

The Reign of the Great Banks:

Financial Development and Firms' Real Economic Activity in Imperial Germany

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¹*Politecnico di Milano*

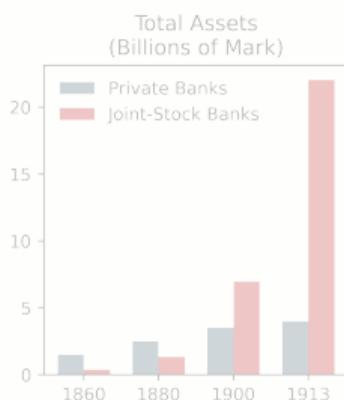
²*Uppsala University*

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Research Objective & Motivation

We study the real effects of financial development on firms' economic activity, exploring **the evolution of the banking landscape** in Imperial Germany, 1896-1914.

Imperial Germany (1871-1918) as a real world lab for financial development:

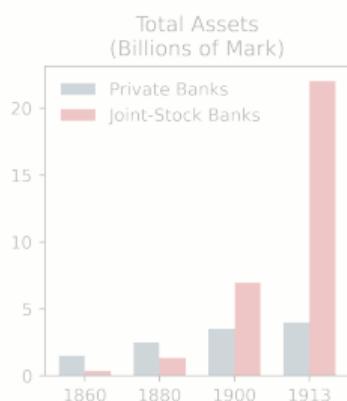


- Period of rapid industrialization & globalization.
- General incorporation legislation.
 - ⇒ Surge in demand for credit.
- Foundation of *Reichsbank* acting as “lender of last resort” (James, 1997).
- Emergence of large joint-stock credit banks.
 - ⇒ High credit volumes
 - ⇒ *Long-term* credit

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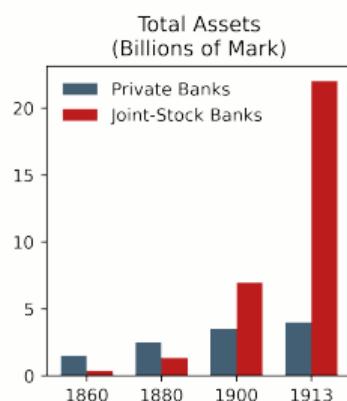


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Period 1896 - 1914: The Expansion of the *Great Banks*

The second half of the empire's life (1896-1918) is of particular interest:

- Established institutions; overall economic growth & moderate volatility.
- With the exception of the 1900-1902 crisis.
- This crisis triggered a transformation of the banking sector.

Before the crisis

- Eight *Great Banks* had emerged, providing a range of financial services.
- Strong within-country heterogeneity of financial development.

After the crisis

- Disproportional growth in importance of the *Great Banks* through...
 - ... geographic expansion.
 - ... increased control over the industry and the financial sector.
- → Reduction in financial development heterogeneity.



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Potential Economic Mechanisms

A priori, the effects of the banking sector's transformation on firm-level activities are not clear:

- (1) Financial development through the *Great Bank's* expansion might increase access to finance.
 - Proximity to banks facilitates financing and spurs firm performance.
(Tilly, 1967; Beck et al., 2019; Bellucci et al., 2019; Herpfer et al., 2023)
 - “Enabling vs. disciplining effect” of financing constraints on investment and firm output.
(Manso, 2011; Garicano & Steinwender, 2016; Cerqueiro et al., 2017)
- (2) The *Great Bank's* dominance spread business know-how but also concentrated power:
 - By enforcing their dominant position, banks may exert downward pressure on loan conditions, hampering firm performance. (Rice & Strahan, 2010; Cornaggia et al., 2015)
 - Strategic investors can significantly enhance business operations, e.g., by providing advice, monitoring, networking etc. (Hellmann & Puri, 2002; Davis et al., 2014; Bernstein et al., 2016)

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This Paper...

... examines the effects of financial development on real economic activities using a well-suited historical setting and unique data.

- Leverage novel data constructed using the latest AI technology developments:
- Firm information and financial data on the universe of German joint-stock companies
 - Hand-collect geolocations of (firms and) banks on the branch level, consistently over time.
 - Previously unexploited information on fiscal agencies (so-called “Zahlstellen”) providing a unique firm-bank link.
 - ⇒ Unique data on 7,646 firms and the eight *Great Banks* for the years 1896–1914.

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Preliminary Results

1. Descriptive findings:

- First firm-level statistics on majority of joint-stock companies in Imperial Germany, 1896–1914.
- First quantitative analysis of the banking sector's transformation following the 1900–1902 crisis.
 - Geographic *Great Bank* branch network.
 - Firm-bank network.
 - Peripheral states experience most pronounced changes.

2. Econometric analyses:

- Financial development of the banking sector increased firm debt financing.
- Firms that benefit from financial development exhibit significantly higher growth rates than the comparison group.

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Agenda

1. Data and Sample Construction
2. The Banking Sector's Transformation: Context and Descriptive Findings
3. Empirical Strategy and Preliminary Results
4. Summary, Outlook, and Conclusion

Empirical strategy



Variation over time

- We exploit changes in the firms' geographic proximity to the *Great Banks* over time (*EEA* scores)

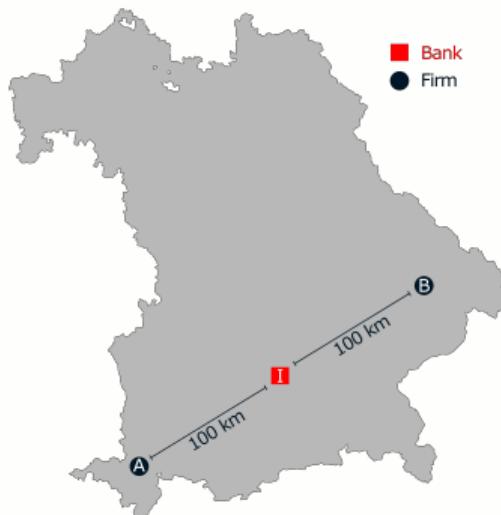
Endogeneity issues

- *Great Banks* do not randomly expand
 - Exclusion of direct firm-bank links
 - Exclusion of firms in the neighborhood of branches
 - Second source of variation

Cross-sectional variation

- We exploit industry dependence on external financing.

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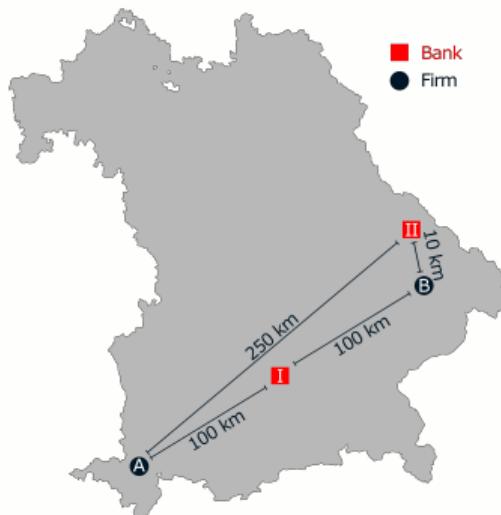
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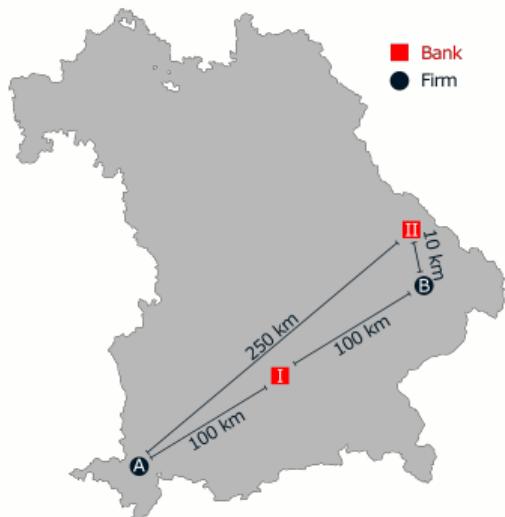
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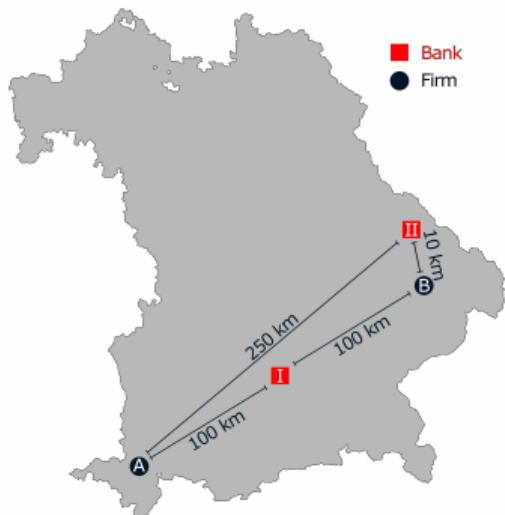
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Defining the Exposure Variable

