tables 1 and 2 and Figure 1). Agricultural value added per rural population and industrial value added per population and per urban population all followed similar relative trajectories until the end of the twentieth century (Table 6). The powerful demographic shock during World War I thus appears to be a leading cause of the trajectory of the region until 1950. However, our estimates and other evidence suggest that other causes such as geography and industrialization and agglomeration economies as well as their interaction with the impact of the earlier demographic shock played important roles in the persistence of the gap between the East and the rest of the country after 1950.

[9] Our estimates take into account some undercount of the Armenian population in the Ottoman censuses.
[10] The population of the area we label as East declined from 21.1 percent of 16.5 million or 3.5 million in 1913 to 16.9 percent of 13.8 million or 2.3 million in 1927 (Table 1).

The armed conflict between the Kurds and the central government after 1984 also played an important role in the relative decline of the East. Kurds have been the largest ethnic group living in Turkey's eastern region since the 1920s. Already in the 1920s and 1930s, uprisings by the Kurds in the east adversely affected the relative trajectory of the region. Since the 1980s, Kurds in the region have been seeking greater autonomy, and at times independence, by military and political means (Kirisci, Kirişçi, and Winrow 1997; Aydin and Emrence 2015). Our estimates as well as the official series at the province level show that the military conflict between the Kurdish organization PKK and the central government during 1984 to 1999 led to sharp declines in all three sectors relative of the country average and East lagged further behind during this period (Tables 2 and 6 and Figure 1).

Another large demographic shock was the exchange of the more than 1 million Greeks in the country excluding those in Istanbul with about 400,000 Muslims in Greece after an agreement between the governments of the two countries during the early 1920s. The Greeks were located in the West and in Other regions and they made up about 14 percent of the total population in the regions other than the East before World War I. During the population exchange, the smaller number of Muslims arriving from Greece were settled in the place of the departing Greeks. Our sectoral and GDP per capita estimates at the province level show that the provinces where the Greeks lived before World War I had more commercialized agriculture, higher urbanization rates and were more industrialized than those in the East where a large fraction of the Armenians lived. They also had access to better transportation network, to ports and major urban markets in the West. As a result, the long-term impact of the population exchange on the provinces where the Greeks lived and left was very different than the impact of the massacres and departures of the Armenians in the East. Even though the regions where the Greeks lived until 1924 did not enjoy high growth rates in the short and medium term, compared to the East, they benefited more from commercialization of agriculture and industrialization as economic growth accelerated after World War II.

Education – Human Capital

Education attainment levels as measured by the literacy rate and average years of schooling for the adult population have been rising in Turkey since the late nineteenth century. However, the country averages have been lower than those of countries with similar GDP per capita levels. In addition, there is detailed evidence that large male-female, rural-urban and regional differences in education attainment levels have persisted. The regional differences in education attainment levels have been strongly correlated with the regional differences in GDP per capita since the late nineteenth century. A strong case can be made that low education levels in the East have contributed to the persistence of the differences in GDP per capita levels between the East and the rest of the country. However, it is not clear to what extent the regional gap in educational attainment levels has been a leading cause of the gap in GDP per capita levels and to what extent the leading causes discussed earlier in this section were also the drivers of the regional the gaps in education attainment levels.

Establishing new schools and a new educational system was an important part of the Ottoman reform and modernization agenda during the nineteenth century. However, due to severe fiscal constraints and varying degrees of demand for education on the part of the population, the spread of the modern system remained regionally uneven. Until World War I, most of the new schools concentrated in the urban areas and in the West. Literacy and schooling rates amongst girls lagged well behind those of boys. The Ottoman government also allowed non-Muslim religious communities and their churches to develop their own school systems. Christian missionaries and international Jewish organizations were also allowed to provide education across the empire. Ottoman education statistics show that during the last decades of the nineteenth century and on the eve of World War I, there were large regional disparities in educational attainment of the Muslim population (Alkan 2000). There were also large regional differences, male-female and urban-rural differences in the educational attainment levels of the non-Muslims but the average literacy rates of the non-Muslims were higher than those of the Muslims. The loss of the Armenians and the departure of most of the Greeks during and after World War I led to declines in the human capital stock and shortages in some occupations especially in the East.

The Turkish republic placed a good deal of emphasis on unified secular education and required that all citizens participate in the same education system offered and regulated by the central government. Progress was slow, however, especially in the provinces and in rural areas due to fiscal and other constraints. The overall literacy rate stood at 33 percent in 1950, it reached 68 percent in 1980 and rose to 94 percent in 2010. Progress was even slower amongst women. In 1950, the literacy rate among women above the age of 15 was only 19 percent, in 1980 it stood at 55 percent and it rose to 89 percent by 2010. Average years of schooling for the adult population was well below 1 year in 1913 and stood only at 1.5 years in 1950. Along with urbanization and economic growth, they increased to 4.2 years in 1980 and 7 years in 2010 (Van Leeuwen and Li 2014, 89–96).

Gender differences in education attainment levels have been declining in recent decades, paralleling trends in most developing countries. However, regional differences in education levels and in the quality of education persisted. In the Kurdish areas in the East, literacy and schooling rates remained the lowest in the country. The gender differences have also been higher in the East. The migration of the younger and generally more educated people from the rural to the urban areas and from lower income to higher income regions also kept education levels lower in the East. In contrast, the more educated segments of the population tended to concentrate in the urban areas, especially in the largest metropolitan areas (Tansel and Güngör 1997).

While the spatial correlation between GDP per capita levels and education attainment levels have remained high in Turkey since the late nineteenth century, it is not clear to what extent low education levels has been an important long-term cause for why the East has lagged behind while other regions tended converge towards country averages.

Government Policy

Government regional policies emerged in Turkey for the first time during the 1930s and became an explicit part of the policy framework in the 1960s. Priority given to regional policies have fluctuated since, however. Those who studied the regional policies in Turkey have often pointed out they have not been very effective. Our regional estimates for sectoral value added and GDP per capita as well as the official series since 1987 pointing to the persistence of the large gap

between the East and the rest of the country for the past century are consistent with this assessment (Doğruel 2006; Filiztekin 2008).

