The impact of access to railroads on economic growth in the Ottoman Empire, 1893-1914

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Abstract
This paper tests whether access to railroads in a judicial district changed the size of the population in the respective judicial district for the years 1893 and 1914. The empirical results indicate some evidence for a positive effect of access to railroads on population in the respective judicial districts. This paper concludes that railroads induced economic growth, leading to higher population in the respective places.

I. Introduction
In the late nineteenth and early twentieth centuries, there was an important transition in the Ottoman Empire regarding its transportation networks, which could have caused economic growth. This consisted of the construction of railroad lines between 1856 and 1914. The building of railroads began in 1856 and railroad networks grew rapidly until 1914. As shown in Figure 1, railroad lines connected Rumelia\(^2\) with other parts of the Ottoman Empire, such as Hejaz, Syria, Iraq, and Anatolia. The railroad networks were not as dense as one might expect because of financial difficulties, wars, and political obstacles, limiting construction even up until 1914 (von Pressel 1966, 91; Schoenberg 1977; Ortaylı 2010, 163-65; Geyikdağ 2011, 90-8).

In the Ottoman Empire, there were only a few railroad lines that were built by the state itself. Many railroad lines were constructed and operated by the foreign railroad companies of major European powers.\(^3\) This could be due to the fact that the Ottoman state did not have the funds to finance the construction of railroads. Its financial situation became worse during the 1850s and it went bankrupt in the 1870s.

Figure 1. Railroad Lines in the Ottoman Empire (1856-1914)
Source: Figure 1 is taken from McCarthy (2001, 29).

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\(^2\) Land of the Ottoman Empire in Europe.
\(^3\) They were the UK, France, Germany, and Austria-Hungary.
Population data come from district level. Economic outcomes, trade, transportation costs, and internal migration at the judicial districts connected cities. Higher employment opportunities attracted people in railroad access induced economic growth and increased employment opportunities in connected cities in Prussia for the period 1840-1871 and argues that railroad access induced economic growth and increased employment opportunities in connected cities. Higher employment opportunities attracted people into the respective cities to look for jobs. There is no data source with information about economic outcomes, trade, transportation costs, and internal migration at the judicial district level. This paper conducts a similar analysis to that of Hornung (2012). Population data come from the 1881/82-93 and 1914 censuses, which have been conducted after 1881 and submitted to the Sultan in 1893 (Karpat 1985, 105).

The Ottoman state primarily wanted the railroads to be built so it could exercise political control over its territories. The major European powers constructed several railroads, such as the line connecting İzmir with Aydın, to extend their economic control and import raw materials from the Ottoman Empire. The decreasing transportation costs made it easy to obtain imports from the Ottoman Empire. However, only a few railroad lines were allocated to places of economic importance (Kolars & Malin, 1970; Karkar 1972, 65; Schoenberg 1977; Quataert 1977; Quataert 1996, 806; Illich 2007, 91-2; Gülsoy 2010, 27-8; Hülagü 2010, 23-25).

In the historical literature, there are controversial arguments for the impact of railroads on economic growth in the Ottoman Empire. Several researchers argue that there had been a substantial increase in trade and agricultural production as places had gained access to railroads. On the other hand, while railroads are generally viewed as having a positive effect on growth, there is a strand of literature where it is argued that railroads could lead to lower production in connected places, as there was an increase in imports due to railroads, which resulted in the domestic industry being hampered in places where railroad lines were located (Quataert 1996, 814). In another strand of the literature it is argued that railroads did not lead to economic growth in the Ottoman Empire. This strand is based on the argument that railroad lines were not adequately connected to one another (Ortaylı 2010, 166), and as a result passenger and goods traffic was not intense.