- Banks at medium distance are just as important as banks in the neighborhood.
- Unlike in modern times, banks at large distances are unlikely relevant.

To incorporate these points, we compute an Exposure to Economic Activity (*EEA*) score:

$$EEA_{it} = \sum_{b \in B_t} \omega_b (1 + r)^{-\delta_{ib}}$$

Where:

- B_t is the set of all branches of *Great Bank* in year t .
- δ_{ib} is the distance (in km) between firm i and bank branch $b \in B$.
- The parameter $r \in (0, 1]$ captures the importance of distant branches for a firm's EEA score.
- The parameter ω_b captures how much bank b contributes to a firm's EEA score.

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EEA Score Intuition

Baseline Specification

- **Goal:** Estimate the causal effect of financial development on firms' real economic activity

$$Y_{it} = \beta_0 + \beta_1(EEA_{it} \times FinDep_i) + Z_{it} + \lambda_t + \varphi_i + \varepsilon_{it}$$

- We consider firms debt financing, growth, and profitability as dependent variables (Y_{it}).
- $EEA = 1$ if firm i 's EEA score is above the Q50 EEA score measured in 1901, and zero otherwise.
- $FinDep = 1$ if firm i operates in capital-intensive sectors (e.g., Mining, Chemicals, Transportation)
 - We control for firm and year fixed effects (λ_t and φ_i) and firm-level controls (Z_{it}).
 - Standard errors are clustered on the firm level; ε_{it} is the error term.

Importantly: direct firm-bank links are excluded, i.e., firms with a *Great Bank* as main lender and firms within 10km distance of a *Great Bank*. The sample is all post-crisis years, 1902–1914.

Financial Development and Debt Financing

Dep. Variable	Debt-to-Asset Ratio		
	(1)	(2)	(3)
$EEA \times FinDep$	0.040*** (0.012)	0.030*** (0.010)	0.021** (0.009)
EEA	-0.023*** (0.009)	-0.023*** (0.007)	-0.016** (0.007)
$FinDep$	-0.104*** (0.011)		
Minimum Dist. (km)	10	10	10
Year FE		✓	✓
Firm FE		✓	✓
Firm-Level Controls			✓
Y	0.496	0.496	0.496
N	18837	18837	18837

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- Post-crisis shifts in regional exposure to *Great Banks* raise debt financing of *FinDep* firms.
- The treatment effect (0.021) is economically significant, suggesting a 4.3% debt-ratio increase.

Financial Development and Debt Financing

Dep. Variable	Debt-to-Asset Ratio						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$EEA \times FinDep$	0.040*** (0.012)	0.030*** (0.010)	0.021** (0.009)	0.022** (0.010)	0.021** (0.010)	0.022** (0.011)	0.034** (0.014)
EEA	-0.023*** (0.009)	-0.023*** (0.007)	-0.016** (0.007)	-0.019*** (0.007)	-0.018** (0.008)	-0.027*** (0.008)	-0.033*** (0.010)
$FinDep$	-0.104*** (0.011)						
Minimum Dist. (km)	10	10	10	20	30	40	50
Year FE		✓	✓	✓	✓	✓	✓
Firm FE		✓	✓	✓	✓	✓	✓
Firm-Level Controls		✓	✓	✓	✓	✓	✓
Y	0.496	0.496	0.496	0.495	0.495	0.494	0.492
N	18837	18837	18837	16444	14009	11846	9203

- Post-crisis shifts in regional exposure to *Great Banks* raise debt financing of *FinDep* firms.
- The treatment effect (0.021) is economically significant, suggesting a 4.3% debt-ratio increase.
- There are geographical spillovers of up to 50 km.
- However, the effect vanishes with increasing distance to closest *Great Bank*.

Financial Development and Debt Financing

Dep. Variable	Debt-to-Asset Ratio									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
$EEA \times FinDep$	0.040*** (0.012)	0.030*** (0.010)	0.021** (0.009)	0.022** (0.010)	0.021** (0.010)	0.022** (0.011)	0.034** (0.014)	0.010 (0.020)	0.012 (0.042)	-0.022 (0.090)
EEA	-0.023*** (0.009)	-0.023*** (0.007)	-0.016** (0.007)	-0.019*** (0.007)	-0.018** (0.008)	-0.027*** (0.008)	-0.033*** (0.010)	-0.016 (0.015)	-0.014 (0.025)	-0.035 (0.038)
$FinDep$	-0.104*** (0.011)									
Minimum Dist. (km)	10	10	10	20	30	40	50	60	70	80
Year FE		✓	✓	✓	✓	✓	✓	✓	✓	✓
Firm FE		✓	✓	✓	✓	✓	✓	✓	✓	✓
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Financial Development and Real Economic Activity

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	(1)	(2)	(3)	(4)	(5)
<i>EEA × FinDep</i>	0.021** (0.009)	0.078*** (0.025)	0.005 (0.011)	0.186** (0.087)	0.004 (0.003)
Minimum Dist. (km)	10	10	10	10	10
Year FE	✓	✓	✓	✓	✓
Firm FE	✓	✓	✓	✓	✓
Firm-Level Controls	✓	✓	✓	✓	✓
Ȳ	0.496	14.244	0.473	12.201	0.028
N	18837	18837	18837	18837	18837

- Firms that raise debt financing after post-crisis shifts in regional exposure to *Great Banks* exhibit significant higher asset and revenue growth than control group firms.
- No such effects are discovered for profitability and fixed assets.

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Split Sample Regressions

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	Full Sample	$\downarrow EEA^{OB}$	$\uparrow EEA^{OB}$	Full Sample	$\downarrow EEA^{OB}$	$\uparrow EEA^{OB}$
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$EEA \times FinDep$	0.021** (0.009)	0.027** (0.012)	-0.007 (0.015)	0.186** (0.087)	0.373*** (0.133)	-0.094 (0.107)
Minimum Dist. (km)	10	10	10	10	10	10
Year FE	✓	✓	✓	✓	✓	✓
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Firm-Level Controls	✓	✓	✓	✓	✓	✓
Ȳ	0.496	0.493	0.500	12.201	12.022	12.374
N	18837	9061	9545	18837	9061	9545

- Debt financing and revenues increase more strongly for firms exposed to relatively low degrees of ex-ante exposure to other joint-stock banks.
⇒ Supports “Access to Finance”-argument.
- No such difference can be found for total assets.