It is difficult to talk about regional development policies in the Ottoman era. However, the new nation state of Turkey did not wait long to show its regional priorities. The decision in the 1920s to move the capital from Istanbul to Ankara was one of the most definitive policy choices with lasting effect. The new capital city was connected to the rest of the country via railways and received a large share of public resources. Ankara soon emerged as a large center, next to the old metropolitan centers Istanbul, Izmir and Adana. The steady rise, in our estimates, in the share of Ankara in total industrial value added until 1950 is quite indicative. Secondly, the government made it a priority in the 1930s to locate the state industrial enterprises in different parts of country, especially along the railway lines. This decision should be expected to lead to some dispersion in manufacturing. Thirdly, there was some attempt to direct economic activity to the Kurdish East, at least for political reasons. However, it is hard to observe the impact of these policies on our overall measures of the inequality for this period. What we clearly observe is that while the dispersion of per capita GDP increased between 1913-1950, there was also beta convergence at work. It should be added that, apart from 1927, the eastern provinces did not clearly diverge from other provinces as a whole until the 1960s.

The regional policies became a visible item of the development agenda in the early 1960s after the establishment of the State Planning Organization (Tekeli 2008). The first and second five-year plans of the decade defined regional cohesion policies and initiated several regional development projects (Göymen 2005). Yet, these policies became increasingly ineffective futile by the third five-year plan in the early 1970s. Some regional policy framework continued to exist in different forms (subsidies and tax exemptions as part of the program “Priority Regions in Development" in the 1980s, and the bottom-up approach of "development agencies" after 2000s), but they never had the fervor of the first two five-year plans. Our estimates indicate that 1960s was a period of rapid growth and acceleration of the regional concentration of incomes. We do not find beta convergence or any decline in the level of dispersion of GDP per capita. In fact, the 1960s appear to be the beginning of the relative decline of the Eastern provinces, which continued until the end century, according to our estimates.

The most important public project for the East during the last century was the large Southeast Anatolia Project (GAP) originally planned in the 1960's. It envisaged the building of a number of interrelated dams and hydroelectric plants on the Euphrates river to supply energy to the rest of the country. For a long time, the project was designed and implemented without sufficient understanding or concern for the needs of the local population. In response to the rise of Kurdish nationalism in the region, governments in Ankara began to redefine the project as an integrated regional development program seeking to improve the social and economic fabric of a poor region. The project then included large investments in a wide range of development-related sectors, transportation, urban and rural infrastructure as well as agriculture and energy. However, the absence of a shared vision between the planners and the intended beneficiaries, the local communities, has seriously limited its benefits (Mutlu 1996; Çarkoğlu and Eder 2005).

6. **What Predicts the Trends in Regional Inequalities?**

In this section, we discuss the predictive power of our leading causes in explaining trends in regional inequality for the period 1913-2010. In view of our earlier discussion of the leading causes, our main focus here will be on identifying the relative importance of structural change and urbanization, industrialization, ethnic conflict and demographic changes, and education. Before we proceed, it is crucial to highlight that our aim is not to prove the causal impact of any of these factors, but rather explore which factors were more important in reducing or increasing differences in GDP per capita across regions of Turkey in different periods.

Following our earlier discussion, we hypothesize that demographic shocks affecting occupational structures and human capital levels were more prominent factors in explaining East-West gaps during the first half of the twentieth century while industrialization and agglomeration, structural change and urbanization are likely to be more dominant after World War II. Taking into account increasing concerns over spatial correlations in historical persistence/deep origins literature (Kelly 2009), we employ a fixed effects model that features a spatially lagged dependent variable, independent variables and a spatially lagged error term. To explore the relevance of our hypotheses, we start by estimating the following equation aiming to capture demographic changes

$$y_{i,t} = \lambda W y_{i,t} + x_{i,t}\beta + W x_{i,t}\gamma + \eta_i + T_t + \rho W u_{i,t} + \varepsilon_{i,j,t} \quad (2)$$

where *i* denotes province, *t* denotes time, $y_{i,t}$ is the natural logarithm of total value added per capita, *W* is inverse distance spatial weighting matrix, *x* denoting the matrix of explanatory variables with $x_{i,t} = (A_t^{1915} * S_i^A,\ A_t^{1915} * S_i^A * D_i^{East},\ A_t^{1923} * S_i^G,\ A_t^{1980} * D_i^K,\ S_{i,t}^{Ind},\ U_{i,t},\ M_{i,t},\ E_{i,t,}^M,\ E_{i,t,}^F)$. S_i^A is Armenian population share in province *i*'s total population in 1906 census, S_i^G denotes Greek population share in province *i*'s total population in 1906 census, D_i^{East} is a dummy variable indicating whether a province is in the East, A_t^{1923} and A_t^{1915} are dummy variables that take on the value equal to 1 if year is greater than 1923 or 1915 respectively and zero otherwise[11]. A_t^{1980} is a dummy indicating the period after 1980, D_i^K is a dummy indicating whether the province is one of the provinces in which the Kurdish population share was historically above 50 percent[12], so that the interaction term captures the Kurdish armed conflict after 1980s, $S_{i,t}^{Ind}$ stands for the share of industrial value added in province *i*'s total value added at time *t*, $U_{i,t}$ is urbanization rate, $M_{i,t}$ is annualized internal migration rate, and $E_{i,t,}^M$ and $E_{i,t,}^F$ are male and female literacy rates. Finally, η_i is province fixed affects and T_t is year effects. It is important to note that since our province fixed effects capture all factors that are time-invariant, we do not include any geographical control variables.

We estimate equation (1) for the periods, 1913-1927, 1913-1950, 1950-2010 and for the entire period, 1913-2010. Since we include province fixed effects, our coefficients capture within variation. This model is essentially similar to a difference in differences (DID) model, however unlike a proper DID, the treatment variables, Armenian and Greek population shares in 1906 are continuous variables instead of treatment dummies. The distribution of Christian minorities is clearly not random, and furthermore, all variables are endogenous in this model. Hence it is of utmost importance to emphasize again that our aim is to evaluate how the relative weight of these factors play out in time in predicting regional disparities (taking into account also the spatial dependence) rather than establishing full-fledged causality. Our results are presented in columns 1-4 in Table 7.

