Market Access and Information Technology Adoption: Historical Evidence from the Telephone in Bavaria Online Appendix

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September 22, 2022

The following lists the utilized variables, including the sources of the underlying data.

- Exchange establishment date (Time to install/ Time installed)
  Source: Königlich Bayerische Post- und Telegraphenverwaltung (1905)
  This is based on the month of opening of a local exchange. The variable 'Time to install' is measured as the number of months until an exchange is opened in a town starting with the opening of the first exchange in Munich in May 1883. This is reported in the summary statistic table as well as used as outcome variable for the diffusion specifications. The adoption specifications use "Time installed" which inverts the variable and measures how long the exchange had been in operation at that point in time.

- Number of lines
  Source: Königlich Bayerische Post- und Telegraphenverwaltung (1905) and other years of the annual report.
  The number of lines is the combined number of lines reported for the respective exchange. This includes private lines, lines used by government and other administrative agencies, and publicly accessible lines.

- Population
  Source: *Historisches Gemeindeverzeichnis*, (Bayerisches Statistisches Landesamt, 1954)

Population is the official number of people resident in the relevant municipality as counted in the 5 yearly census, starting in 1880. Annual values between these census data points are interpolated. The variable is specified in thousands of residents.

- Distance
  Source: Bayerische Vermessungsverwaltung – www.geodaten.bayern.de
  The distance matrix between locations is based on the great-circle distance between towns calculated from geographic coordinates from the Bavarian topographical office. The value in kilometer is used for the variable.

- Postal Revenues & Telegraph Revenues
  Source: Königlich Bayerische Verkehrsanstalten (1882)
  These are the total reported revenues for offices in the respective locations in *Mark* and *Pfennig* in 1882. If multiple offices are reported for individual towns, the respective values are then aggregated. The variables are specified as per-capita values and use the reported population for 1880.

- Border
  Source: *Historisches Gemeindeverzeichnis*, (Bayerisches Statistisches Landesamt, 1954)
  This dummy variable indicates that a town is located in a county that borders a foreign neighbor state. The identification of such counties is based on visual inspection of historical county borders.

- Agriculture
  Source: Reibel (2007)
  This variable is the share of agricultural workers in the male population. It is based on *Reichstag* constituencies and reported for 1890.

- Employment ratio
  Source: *Beiträge zur Statistik des Königreichs Bayerns 82*, (Bayerisches Statistisches Landesamt, 1911)
  This variable contains the share of the total population engaged in non-farm employment at the county level, capturing not only non-agricultural occupations but also the level of total employment in the area. The data used for the diffusion analysis is based on the year 1882, the 1900 adoption analysis uses 1895, and the main adoption analysis uses 1907.

- Similarity
  Source: *Beiträge zur Statistik des Königreichs Bayerns 82*, (Bayerisches Statistisches Landesamt, 1911)

This variable uses occupational categories of non-farm employment to create an indication of Dissimilarity in the county. The number of workers in 23 separate categories is used for an indication of how strong an individual district deviates in its occupational structure from the state-wide average. This is calculated with the formula $\frac{1}{2}\sum_{i=1}^{N}|\frac{sec_{iC}}{emp_C}-\frac{sec_{iB}}{emp_B}|$ where i indexes the sector, B the whole of Bavaria and C the district in question. The data used for the diffusion analysis is based on the year 1882, the 1900 adoption analysis uses 1895, and the main adoption analysis uses 1907.

- State Tax
  Source: *Beiträge zur Statistik des Königreichs Bayerns 57*, (Bayerisches Statistisches Landesamt, 1892)
  This variable captures the amount of state tax collected in the county in the year 1887. This is specified as a per-capita value using the 1885 county population.

- Railroad Station & Revenues
  Source: Königlich Bayerische Verkehrsanstalten (1882)
  The annual report for 1882 lists the revenues for all railroad stations in Bavaria, which are identified by the name of the respective location. The station variable is a dummy variable indicating that the location was included in the list of active stations. The revenue variable is calculated as total revenue minus *Nachnahme* revenue.