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Outlook

- Several small (but important) data issues will keep us occupied. Most importantly, we plan to add firm-level patent information.
- We plan to augment the current data by utilizing person-level information to further enhance firm-bank network construction.
- This allows us to also investigate a further dimension → *Great Banks* as strategic investors.

Thanks a lot for listening!

Appendix

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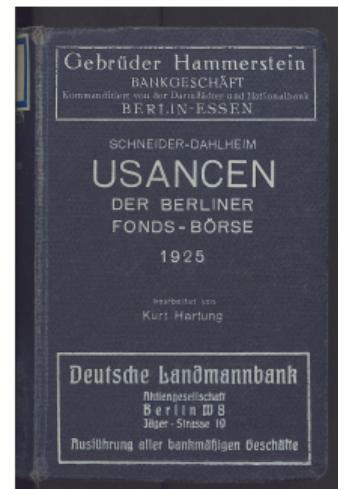
Data Sources

We extract information from different sources

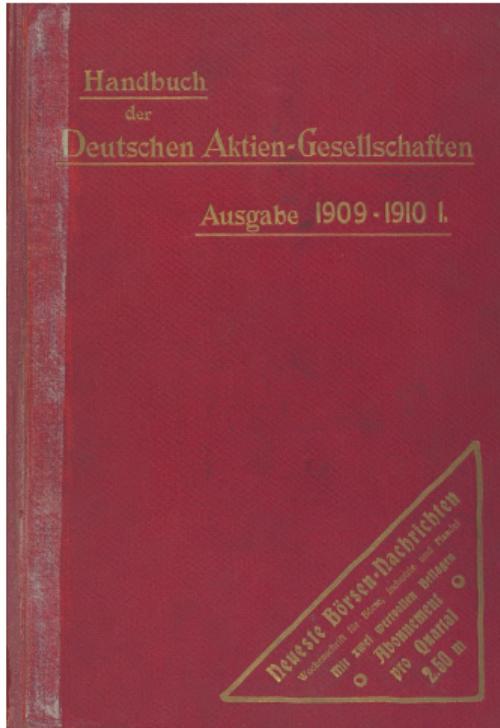
1. Handbuch der Deutschen Aktiengesellschaften (HdAG)
2. Berliner Börsenzeitung (BZZ)
3. Usancen der Berliner Fonds-Börse



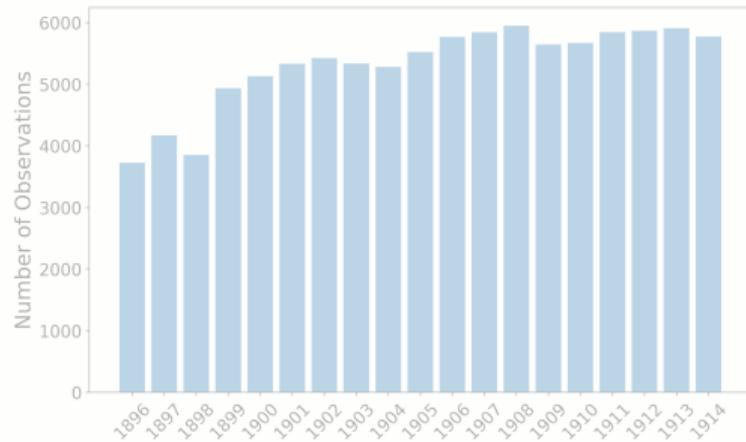
Jahrgang IV.		Kurzzettel der Berliner Börsen-Zeitung														
Band I		Nummer 122												Berlin, 26. Juli 1910		
Vereinigte Aktiengesellschaften der Deutschen Börsen	Aktiengesellschaften die in Deutschland bzw. im Ausland nicht beteiligt sind	Börsenkurse und Handelsnotizen der Deutschen Börsen													Kommanditieren von Darmstädter und Hoffnungsbank	BERLIN-ESSEN
		Zeitung	Kapital	Gewinn	Rücklagen											



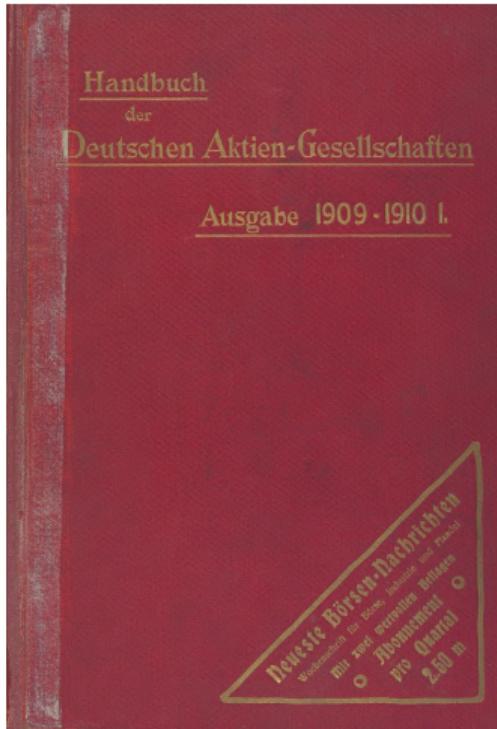
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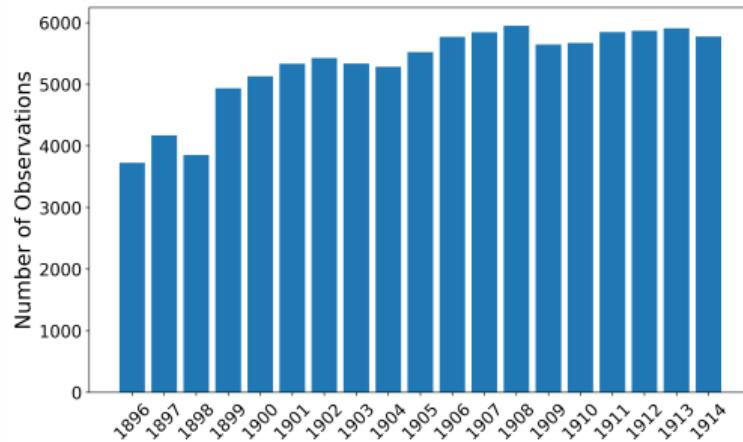
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- **Covers the university of German joint-stock companies**



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The Primary Source: *Handbuch der Deutschen Aktiengesellschaften*

Süddeutsche Donau-Dampfschiffahrts-Gesellschaft
in **München**, mit Betriebsdirektion in Wien, Obere Donaustrasse 57.

Gegründet: 28. Dez. 1888. Letzte Statutenänder. vom 8. Juni 1895.
Zweck: Güterverfrachtung auf der Donau. Die Ges. übernahm 1895 sämtliche Aktiven der
Drau-Dampfschiffahrt-Unternehmung Schenker & Co., A. Henry gegen M. 1 307 000 Aktien
al pari. Die Flotte bestand Ende 1898 aus 9 Dampfern, 47 eisernen und 26 hölzernen
Schleppkähnen.

Kapital: M. 2 000 000 in 2000 Aktien à M. 1000, auf den Inhaber lautend.
Prior.-Anleihe: M. 2 000 000 in 4%_o Oblig., rückzahlbar ab 1897 mit 103%_o. Ausl. im Sept.
auf 2. Jan. Ausgelost bis Ende 1898: M. 27 000, noch unbegeben M. 1 958 000.

Geschäftsjahr: Kalenderjahr. **Gen.-Vers.:** Bis Ende April in München oder Berlin.
Stimmrecht: 1 Aktie = 1 St. **Gewinn-Verteilung:** 5%_o zum R.-F., bis 4%_o Div., vom verbleib.
Überschuss 6%_o Tant. an A.-R. Rest zur Verf. d. G.-V.