[11] Since we have no data between years 1913 and 1927, these two dummies are equivalent in practise and capture the duration between those two benchmark years.
[12] These provinces are Siirt, Mardin, Ağrı, Diyarbakır, Muş, Van and Urfa.

Table 7 Changing Correlates of Differences in Regional GDP Per Capita, 1913-2010

	Spatial Fixed Effects	Spatial Fixed Effects	Spatial Fixed Effects	Spatial Fixed Effects
	1913-1927	1913-1950	1950-2010	1913-2010
	(1)	(2)	(3)	(4)
Urbanization rate	0.014***	0.016***	0.011***	0.010***
	(0.005)	(0.004)	(0.003)	(0.002)
Industrial share in province total VA	-0.011*	-0.000	0.006***	0.004**
	(0.006)	(0.003)	(0.002)	(0.002)
Internal migration rate (annualized)		0.004	-0.002	0.041**
		(0.032)	(0.025)	(0.021)
1906 Armenian pop. share*After1915	0.019**	0.014**		0.002
	(0.008)	(0.007)		(0.006)
1906 Armenian pop. share*After1915*East	-0.025**	-0.020***		-0.009
	(0.011)	(0.008)		(0.007)
1906 Greek pop. share*After1923	0.009	0.007		0.007*
	(0.007)	(0.005)		(0.004)
Kurdish provinces*After1980			-0.193**	-0.236**
			(0.097)	(0.102)
Male literacy rate	-0.030	-0.013	-0.015***	-0.008**
	(0.043)	(0.009)	(0.004)	(0.004)
Female literacy rate	0.015	0.012	0.006*	0.008**
	(0.052)	(0.012)	(0.003)	(0.003)
Observations	116	232	406	580
Number of provinces	58	58	58	58
Year Effects	Yes	Yes	Yes	Yes

Notes: Standard errors are in parentheses, *** p<0.01, ** p<0.05, * p<0.1. Spatial autoregressive models in columns (1) to (4) are estimated using the STATA routine *spxtregress* with fixed effects. A spectral inverse distance spatial weighting matrix is used for all spatially lagged variables and error terms.

Our estimations reveal results which are broadly consistent with our hypotheses. First, the urbanization rate in our estimations confirm the important role of structural change in understanding regional disparities in GDP per capita. The second important result our estimations suggest is that the impact of industrialization and agglomeration economies on regional inequalities was not strong before 1950 and began to be felt after that date. Column (1) suggests

that provinces with higher industrial value added share experienced lower per capita income growth between 1913-1927 and column (2) suggests that there is no statistically meaningful relationship between industry share and per capita growth between 1913-1950. On the other hand, the coefficient for industry value added share is highly significant during the period between 1950-2010, suggesting that a percentage point increase in industry value added is associated with 0.6 percent higher income per capita growth all else equal. To put these figures into perspective, consider the example of Kayseri, a Central Anatolian province that showed impressive export growth after 1980. The industry value added share in Kayseri went up from 20 percent in 1950 to 36.9 percent in 2010. Using our coefficient estimate of 0.6 percent, an increase of 16.9 percentage points in the industry share in Kayseri translates into about 10 percent higher total value added per capita income between 1950 and 2010.

With respect to demographic variables, our estimations suggest that, controlling for urbanization, the share of industrial value added in provinces' total value added and education, there is no statistically significant association between income growth and the presence of Greeks before 1923 for the periods between 1913-1927 and 1913-1950. On the other hand, the coefficient for Armenian population losses after 1915 is positive and significant while it is negative and significant for Armenian population losses in the East. One percentage point higher Armenian population share in 1906 is associated with 1.9 percent higher growth in value added per capita between 1913-1927 and 1.4 percent between 1913-1950. The positive coefficient can perhaps be explained by the fact that Armenians in Non-Eastern provinces were mostly located around either Istanbul or Central Anatolia, i.e. in the regions which suffered relatively less from the direct consequences (such as invasion) of the World War I and the Independence War in comparison to the Aegean provinces in the West and Eastern provinces.

In contrast, in the East, we find a negative correlation between per capita growth and Armenian presence before 1915. One percentage point higher Armenian share in population in 1906 is associated with 2.5 percent lower growth between 1913 and 1927 and 2 percent lower growth between 1913-1950. These estimations indicate a divergence between Eastern provinces with higher Armenian presence and the other regions. However, in the long run, we find no statistically meaningful relationship between Armenian population losses and per capita growth,

whereas provinces with Greek presence before 1923 seem to have grown faster on average until 2010 as we discussed in the previous section.

How should we interpret the negative coefficient for Armenian population losses in the East and the insignificant coefficient for Greek population losses (clustered mostly in the West, Central and Northeastern regions) until the mid-century? While these questions beg a separate research agenda, one potential explanation is the non-random distribution of incoming Muslim immigrants both from Greece after the population exchange and from Balkans and Caucuses after World War I. Late Ottoman state as well as the newly established Turkish Republic are known to have settled the immigrants to the relatively more fertile and productive areas in the West and to a lesser extent in Other regions, while the higher altitude, mountainous Eastern provinces were left unpopulated after Armenian losses (Karpat 1985). In other words, population density in the West and Other regions which were already more urbanized, quickly recovered after large demographic movements while the critical mass was not met in the East, at least until the 1950s. A contributing factor, intertwined with lower urbanization and industrialization was the Kurdish uprisings and military conflicts in the East during 1984 to 1999 and continuing tensions since which interrupted economic activity and reduced long term investment.[13] Hence the two contrasting economic and social environments; a better integrated and more populated post-war West and a geographically more distant and deserted East might have aggravated the existing disparities.

Finally, our estimations suggest that female literacy was more strongly associated with income per capita growth than male literacy in the second half of the century. As in the case of industry value added shares, neither male nor female literacy rates are statistically associated with income per capita growth before 1950 (columns (1) and (2)). However, for the period between 1950 and 2010, female literacy is positively and significantly associated with per capita growth whereas male literacy is negatively associated. This could be due to the fact male literacy rates increased more or less at the same rate across all provinces of Turkey whereas the female literacy growth was not uniform. In fact, the coefficient of variation for male literacy was 0.28 versus 0.53 for that for females. Our estimations suggest that female literacy was as important as the industrial value added share, with a coefficient of 0.6. Since the accumulation of human capital is highly

[13] Since provinces with Kurdish population and provinces with Armenian population greatly overlap in the East, it is nearly impossible to separate out the effects of the two.

endogenous, our coefficients could be reflecting the fact that in regions where there was higher growth and demand for skills, the pool of male labor force might have been saturated and returns to female education might have been stronger.