To shed light on this issue, this paper examines whether access to railroads induced economic growth in the Ottoman Empire, using data for 455 judicial districts (known as kazas) from 32 provinces (known as vilayets) in the Ottoman Empire for the years 1893 and 1914. Hornung (2012) uses population growth as a proxy for economic growth in Prussia. He reports the positive impact of railroads on population figures in connected cities in Prussia for the period 1840-1871 and argues that railroad access induced economic growth and increased employment opportunities in connected cities. Higher employment opportunities attracted people into the respective cities to look for jobs. There is no data source with information about economic outcomes, trade, transportation costs, and internal migration at the judicial district level. This paper conducts a similar analysis to that of Hornung (2012). Population data come from the 1881/82-93 and 1914 censuses, which have been conducted after 1881 and submitted to the Sultan in 1893 (Karpat 1985, 105).

Footnotes:


5 This is because all major European powers wanted to build railroads to control places politically and economically (Illich 2007, 91-3; Geyikdağ 2011, 54-5). Furthermore, the construction of the railroads by one power would create a threat to its rivals' economic and political dominance in the respective location. Competition among the major European powers to control the respective location via railroad investments would lead to conflicts (Ortaylı 2010, 165-6). For instance, in 1836 Colonel Chesney, who was a British engineer, had proposed the construction of several railroads in the Ottoman Empire to the UK government. The railroads would have connected the Syrian coast with Baghdad (von Pressel 1966, 92). However, since railroads would create a threat to the economic dominance of France in these areas, France blocked the building of these railroads using a French diplomat, that is, Ferdinand de Lesseps (Gülsoy 2010, 43-4).

6 Another reason for this is that railroads were not connected with highways (Eldem 1994, 105).

7 The 1881/82-93 census was conducted after 1881 and submitted to the Sultan in 1893 (Karpat 1985, 30-6).
made available by Karpat (1985, 122-50, 167-90). This paper constructs a detailed map that shows the location of the railroad lines by both place and year.

II. Empirical approach

This paper runs the following regression:

$$\log(P_{icpt}) = \beta_0 + \beta_1 \log(R_{icpt}) + \beta_2 D_{icp} \times y_t + \beta_3 M_{icpt} + \rho_p + u_{icpt}$$

where $i$, $c$, $p$, and $t$ indicate the judicial district, county, province, and year, respectively. $\log(P_{icpt})$ is the logarithm of the judicial district level population for judicial district $i$, located in county $c$ of province $p$, in year $t$. $\log(R_{icpt})$ is the logarithm of the distance between the nearest railroad line and each judicial district, in year $t$. $\beta_1$ is the coefficient of interest.

To control for initial conditions in a judicial district, this paper uses $D_{icp}$ that equals 1 if natural disasters were seen in judicial district $i$ of county $c$, located in province $p$, between the 1800s and 1850s, and zero otherwise. $M_{icpt}$ is a dummy variable which equals 1 if there was at least one operating mine, such as a coal, gold, or copper mine, in judicial district $i$ of county $c$, located in province $p$, in year $t$, and zero otherwise.

There was an increase in the population and production in several places, such as Balya judicial district in Balikesir, after coal mines had been operating in the 1900s in the respective locations (Su 1939, 6-12). In addition, the regression includes the interaction of $D_{icp}$ with year dummies ($y_t$) that control for the time varying effects of different initial conditions in judicial districts on the population. $p_i$ are province fixed effects that account for time-invariant characteristics at the province level (for example, the presence of mountains, rivers, and lakes, and geographic size). Lastly, $u_{icpt}$ is the error term.

If being closer to a railroad line was positively associated with economic growth through increasing production and trade which attracted an inflow of workers and their families, then $\beta_1 < 0$. However, a positive coefficient estimate of $\beta_1$ implies that being closer to a railroad line could lead to lower production and trade through increasing imports which resulted in hampering of domestic industry, and consequently population went down due to increasing migration.

III. Results

The OLS (Ordinary least squares) estimate for the effect of railroads in column (1) of Table 1 is statistically significant at 10 per cent. The point estimate reveals that a one per cent decrease in the distance from a judicial district to the nearest railroad line leads to an increase in the population of the respective judicial district by 0.03 per cent, on average.