Bilanz am 31. Dez. 1898: Aktiva: Schiffspark 3 467 597, Stationsinventare 72 158, Immobilien
177 113, Mobilien 13 713, Material- u. Requisitenvorräte 139 637, Kassa 35 408, Kautionskto
29 808, Effekten (unbegebene Oblig.) 1 958 000, Debitorien 307 660, Verlust 144 046. —
Passiva: A.-K. 2 000 000, Oblig. 1 973 000, R.-F. 6434, Kreditoren 2 365 710, Sa. M. 6 345 145.

Gewinn- u. Verlust-Konto: Debet: Centralverwaltung 122 645, nautischer Dienst 48 503,
Schiffsdienst 696 477, Stationsdienst 80 580, Steuern u. Gebühren 9049, Zs. 97 110, Schiffs-
verkauf 13 218, Abschreib. 120 000. — Kredit: Saldo a. 1897 3638, Thalfrachten 76 669,
Bergfrachten 913 069, Remorque 27 955, verschiedene Einnahmen 22 207, Verlust 144 046.
Sa. M. 1 187 586.

Reservefonds: M. 6434. **Dividenden 1891—98:** 0, 0, 0, 0, 5, 0, 0%_o. Coup.-Verj.: 4 J. n. F.

Direktion: Gen.-Dir. Anton Henry, Wien; Jos. Schnell, München.

Aufsichtsrat: Vors. Bankdir. Carl Fürstenberg, Berlin; Stellv. Komm.-Rat Otto von Pfister,
München; Konsul Arthur von Rosencrantz, Dresden; Joh. N. Mayr, München; Emil
Karpeles, Wien. **Prokuristen:** Charles Souchay, Carl Marchetti, Wien; Jos. Lutz, München.

Firmenzeichnung: Zwei Vorst. oder ein Vorst. mit einem Prok. oder zwei Prok.

Zahlstellen: München: Gesellschaftskasse; Berlin: Berliner Handels-Gesellschaft.

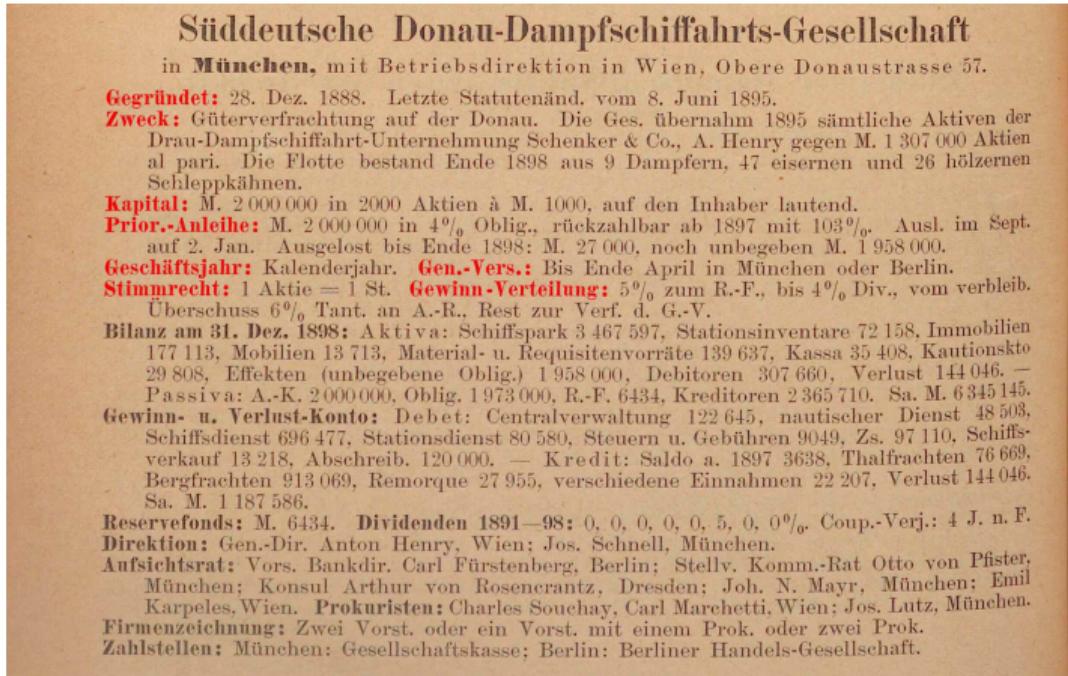
- Name and location
- General information
- Balance sheet, P&L statement
- Management & supervisory board
- Fiscal agencies (*Zahlstellen*)