Overall, while rates of structural change and urbanization mattered for the entire century, our estimations point to different narratives for the two periods of 1913-2010. *i)* In the period until the 1950s, with economic growth rates low and industrial growth not yet strong enough to drive per capita differences, demographic shocks contributed to East-West divergence. *ii)* In the sub-period from 1950 to 2010 when economic growth rates were higher, industrial growth and education were strong predictors of economic growth. East again lagged behind due to both lower rates of structural change, industrialization and ethnic conflicts.

7. Conclusion

This study examined the evolution of regional income inequalities and their proximate causes within present day borders of Turkey since 1880. Making use of Ottoman and Turkish statistics, we constructed indices for value added per capita for agriculture, industry and services as well as GDP per capita for each of the 58 administrative units for about one dozen benchmark years. For the recent period since 1987, we made use of the official series for GDP per capita for each of the same 58 spatial units. As a result, we were able to document, for the first time, the evolution of the regional income inequalities since the late Ottoman era. As far as we know, this is a rare if not unique study that examines the spatial distribution of economic activity in a developing country from the nineteenth century to the present.

We found an inverse U shaped pattern for the regional disparities in Turkey since 1880. Regional disparities were rising since the decades before World War I and they reached their peak around the middle of the twentieth century. The overall trend from the 1910's to the present has been convergence for the country as a whole. While all other regions began to move towards country averages and the disparities in GDP per capita for the country as a whole began to decline after the end of World War II, the differences between the East and the rest of the country persisted and even increased during the second half of the twentieth century. The differences between the East and the rest of the country have declined somewhat since the beginning of the present century

but they are still very large. Our comparisons also suggest that the regional disparities in Turkey since the second half of the nineteenth century have been and are still larger than those in European countries of similar size such as Italy, France and Spain.

Problems of endogeneity make it difficult to establish causality at this stage of the research. Nonetheless, we are able to offer an interpretation consistent with our empirical findings. We find not a single cause but a combination of causes led by geography, industrialization and agglomeration economies, and ethnic conflict and demographic movements are behind this pattern for the country as a whole and for the fact that the East has continued to lag behind. We find that there were already differences between the East and the rest of the country in the decades before World War I and these differences continued during the twentieth century. Ethnic conflicts and demographic movements were an important cause but not the only cause why the East continued to lag behind. Multiple demographic shocks involving Armenians and Kurds, both by themselves and in interaction with the other variables such as geography, structural change and industrialization contributed to the persistence of the relative decline of the East during the twentieth century. Finally, a few words are in order for future research building on the findings of the present study. We feel this paper has not been able to examine in greater detail the dynamics of the spatial distribution of industry and the impact of industrialization and agglomeration economies on regional disparities in GDP per capita. We also feel the impact of ethnic conflicts and demographic movements and their interaction with other variables such as geography and industrialization and agglomeration economies need to be investigated further with more detailed data.

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Appendix

Estimation Methods and Data Sources for Value Added at the Province Level

Agriculture

The estimation of the agricultural value added at province level was methodologically straightforward, but rather time-consuming. A large amount of acreage and output data (at crop-year-province level) in the annual official publications available in pdf format have been digitized, cleaned and processed. For each year, about 60-70 products (both crops and animal products, varying by year) were observed for each of our 58 provinces.

To obtain the gross output, we multiply crop output (physical output in tons) with the local prices whenever possible, or otherwise with the average national prices. The output data consistently covered large majority of field crops (cereals, legumes, cash crops such as cotton, tobacco, sugar beet etc.). On the other hand, the fruits data were missing for 1928-1936.[14] We made the adjustment for those years by assuming that the cereal-fruit output ratio in 1939 at provincial level can be applied to earlier years. Since vegetables began to be reported only in 1970, we excluded all vegetables from our dataset to make our estimates comparable across years.

We did not directly use the crop output figures as reported in the official documents due to possible errors or misreporting, either in the original documents or because of errors that might go unnoticed during the digitization process. Instead, we *winsorize* the output figures based on the average yields. To be more precise, we first calculate the yields (reported physical output/acreage) and then replace the values above 95 percent and below 5 percentile with the 95 and 5 percentile figures for each product at each year, thus removing extreme values of yields. We then re-calculate output by multiplying the acreage with the updated yields. This is a typical statistical procedure when researchers are not sure of the quality of the raw data, especially in the presence of the outliers when using large amounts of data. In cases where the acreage data was missing, we simply took the reported output level.

The direct data on animal output (meat, skins, milk, animal hair, mohair, wool) are available after 1935. For earlier years, i.e. 1909-13 and 1928-1934, we extrapolate using the number of animals, subject to tax for the republican period and all animals for 1909. Unlike the other products, the animal hides are reported in number, rather than in tons, so we convert these figures into physical output by assuming 2.5 kg per dried skin for sheep and goats and 5 kg per others. We did not calculate the animal manure, as we are primarily interested in the gross crop plus livestock output and the animal manure goes into crop production. By the same logic, animal feed is also ignored in order to avoid double counting. We use the national averages of prices of animal products since regional prices are not available.

We have 119 different crops, yet, the dataset is not balanced, meaning that the number of observations by crop vary from one crop to another. That is partly due to the fact that not all crops were produced in all provinces. Second, it is possible that if one crop is produced in small amounts

[14] The fruit data for 1933-35 seems poor quality, so we do not use it. Even though fruits output in the 1950s-1960s were not reported entirely fully, we prefer to use it as it is, assuming that major crops were reported. A few minor issues: i) in the earlier years, the citrus fruit (oranges, lemons, etc.) output is presented as the number (in '000s), we use this rough estimate to convert into figures in tons by assuming each orange weighing 0.2 kg, and each lemon and clementine 0.1 kg.

in one province, it is more likely not to be reported. Third, in some years, there is systematic omissions: for instance, many fruit types were not reported at all in the 1950s-1960s.