- Election Participation, Vote Shares (Socialist, Zentrum)
  Source: Reibel (2007)
  This uses the 1890 elections for the *Reichstag*, the federal parliament of the German empire, and the attendant constituencies. The participation is the share of eligible voters participating in the first round of the election. The vote shares for Socialists and Zentrum are the respective vote shares for the *Sozialistische Arbeiterpartei Deutschlands* and the *Zentrumspartei*. The remaining votes were predominantly for different liberal parties, as well as small conservative parties and independent candidates.

- Catholic population (Catholics)
  Source: Reibel (2007)
  This variable indicates the share of Catholics in the local population. It is measured on *Reichstag* constituency level. The difference between the Zentrum vote share and the catholic population share are combined in the (Catholics - Zentrum) variable.

- City status
  Source: *Historisches Gemeindeverzeichnis*, (Bayerisches Statistisches

Landesamt, 1954)
This designates if a town is *kreisfrei*, so the municipality also serves as county administration. The variable is specified as a dummy.

- County Population share
  Source: *Historisches Gemeindeverzeichnis*, (Bayerisches Statistisches Landesamt, 1954)
  This is the share of a town's population of the county's population. If the town is *kreisfrei*, then it is equal to one. There are two cases where the telephone administration reported data of smaller, suburban exchanges not separately but combined it with larger neighboring towns, consequently I merge all other covariates and do not use these two as separate observations. As they do form part of a different county, the population of the combined municipalities is larger than the population of the county of the main town. Consequently, the value is restricted to one.

- Fringe location
  Source: *Historisches Gemeindeverzeichnis*, (Bayerisches Statistisches Landesamt, 1954)
  This dummy variable indicates whether a town was in the vicinity of a larger city. This is based on the town being located in a county that is named after and administered by the larger *kreisfrei* city that does not form part of the county itself.

Tables

Table Appendix 1 shows the results for conducting the adoption analysis for 1900 as well as for 1905 with the set of towns that had an exchange in 1900 as described in the Market Access Consideration section of the main paper.

Table 1: Adoption of Telephone Lines 1900 / 1905 (1900 Towns)

	1900	1905 (1900 Towns)
Constant	-0.55	3.77
	(3.48)	(6.21)
MA Population	-0.21^{*}	-0.31^{*}
	(0.09)	(0.14)
Border	1.32^{*}	1.82
	(0.67)	(1.13)
Population	0.12^{***}	0.13^{***}
	(0.00)	(0.00)
Post Revenues (pc)	0.40^{*}	0.75^{*}
	(0.18)	(0.31)
Telegraph Rev (pc)	0.56	2.39^{***}
	(0.31)	(0.51)
Time installed	0.02^{*}	0.02
	(0.01)	(0.01)
Agriculture	9.15^{***}	17.40^{***}
	(2.28)	(3.50)
Employment ratio	-4.29	13.42^{*}
	(3.85)	(6.07)
Similarity	2.18	2.28
	(2.81)	(4.84)
Rail Station	-2.70^{*}	-6.39^{**}
	(1.37)	(2.32)
Rail Revenues	4.91	10.02
	(3.45)	(5.93)
State Tax	0.84^{***}	0.81^{***}
	(0.11)	(0.20)
Participation	2.14	-7.91
	(3.40)	(5.83)
Socialist	15.23^{***}	14.25^{***}
	(2.34)	(4.04)
Zentrum	-2.39^{**}	-3.05^{*}
	(0.89)	(1.53)
Catholics - Zentrum	-3.26	5.35
	(2.13)	(3.70)
City Status	1.90	1.33
	(1.46)	(2.59)
County Pop Share	-4.38^{*}	-5.24
	(1.72)	(3.00)
Fringe Location	0.26	-0.04
	(1.26)	(2.20)
ρ	0.19^{*}	0.28^{**}
	(0.08)	(0.09)
Log likelihood	- 542.7	- 624.1
Observations	126	126

$^{***}p < 0.001$; $^{**}p < 0.01$; $^{*}p < 0.05$

Standard deviation in parentheses, Population rescaled by 10 for readibility.