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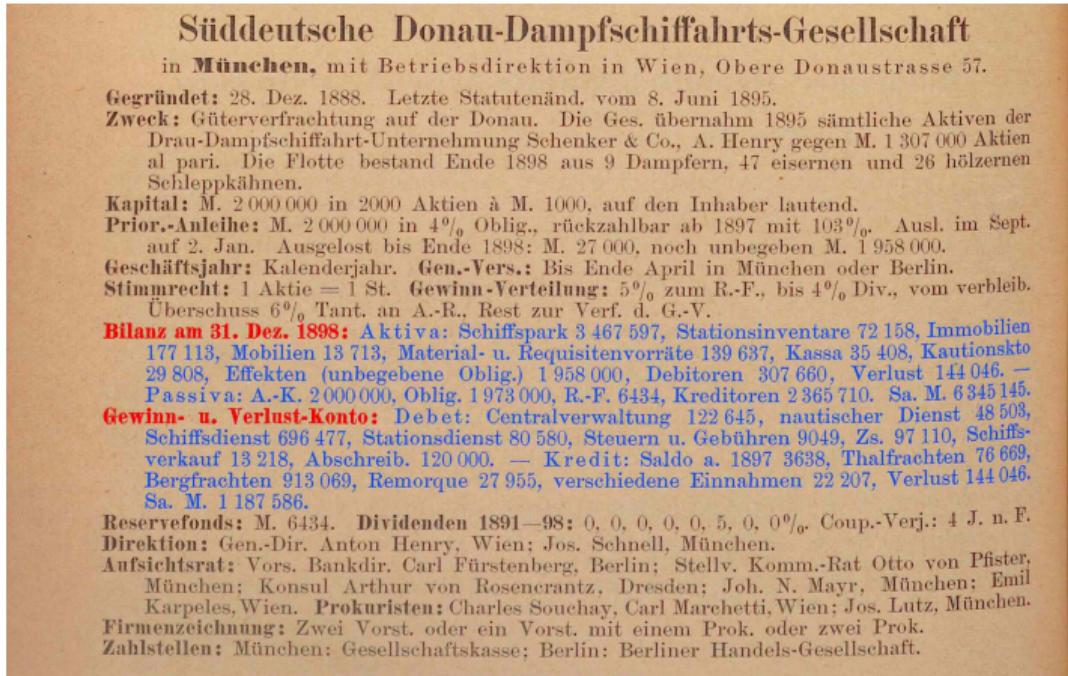
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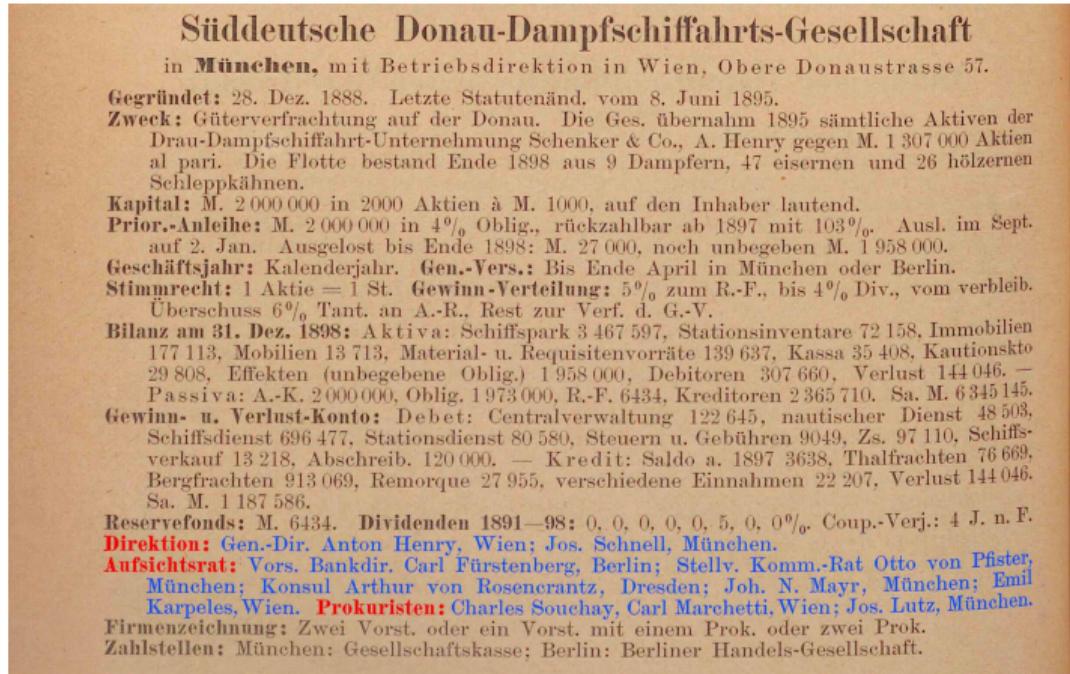
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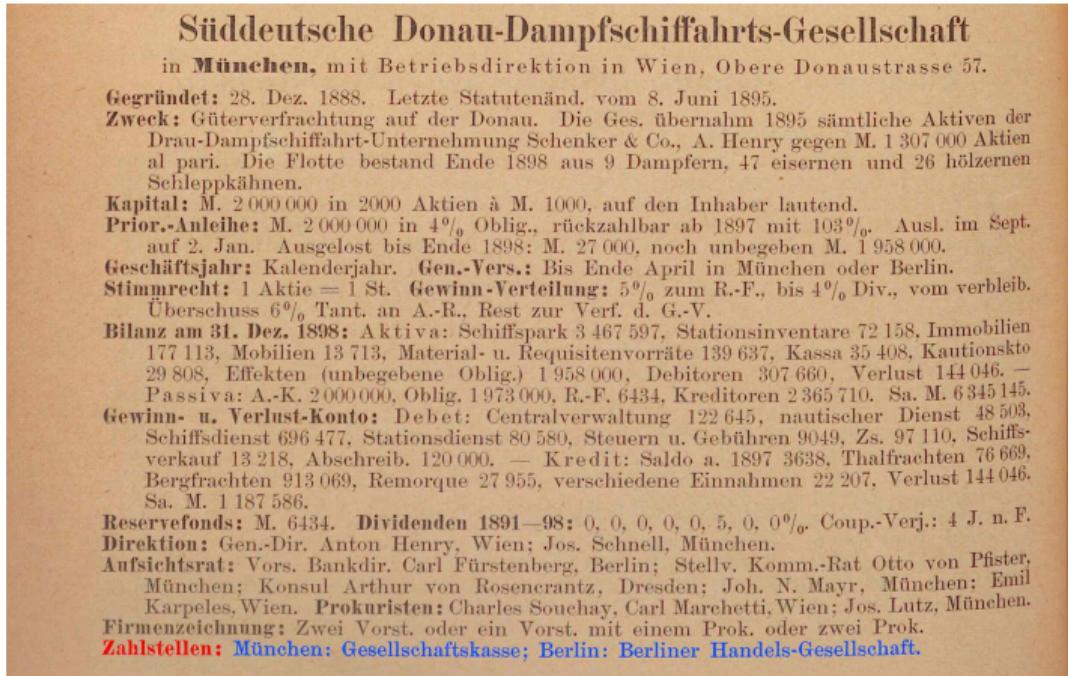
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Data Generation Process in a Nutshell



Optical Character Recognition (OCR)

- Project partner UB Mannheim
- incl. scanning, pre-processing, line straightening
- Tesseract 5.x



Input & derived Layer

- OCR Output to PostgreSQL instance
- Line type classification
- Collapsing to firm-year level



Linking Layer

- Introduce panel ID to cross-sectional data
- NeerMatch (Machine Learning Similarity Encoding Matching)
- Firms & persons



Combination & export layer

- Parsing
- Harmonization



Tesseract

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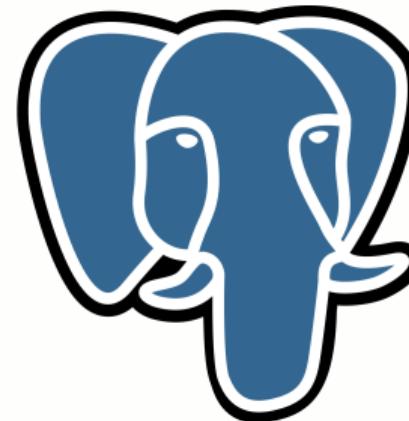
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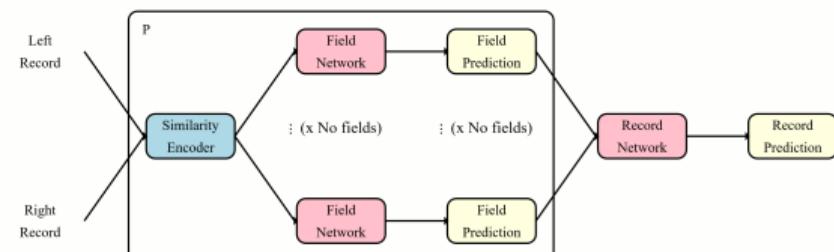
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Sample Generation and Description

- Following this procedure, we obtain 100,996 firm-year entries for 1896–1914.
 - We drop observations with missing assets and those with inconsistent balance sheet sums.
 - As a precautionary step, we exclude observations with likely OCR errors and singletons.
 - We manually checked location and industry information.
- Final data: 61,460 observations, 7,646 individual firms, 24 states, 49 industrial sectors.