For 1909, data for some provinces are missing: Eskisehir, Ordu, Zonguldak and Kars. We assume those provinces produced a certain fraction of the output of the larger provinces in 1928 that they were administratively part of at the time: Kutahya, Trabzon, Bolu, Erzurum (Kars was not a part of Erzurum, yet it is a reasonable point of comparison).

For local prices, we use 1909 Ottoman statistics, 1927 Agricultural Census and the annual data presented after 1970. For missing years, we assume the crop-level provincial price differentials in 1927 also apply to 1939, and the price differentials of 1970 can be applied in 1950 and 1964. As a result, we reach total agricultural output by province by year.

The calculation of the value added draws on the physical product times average local prices (mostly) net of productions costs:

$$Y_{it} = \sum_j [(Q_{jit} * (1 - WasteRate_j) - Seed_{jt})] * P_{jit} - AdditionalCosts_{it} \quad (1)$$

where *j* represents product, *i* province and *t* year, *Q* physical output and *P* nominal prices. Even though the output is calculated at the *crop(j) x province (i) x time (t)* level, the costs are calculated differently. Following TUIK's official methods, we break down the agricultural costs according to waste, seeding requirement, maintenance, oil etc. The waste rates (as the percentage of output) and seeding requirements (the amount of seeds per hectare of land) are obtained from the technical coefficients in DIE (2003), combined with those in Bulutay, Tezel, and Yıldırım (1974). After the crop-level costs are deducted, we obtain the total national level amount of additional costs (oil, maintenance, irrigation, labor etc.) from official figures. We allocate these figures to provinces according to the number of agricultural tools and machinery.[15] The shares of these additional costs in total costs turn out not to be substantial until the 1950s, when more intensive mechanized production began to gain momentum. For this reason, the value added distribution is more different from the gross output distribution in later years.

For data sources, we use the Ottoman agricultural statistics of 1909 and 1913, the first detailed and systematic official series, compiled and presented by Güran (1997). In terms of the construction method, these series are consistent with the annual official crop data of the republican period, which start in 1928. In principle, these are all crop output and acreage estimates, provided by the local branches of the Ministry of Agriculture.[16] In addition, there also exist the summary reports of the agricultural censuses (1927, 1950, 1963, 1970, 1980, 1991 and 2001). We make use of the 1927 census data, yet, we prefer to rely on the annual official surveys.

The reconstruction of the long-run comparable output and value added figures has been challenging since the administrative divisions, the crop definitions, and sometimes, the way the data presented in the original publications, varied from one year to another. First, we define 58 provinces in order to create a reasonably meaningful classification which reconciles the changing administrative classifications since the Ottoman era (Table A1) With the minimal amount of *ad*

[15] To obtain agricultural machinery and tool numbers, we use census and additional surveys; the 1927 census, 1940-1946 surveys, available for every four years, and the data available annually after 1970. We do not take into account the simple wooden ploughs. We simply count all reported machines and tools, without making adjustments the quality or value of the machines.

[16] The acreage data seems to be more problematic than the output, since the cadastral surveys were mostly lacking in the early Republican years. See "introduction" of DIE (1937).

hoc adjustments, this 58-province classification allowe us to combine various classifications. As for the crop definitions, we take the 1970 classification as the basis, which was the most convenient.

Finally, we calculate three-year averages of the value added to reach the estimates for the benchmark years of 1929, 1939, 1950, 1964, 1970, 1980 and 1990. That aims to reduce the impact of annual unexpected shocks, such as rainfall, or other climatic changes. For the Ottoman data, we take the average of 1909 and 1913 for each provinces. The underlying data is missing for some eastern provinces in 1913, so we take 1909 levels for them. We also make a few corrections for the provinces for which the 1929 figures seem unreasonable. Indeed, the underlying official data seem to have inexplicable patterns, possibly because this was the early period of the statistical collection.

Industry

The main data sources for the estimation of the industrial value added are the summary reports of the industrial censuses (1927, 1950, 1964, 1970, 1980 and 1991), the 1938-39 industrial statistics, 1913-14 Ottoman industrial survey, manufacturing surveys annually published after 1964, the population statistics and the construction statistics. We define the industrial activities as comprising medium-large scale manufacturing (conventionally categorized as big manufacturing by official publications), the small scale manufacturing (or handicrafts), mining, construction and utilities. The industrial censuses after 1964 make a clear distinction between the "small" and "big" manufacturing enterprises. The definition of the scale becomes slightly more refined over time. However, there was a broad consistency, in the sense that the data on "big" enterprises are rather comparable. The 1927 and 1950 censuses do not distinguish big enterprises from the small. For 1927, we made the assumption that the enterprises with more than 10 employees are consistent with the definition of the "big enterprises". For 1950, since the value added data was already available, so we did not need such an assumption.

In the present estimates, the final allocation of the national industrial value added draws on, first, getting consistent estimates or proxies at province level for each of five sectors, and then allocating the official national value added figure with the shares derived from those estimates or proxies. This procedure yields the estimates for provincial industrial value added at current prices.

Table A2 summarizes the main elements of our methods. In most cases, the big manufacturing value added were obtained from the censuses directly, only with occasional corrections that we consider as errors, or with a reasonable manipulation of the available data. The small manufacturing estimates are either derived from employment figures, if available, or the employment is statistically estimated from the employment in big manufacturing and urban population. For prediction, we use the regression coefficients estimated for the closest year. For instance, for 1939 and 1913, we derive the employment estimates in small manufacturing by first running a regression for manufacturing employment on the big manufacturing employment and urban population in 1927, and then use those estimated coefficients to predict the manufacturing employment for 1913 and 1939. We then deduct the big manufacturing figures, that we already have, from the predicted manufacturing employment. The final small manufacturing employment is used as a proxy to allocate the national level small manufacturing figures.

The censuses after 1964 give us the national level small manufacturing output. Yet, it is tricky to obtain those figures for the earlier years. We allocate some reasonable shares of manufacturing

output by referring to several studies and some guesswork. For 1913-14, we relied on Eldem's (1994) coefficients and assumed some linear decline until 1964, through 1927, 1939 and 1950.