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<tr>
<th>Table 1. Impact of railroads in the Ottoman Empire (1893 and 1914)</th>
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<td><strong>Dependent variables: log(Population) and log(Distance to railroad lines)</strong></td>
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<td>log(Distance to railroad lines)</td>
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<td>Presence of natural disasters</td>
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The positioning of the railroad lines could be endogenous to the population size (that is, reverse causality), which leads to a bias in the OLS estimates for the impact of railroads. This is because in the historical literature it is indicated that one of the railroad lines was allocated to places that were commercially important (that is, İzmir and Aydın) (Kolars & Malin 1970; Karkar 1972, 65, 79). The Ottoman state wanted several railroad lines to be built in unpopulated places, such as Bandırma and Balıkesir, due to famines. The railroad lines would decrease food shortages and prevent future famines in the respective places (Quataert 1996, 789; Erler 2010, 304-12).

To address the reverse causality issue, this paper pursues two different strategies: (I) an instrumental variable for railroads based on trade and caravan routes is constructed; and (II) this paper examines the effect of un-built lines on the population in the proposals of Colonel Chesney and Levant Herald.8

The second stage result, using the instrument (that is, the logarithm of the shortest distance between each judicial district and the trade and caravan routes) to predict the distance to the railroads, is presented in column (2) of Table 1. The IV estimate for the effect of the railroads is not statistically different from zero. Furthermore, the IV estimate is larger than the OLS coefficient in magnitude, which suggests that the OLS estimate is biased downward. The coefficient estimate for the impact of the distance to the trade routes in column (3) is statistically different from zero at 1 per cent. However, the IV estimate is not precise enough to provide

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8 Before 1870, Colonel Chesney and Levant Herald proposed the construction of several lines that would have been located in Syria, Iraq, and Anatolia. The positioning of the proposed lines was related to the population in a similar way to how the railroad lines were actually built. Furthermore, events that were less likely to be related to economic conditions in the judicial districts (such as financial difficulties faced by the Ottoman state, which could have arisen due to wars and its debt) were mainly responsible for the fact that none of the proposed lines attracted considerable interest.
information on railroad line placement decisions, as the F-statistic in column (3) is not larger than 10.

To further address reverse causality concerns, in column (4), this paper examines the effect of lines that were planned but that were not constructed. Column (4) reports that the coefficient estimate for the impact of the distance to the railroads is negative and statistically different from zero, as before. In addition, column (4) reports that the coefficient estimates for the effects of Chesney’s proposal and Levant Herald’s proposal are not statistically significant. These results imply that reverse causality is not an important concern. This could be due to the fact that the railroads in the Ottoman Empire were primarily built for political, religious, or military rather than economic reasons. This is also in line with Jedwab & Moradi (2012), who examine the impact of railroads on cocoa production and population growth in Ghana.

IV. Conclusion

The findings show that railroad access induced economic growth, which led to expansion in the affected areas. Railroads can be an important driver of economic growth in places where road networks are poor before railroads are built, as those of the Ottoman Empire were, even if economic factors do not play an important role in the construction of railroads.

This paper contributes to previous literature in several respects. It is the first study that uses a unique historical dataset of railroads and judicial district population figures to analyse the impact of railroads in the Ottoman Empire. It provides empirical evidence to help inform the historical literature as to whether access to railroads induced economic growth in the Ottoman Empire. It is the first study that uses a unique historical dataset on trade and caravan routes in the Ottoman Empire as well as proposals by Colonel Chesney and Levant Herald in order to deal with the endogeneity issue of where railroad lines in the Ottoman Empire were built; that is, it represents the first attempt to study decisions about the placement of railroad lines empirically. Finally, it extends the empirical literature on the impact of railroads by presenting empirical evidence from history, using a unique historical dataset on the Ottoman Empire, whose borders included many present-day countries.9

Bibliography


9 These countries are Turkey, Greece, Syria, Iraq, Lebanon, Israel, Palestine, Jordan, and Yemen, and some parts of Albania, Macedonia, Kosovo, and Saudi Arabia.