Variable	Obs.	Mean	SD	Q25	Median	Q75
<i>TotalAssets</i> (in million M.)	61460	3.92	5.41	0.90	1.94	4.23
<i>AssetGrowth</i>	51904	0.04	0.10	-0.01	0.01	0.07
<i>PPE</i> (in million M.)	61460	1.26	1.57	0.23	0.68	1.58
<i>Tangibility</i>	61460	0.44	0.28	0.21	0.45	0.65
<i>DebtRatio</i>	61460	0.50	0.21	0.36	0.50	0.64
<i>CashRatio</i>	61460	0.04	0.07	0.00	0.01	0.05
<i>Depreciation</i> (in million M.)	61460	0.06	0.10	0	0.02	0.07
<i>Profitability</i> (RoA)	61460	0.03	0.05	0	0.02	0.05
<i>Age</i>	61460	17.36	13.13	7	14	26

State	Obs.	in Percent
<i>Preußen</i>	31274	50.89
<i>Sachsen</i>	6619	10.77
<i>Bayern</i>	5756	9.37
<i>Baden</i>	2619	4.26
<i>Elsaß-Lothringen</i>	1993	3.24
<i>Hamburg</i>	1952	3.18
<i>Württemberg</i>	1942	3.16
<i>Bremen</i>	1506	2.45
<i>Braunschweig</i>	1478	2.40
<i>Hessen</i>	1054	1.71

Industry Overview

Geography

Quality Check: Estimating a Capital Structure Equation

Dep. Variable	Debt-to-Asset Ratio	
	(1)	(2)
log(Revenue)	0.021*** (0.001)	0.016*** (0.001)
Tangibility	0.014* (0.007)	0.022*** (0.007)
CashRatio	-0.067*** (0.018)	-0.089*** (0.017)
Profitability	-0.303*** (0.022)	-0.247*** (0.022)
Year FE		✓
Firm FE	✓	✓
R ² (adjusted)	0.706	0.720
N	60587	60587

- As a validation check, we estimate a common capital structure equation (Frank & Goyal, 2008):

$$\text{Debt} = f(\text{FirmSize}, \text{Collateral}, \text{Cash}, \text{Profitability})$$

- All coefficients show the expected sign, emphasizing the validity of the data.

Agenda

1. Data and Sample Construction
2. The Banking Sector's Transformation: Context and Descriptive Findings
3. Empirical Strategy and Preliminary Results
4. Summary, Outlook, and Conclusion

Institutional Context

Political, financial economic integration

- Foundation of the German Empire (1871)
- Unified Commercial (HGB) and Civil Code (BGB) (1900)
- Establishment of the *Reichsbank* (1876)
- Monetary union with introduction of the *Mark* (1871-1876)

Major pieces of legislation

- General incorporation & end of concession system (1870)
- 1884 Corporations Act: Strengthening Banks' Systemic Role
(Burhop et al., 2018)



Increased Demand for (long-term) financing

- Emergence of modern industrial enterprises (Fohlin, 2007)
- Rapid economic growth
- Globalization required large-scale, fixed investment

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Different Types of Banks

Private Bank

- Operating locally since the late 18th century.
- Predominantly invested in low-risk securities.
- Provision of short-term finance & investment banking services.

Cooperatives

- Emerged in the 1850s.
- Urban regions: short-term credit to private small businesses.
- Rural areas: long-term credit to the agricultural sector.

Joint-Stock Credit Banks

- Initially founded to increase the capital base.
- Universal banking: wide array of services Levine 2005
- Provision of long-term credit to the industrial sector.



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The Emergence of the *Great Banks*

Among the joint-stock banks, eight so-called *Great Banks* stood out:

Related Literature

- Holding about 50% of all the joint-stock banks' assets in 1900.
- "reigned over the Berlin Stock Exchange" (Kocka, 1975, p.100).
- Used proxy voting rights to appoint board members, allowing them to actively shape company policies and strategies (Guinnane, 2002).

Crisis of 1900-1902 as catalyst:

- Need for risk diversification & chance to further increase dominance
→ Geographic expansion
- "The reign of the banks over the industrial capital" (Hilferding, 1910)

List of *Great Banks*

- Deutsche Bank
- Dresdner Bank
- Disconto Gesellschaft
- Darmstädter Bank (BfHI)
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The Great Banks' Ties to the Industry

Closeness to industry: “*German banks [...] established the closest possible relations with industrial enterprises [, accompanying them] from the cradle to the grave, from establishment to liquidation throughout all the vicissitudes of its existence.*”
(Gerschenkron, 1962, p.14)

Control over industry: “*Banks acquired a formidable degree of ascendancy over industrial enterprises, which extended far beyond the sphere of financial control into that of entrepreneurial and managerial decisions.*” (Gerschenkron, 1962, p.14)

Exertion of control:

- Supervisory board meetings (up to monthly)
- Investment, production, and personnel decisions

Anecdote

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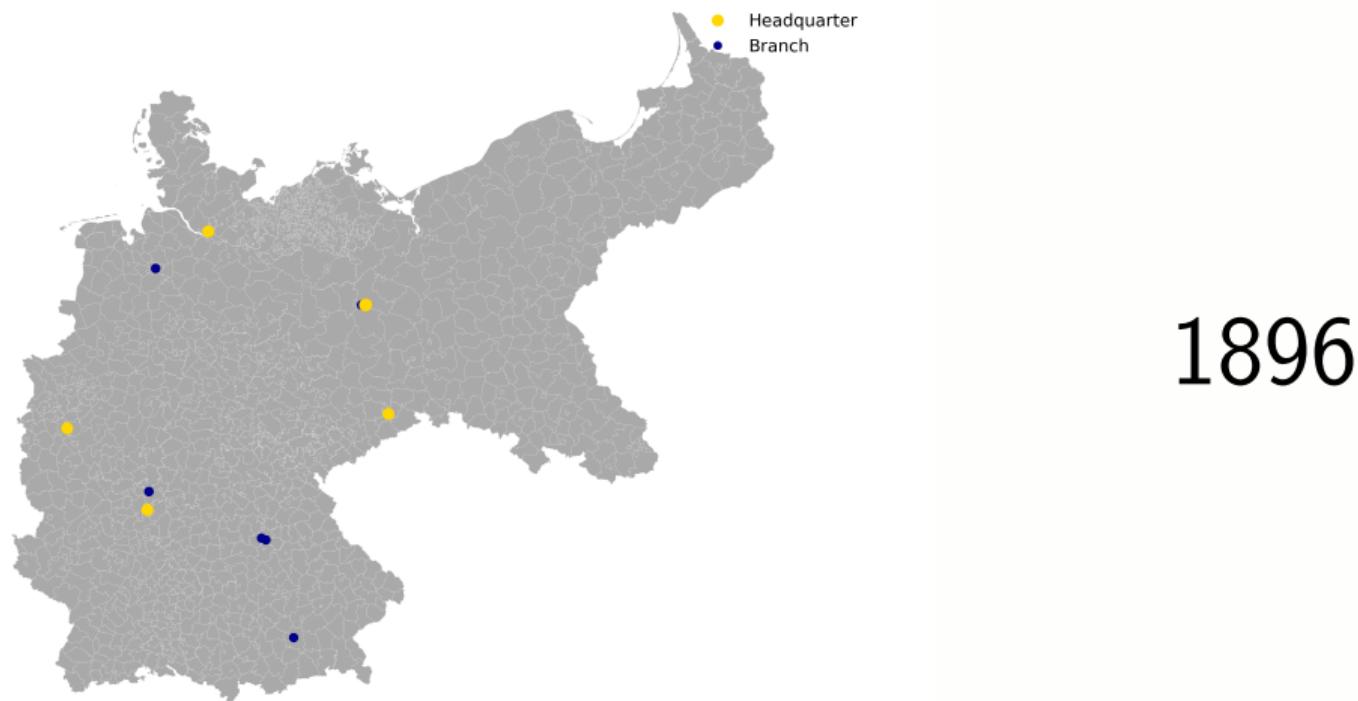
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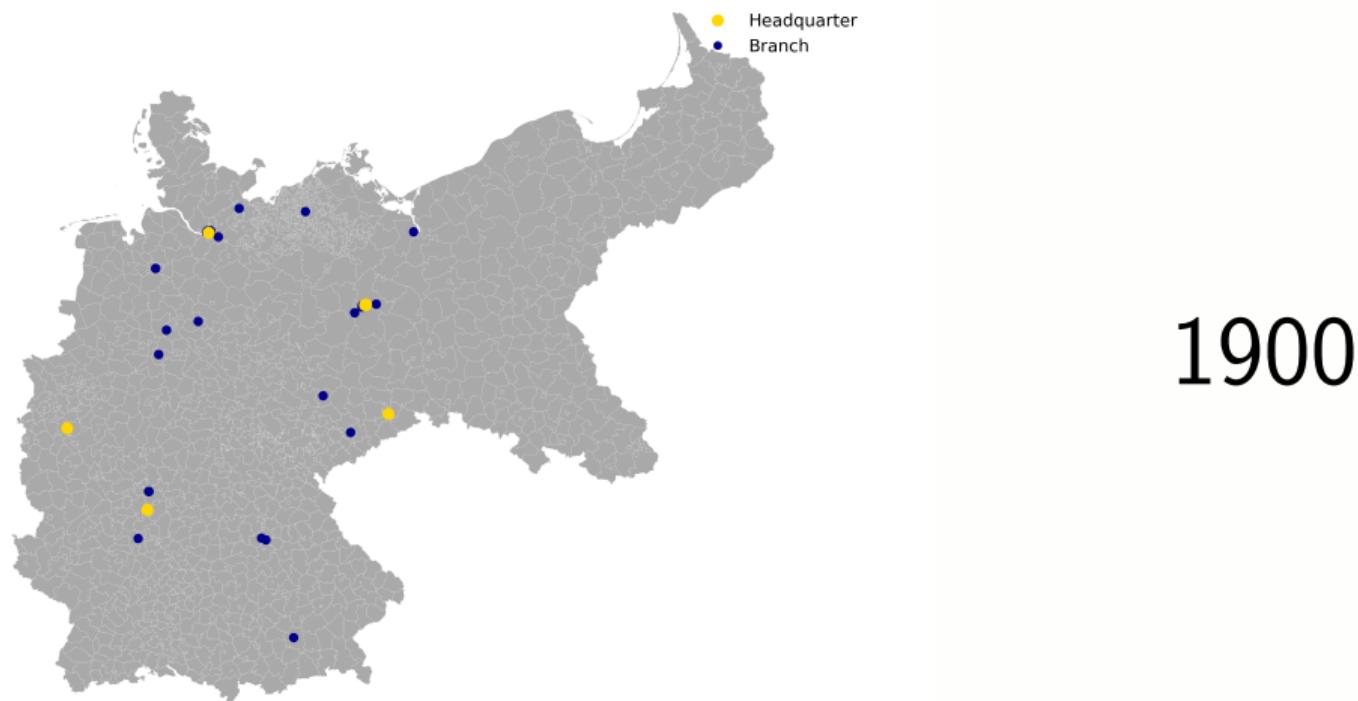
The Transformation of the Banking Sector in Imperial Germany