For mining, utilities and construction, we use the most reasonable and straightforward proxies for value added, due to the difficulty of getting output estimates, or rather lack of data sources. The employment in mining and utilities measure the mining and utilities output and the value of building permits measures the construction output. The employment figures come from the population censuses. For some years, better data are available for this or that sector, allowing to compare the efficiency of our proxy choices. After checking such alternative sources, we decide on the proxies as such.

1927 and 1950 industrial censuses cover all these sectors, while only the latter gives information on the value added structure directly. The censuses after 1964 were in fact manufacturing surveys, partly providing data on the small enterprises. The 1950 census was the only census that covered all sectors and provided data on value added at the same time. Therefore, we follow a series of procedures to arrive at estimates of the components of industrial value added. First, for most years, we use direct value added data for big manufacturing. Second, for most years, we use proxies for small-scale manufacturing, whose share in total value added progressively decreased to the level of 10-12 percent by 1970. Similarly, for mining, construction and utilities, we use alternative proxies, and eventually chose the most consistent one as the final output series.

1927 Industrial Census

In the Census, the number of enterprises (big and small) and employees are reported at sectoral (10 sectors) and provincial levels. In addition, the employees are reported by average size of enterprises. Using these, we are able to reach the number of employees in manufacturing. To estimate the value added for provinces, we try several methods. One alternative is to assume sectoral average value added the same for all provinces. However, considering the regional specialization patterns, i.e. that the average output might differ spatially, we prefer to refer to the 1950 census results (as said above, the most complete one) by assuming the regional labor productivity to be the same in 1927 and 1950. Thus we multiply the manufacturing employment in 1927 with the average labor productivity in 1950 by provinces and calculated the manufacturing shares for provinces.[17] Finally, mining and construction output are measured by the number of employees.

1950 Industrial Census

The summary report of the 1950 industrial survey is available only for manufacturing in detail.[18] For each province, the summary tables report the number of enterprises, salaried employees, annual gross wages, annual gross sales, output and inputs and finally the value added. For mining, and utilities we use the number of employees as reported in the 1950 population census. As for construction, we obtain the construction permits values for each province in 1954 and use them as proxies for the construction output in 1950.[19]

Industrial Censuses of 1970, 1980 and 1992

[17] Manufacturing sectors are food processing, textiles, wood-processing, machines-making and mining-related, paper making, chemicals and the mixed. In other words, all sectors reported in the census except mining and construction.

[18] The summary tables can be found in the supplement of the December 1955 issue of DIE's *Monthly Statistics*.

[19] Data on the building permits are not available for earlier years.

These censuses follow a similar format. Basically, we obtain the value added of big manufacturing from the census data directly. For small manufacturing a part of the total manufacturing value added is allocated to provinces based on an index, which was a linear combination of urban and rural population by the ratio 2:1. This ratio give more weight to urban population, and thus assume that the more urbanized provinces have larger small-scale industry. Similar to the data for other years, the construction, mining and utilities value added are measured by the number of employees. This is also the method used by Özötün (1980); Özötün, Hazinedar, and Kaya (1986) and Özmucur (1988).

Services

Our major shortcoming of the available data is services. Neither in the Ottoman archives, nor in Turkish Republic official statistics there is any information on regional distribution of services value added until 1975. The only sources that include estimates for the services value added of provinces is Özötün's dataset that provides comparable series between 1975 and 1985. These two studies were commissioned by the State Planning Organization (SPO) and were methodologically consistent with the official national statistics produced by the SPO. Province level services series were estimated using input-output tables and other sectoral statistics.

In estimating provincial value added in services for the period before 1987, we rely on a regression method and use the series for the period 1975-1985 provided by Özötün as our training sample to predict services for our earlier benchmark years. The baseline Ordinary Least Squares (OLS) model that we estimate is the following:

$$Y_{it} = \beta_0 + \beta_1 S_{it}^{industy} + \beta_2 S_{it}^{agriculture} + \beta_3 S_{it}^{urbanpop} + \beta_4 (S_{it}^{urbanpop})^2 + \tau_t + \varepsilon_{i,t} \qquad (2)$$

where i denotes province, t denotes year, Y_{it} denotes province share in total services VA, $S_{it}^{industy}$ denotes province share in total industrial VA $S_{it}^{agriculture}$ denotes province share in total agricultural VA, $S_{it}^{urbanpop}$ denotes province share, $(S_{it}^{urbanpop})^2$ is the square of province share in Turkey's total urban population in a given year and τ_t denotes year fixed effects. We do not include province fixed effects in our estimations as fixed effects estimators take away the "between variation" across provinces and result in poor out of sample prediction for earlier periods such as 1913 and 1927. Our main motivation in choosing these explanatory variables is the empirical observation that industrialization, urbanization and services growth are strongly correlated at the early stages of structural transformation before the services sector takes over (Herrendorf, Rogerson, and Valentinyi 2014).

In Table A3 we present our estimation results. In column (1) we include province shares in total industrial value added, agricultural value added and urban population, but not the square of urban population whereas in column (2) we also include the latter. Our aim here is not to establish causality, but rather develop a consistent model for out of sample prediction. In both columns, the coefficients of province shares in total industrial value added and urban population are highly significant. The coefficient for province share in total agricultural value added changes sign when we fit a second order polynomial for province share in urban population in column (2). However, because both the residual sum of squares and root mean square error are smaller compared to the

specification in column (1), we use the model in column (2) in making out of sample predictions for province share in services sector for our benchmark years.

Overall, our own estimates compare reasonably well with the existing estimates. Eldem (1970)'s estimate of the share of Istanbul in the national income of Turkey in 1913 within present day borders is 16,7 percent, while that is 14,8 percent in our estimates. Unfortunately, Eldem presents guesstimates for only very broad regions, details of which are imprecise, which makes it difficult to make further subnational comparisons. Our estimates for the year 1980 are also close to those by Özötün for the same year. We find the coefficient of variation in total incomes in 1980 to be 1.61, while Özötün's estimate is 1.81. Our coefficient of variation estimates for agriculture, industry and services are, respectively, 0.72, 2.08 and 2.27, while the corresponding estimates in Özötün data are 0.66, 2.17 and 2.43. The largest difference between the two sets of estimates seems to be for agriculture, which is possibly due to that we do not count vegetable output in order to ensure the consistency of our data coverage over time.

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Table A1: Our 58 Provinces and the Existing NUTS 3 (81) province classification for Turkey

Our Province	NUTS 3 Provinces	Our Province	NUTS 3 Provinces
Adana	Adana, Osmaniye	Istanbul	Istanbul, Yalova
Afyon	Afyon	Izmir	Izmir
Agri	Agri	Kars	Kars, Ardahan, Igdir
Amasya	Amasya	Kastamonu	Kastamonu
Ankara	Ankara, Kirikkale	Kayseri	Kayseri
Antalya	Antalya	Kirklareli	Kirklareli
Antep	Gaziantep, Kilis	Kirsehir	Kirsehir, Nevsehir
Aydin	Aydin	Kocaeli	Kocaeli, Sakarya
Balikesir	Balikesir	Konya	Konya, Karaman
Bilecik	Bilecik	Kutahya	Kutahya, Usak
Bolu	Bolu, Duzce	Malatya	Malatya, Adiyaman
Burdur	Burdur	Manisa	Manisa
Bursa	Bursa	Maras	Maras
Canakkale	Canakkale	Mardin	Mardin
Cankiri	Cankiri	Mugla	Mugla
Coruh	Rize, Artvin	Mus	Mus, Bingol, Bitlis
Corum	Corum	Nigde	Nigde, Aksaray
Denizli	Denizli	Ordu	Ordu,
Diyarbakir	Diyarbakir	Samsun	Samsun
Edirne	Edirne	Siirt	Siirt, Batman, Sirnak
Elazig	Elazig, Tunceli	Sinop	Sinop
Erzincan	Erzincan	Sivas	Sivas
Erzurum	Erzurum	Tekirdag	Tekirdag
Eskisehir	Eskisehir	Tokat	Tokat
Giresun	Giresun	Trabzon	Trabzon
Gumushane	Gumushane, Bayburt	Urfa	Sanliurfa
Hatay	Hatay	Van	Van, Hakkari
Icel	Icel	Yozgat	Yozgat
Isparta	Isparta	Zonguldak	Zonguldak, Karabuk, Bartın

Table A2: Overview of methods- industry

	Medium-large scale manufacturing	Small-scale manufacturing	Mining	Utilities	Construction
1913	Estimated total wage share (7 cities)	Estimated based on employees of big manufacturing and urban population.	Direct data		Urban population
	Official statistics and Eldem (1994)	Population census	Eldem		Population census
1927	Employment x Value added differentials in 1950		Employment		Employment
	1927, 1950 industrial censuses		Industrial census		Industrial census
1939	Direct data	Estimated based on employees of big manufacturing and urban population.	Employment in 1950	Employment in 1950	Urban population
	Official statistics	Population census	1950 population census	1950 population census	Population census
1950	Direct data		Employment	Employment	Value of new building permits
	Industrial census		Population census	Population census	Construction Statistics
1964	Direct data	Estimated based on employees of big manufacturing and urban population.	Employment	Employment	Value of new building permits
	Industrial census	Population census	Population census	Population census	Construction Statistics
1970, 1980, 1992	Direct data		Employment	Employment	Value of new building permits
	Industrial census		Population census	Population census	Construction Statistics

Table A3: Predicting Province Share in Total Services Value Added

VARIABLES	Province Share in Services VA
Province share in total industrial VA	0.153***
	(0.028)
Province share in total agricultural VA	0.142***
	(0.024)
Province share in total urban population	0.530***
	(0.039)
Square of province share in total urban population	0.028***
	(0.003)
Observations	638
R-squared	0.984
Year fixed effects	Yes
Root mean square error	0.480

Note: Standard errors are in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Table A4: Estimates for GDP Per Capita of the 58 Provinces, 1913-2015, Country Average = 100

	1913	1927	1939	1950	1964	1970	1980	1991	1995	2000	2005	2010	2015
ADANA	177	148,3	155,8	149,5	124,5	121,2	111,6	98,2	94,8	93,3	66,8	71,8	70
AFYON	93,1	63,9	69,4	71,6	71,6	69,8	70,4	59,7	59	67	65,2	71,4	69,1
AGRI	106,1	52,4	100,6	70,9	50	24,5	21,2	18,1	16,9	20,3	32,3	35,9	32,6
AMASYA	107,4	112,7	98,3	103,7	88,5	68,4	77	61,4	59,9	71,8	72,2	74,1	75,3
ANKARA	125,1	77,7	107,4	150,1	151,1	132,4	119,5	135,5	134,2	137	150,5	146,5	132,5
ANTALYA	90,1	95,8	135,3	55,6	93,4	103	99,5	113,3	125,6	118	131,2	127,7	109,6
ANTEP	102,4	171,8	104,2	84,2	118,9	109,3	109,2	87	77,8	76,8	67	62,2	71,5
AYDIN	133	110,4	109,3	92,7	92,6	89,2	91,4	100	121,7	118,4	77,2	74	71,3
BALIKESIR	104,2	131,6	87,7	70,7	91,8	89,3	94,5	99,1	98,4	92,8	90	91,1	81,5
BILECIK	103,8	70,4	57,5	69	68	83,8	108,7	141,9	176,8	147,7	122,4	112,2	118,9
BOLU	162,3	90	53,5	60,1	56	68,4	67,1	108,6	145,1	257,3	215,5	223,2	228,5
BURDUR	132,3	123,9	89,1	86,8	91,8	82,2	90,8	80,7	85,7	96,7	93,8	95,9	87,8
BURSA	149,1	105,5	124,3	111	116,9	115,7	122,2	137,8	127,6	122,4	117,4	109,8	111,7
CANAKKALE	92,9	127,9	71,3	59,6	78,3	94,6	99,3	126,6	133,5	122,8	102,2	106,8	98,3
CANKIRI	69,2	39,2	51,2	59,2	39,9	45,8	60,8	44,7	50,3	82,1	74,3	74,1	74,6
CORUH	46,1	58,4	87,4	29,4	40,1	59,4	38,9	95,3	98,6	90,5	77,2	85,3	84,3
CORUM	58,3	88	57,9	72,1	66,3	68,4	78,1	71,2	75,3	87,5	63,9	70,6	65,5
DENIZLI	91,8	92,9	61,7	84,9	62,8	85,8	109,1	102,6	109,9	119,2	96,3	90	89,7
DIYARBAKIR	85,6	79,9	85,7	106,7	56,9	62,6	80,5	69,3	58,8	50,2	46,4	47,9	47,9
EDIRNE	93,2	101	82,5	119	87,5	128,4	133,9	89,7	87,5	107,4	86,5	95,3	85,3
ELAZIG	64,8	44,6	82	55,9	68,7	58,7	52,7	68,5	66,3	62,9	63,3	70,5	66,6
ERZINCAN	63	39,6	56,9	47,9	57,3	58,3	57,9	51,1	55,3	61,2	77	85,7	82,4
ERZURUM	85,8	61,7	57,8	49,5	50,6	32,8	40	41,4	38	41,2	50	59,4	58,9
ESKISEHIR	79,2	108,5	134,9	178,2	114,1	112	114,2	108	107,5	119,4	108,7	106,8	107,1
GIRESUN	64,8	59,9	51,2	47,3	47	68,7	56,3	50,3	57,4	65,1	61,7	61,8	65,4
GUMUSHANE	22,1	46,5	47,4	48,2	39,1	38,5	27,5	35,5	41	56,6	60,7	68,8	63,5
HATAY	97,1	116,6*	91,5*	83,3	82,8	78,3	81,7	82,4	86,4	83	62	63,7	63,7
ICEL	145,6	174,8	135,1	114,2	166,2	123,3	124,6	123,1	121,1	113,8	80	81,7	80,8
ISPARTA	83,8	98,6	85,2	64,7	75,6	66,5	77,6	65	66,1	75,6	84,3	79,6	76,2
ISTANBUL	249,1	288,9	326,5	305,5	249,4	220,9	183	157,7	139	124,8	164,4	159,7	161,2
IZMIR	188,5	157,8	182,7	187,8	150,4	147,2	132,2	157	158,3	143,2	122	115,2	114,6
KARS	34*	25,2	76,2	51,1	49,3	27,8	17,8	26,2	27,8	31,1	45	53,6	54
KASTAMONU	50,5	78,1	37	40	42,1	53,3	49,7	65,5	69,3	81,4	74,8	79	73,9
KAYSERI	97	99,7	127,5	95,7	122,9	103,2	88,5	69,4	68,4	74	91,2	85,4	85,3
KIRKLARELI	69,1	61,1	80,3	84,4	82,3	104,7	91,4	160	153,3	142,7	103,8	113,5	101,8
KIRSEHIR	101,1	64,5	59,7	63	84,9	120,3	129,6	80,1	88,7	91,8	69,2	75	70,3
KOCAELI	99	102,1	97,5	88,2	119,4	132	192	187,4	188,9	175,9	127,7	128,6	137,8
KONYA	99,3	64,9	114	103,3	111,6	128,7	114,3	79,9	76	82,5	75,4	73,7	80,7
KUTAHYA	132,5	83,2	69,8	105,8	82,3	84,9	83,6	78,9	83	73,6	70,9	77,4	76,2
MALATYA	78	49	59,8	79,1	67	65,5	73,2	73,5	66,2	62,6	54,5	53,6	55,8
MANISA	111,3	108	123,3	130,2	105,8	118,5	124,5	125	126,8	135,6	93,7	84,5	91,6
MARAS	82	71	61,4	70,4	76,9	77,5	58,3	62,4	63,4	63,6	60,4	62,8	60,1
MARDIN	103,2	41,5	43,8	71,3	66,5	55,5	78,9	47,8	46,2	40,4	39,8	48,3	51,1
MUGLA	82,9	113,8	81,3	66,3	73,4	65,9	87	127,5	141,6	155,3	111,2	109,4	100,1
MUS	74,9	52,9	38,9	38,1	42,4	28,2	28,7	25,4	23	24,3	38,9	43,6	45,4
NIGDE	102,3	63,4	87,4	75,5	81,8	109,4	104,2	61,2	59,5	66,8	61,9	66	70,3
ORDU	80,2	49,3	29,7	40,3	46,3	67	53,1	44	53,8	60,5	57,8	55,9	64,7
SAMSUN	64,2	113,3	84,3	90,5	73,3	82	75,7	76	75,5	80,8	69,3	72,1	73,9
SIIRT	40,2	42	55,3	47,2	105,2	78	64,4	47,2	39,3	35,8	42,4	47,3	44,1
SINOP	50,1	33,1	64,6	43,2	39,2	48,2	50,6	56,5	59,3	69,3	65,2	68,1	63,6
SIVAS	64,4	61	58,8	53,7	62,4	49,1	45,6	54,5	55,9	62,3	62,1	70,7	70,4
TEKIRDAG	76	68,4	67,4	108	91,8	126,1	162,3	131,1	127,4	140,9	133,2	125,5	120,6
TOKAT	86,4	89,1	84,6	112,7	80,6	66,7	55,4	61,4	61	67,7	52,2	56,8	56,1
TRABZON	32,5	59,5	49,3	50,6	51,6	61,8	53,8	65,9	67,1	71,9	78,1	81,6	83,9
URFA	149,1	63,3	106,4	94,6	90,9	94,6	64,9	39	47,9	55,6	40	40,5	37,4
VAN	55,2	63,2	73,6	51,2	44,1	27,6	25,1	31	25,7	26,4	35,8	37,8	36,9
YOZGAT	83,9	51,9	52,8	86,2	57,8	52,1	70,3	41,8	47,3	52	56,6	61,6	62,1
ZONGULDAK	65,1	87,9	77,6	121,5	118,7	116,7	117,1	72,2	81,7	97,3	64,3	66,4	70,1

*: Kars was not a part of Ottoman Empire in 1913, and Hatay was not part of Turkey until 1938. In the absence of statistics, the values with stars for these two provinces are our best guesses.