Evidence on the expansion of the Great Banks across Imperial Germany (1896–1914)



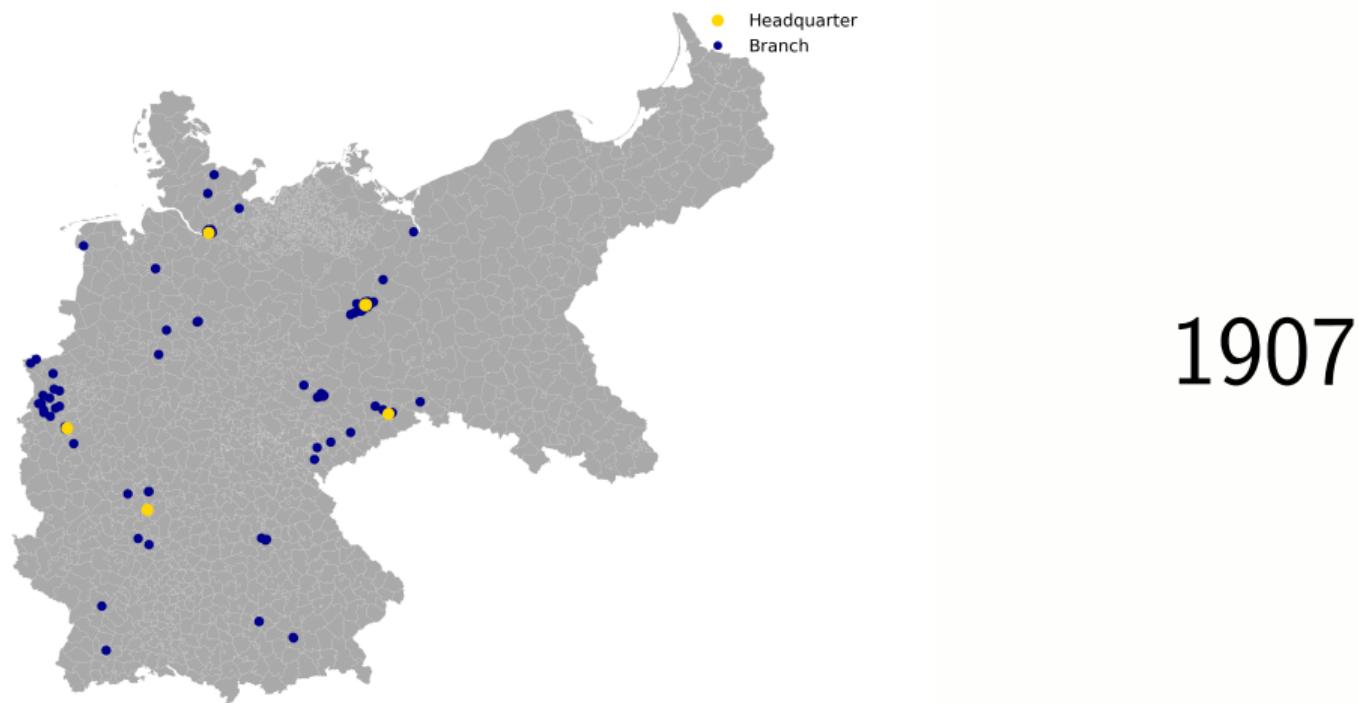
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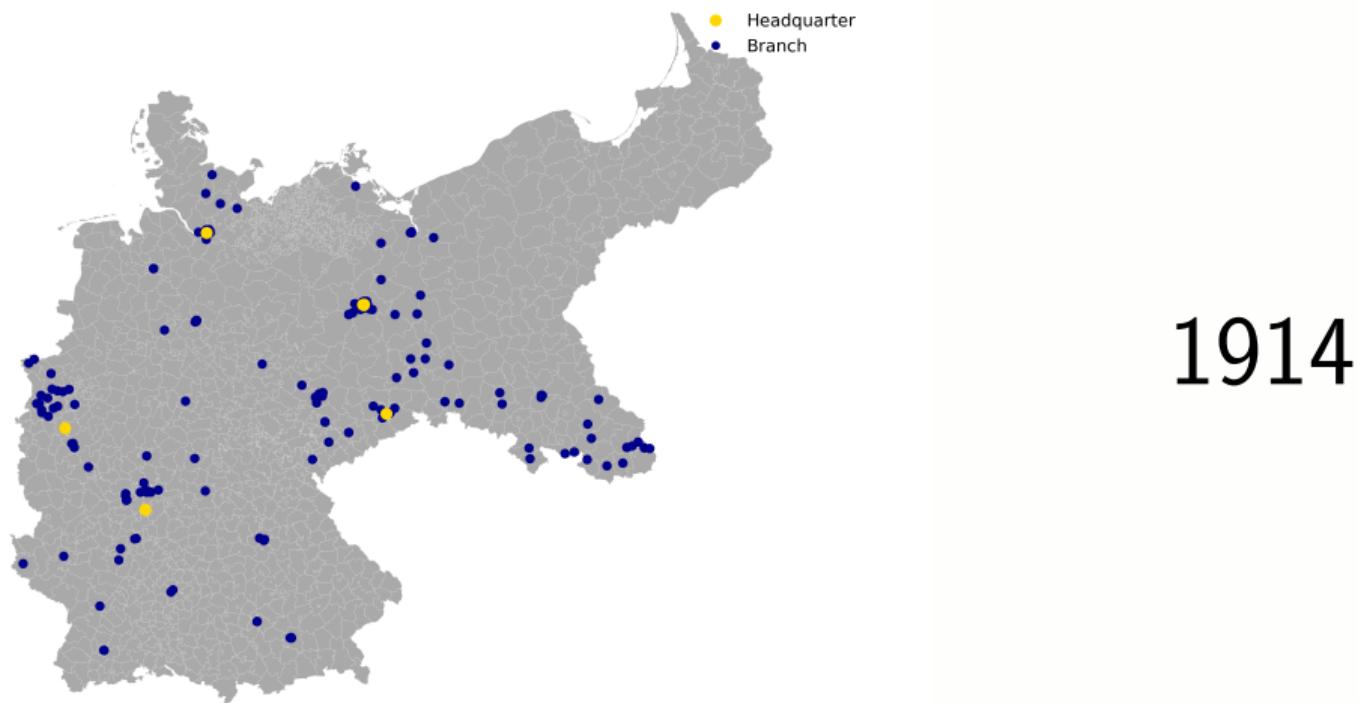
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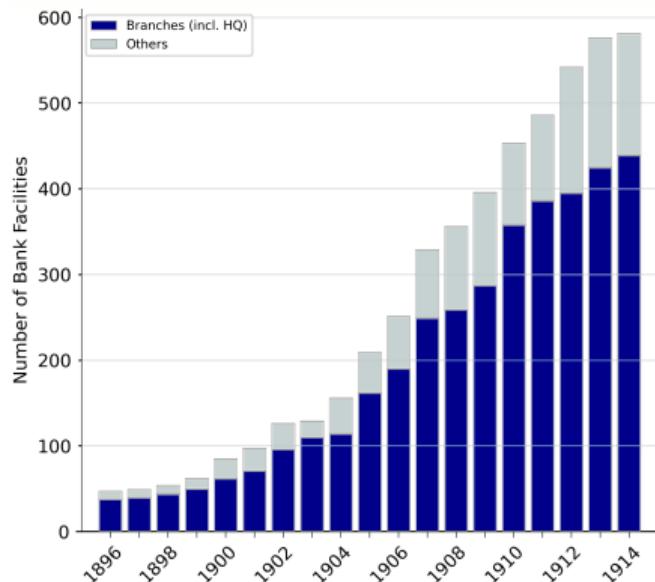
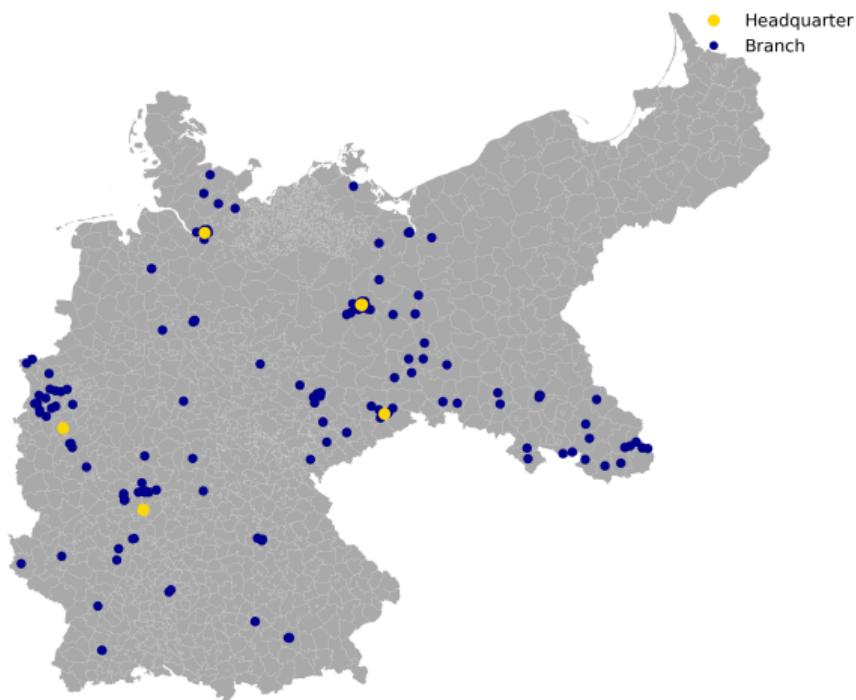
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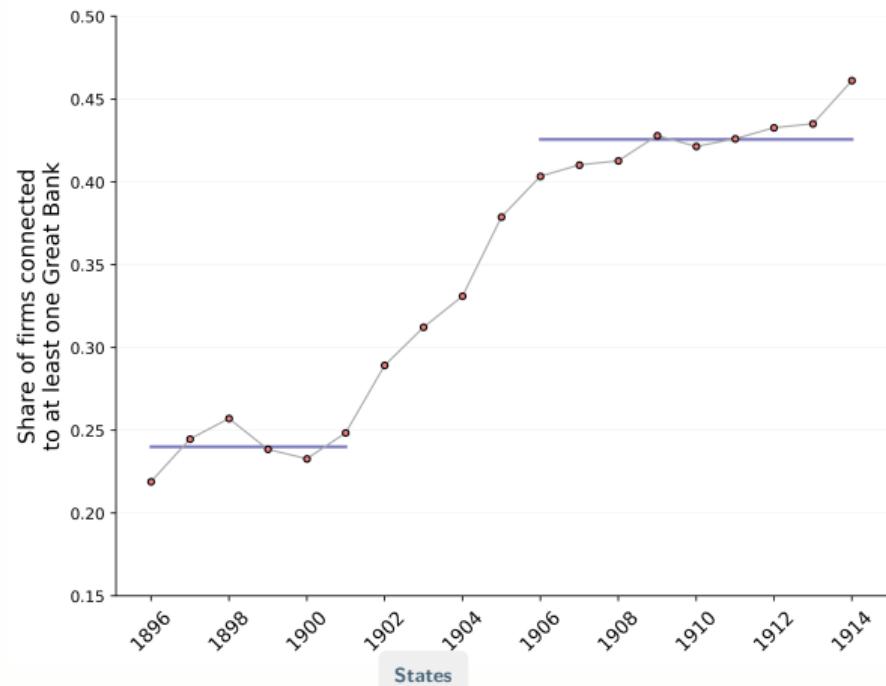
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The Transformation of the Banking Sector in Imperial Germany

The number of firms linked to the Great Banks surged, especially since the early 1900s.

[...] the fiscal agencies [“Zahlstellen”] supply a means whereby the industrial connections of the great banks may be measured.” (Riesser, 1911, p.370)



PE firms implement three sets of changes (S. N. Kaplan & Strömberg, 2009)

- Financial engineering
 - Management incentives via stock and options (S. Kaplan, 1989a)
 - Debt restructuring to reduce *Free Cash Flow Problems* and increase interest tax shield (Jensen, 1986; S. Kaplan, 1989b)
- Governance engineering
 - Control over the firms' board
 - Active governance through frequent meetings (Acharya et al., 2013)
 - Personnel decisions (management replacement and board composition) (Acharya et al., 2013; Hellmann & Puri, 2002)
- Operational engineering (Gompers et al., 2015)
 - redefining the company's strategy / business model
 - cost reduction, etc.

The new role of the *Great Banks*: The case of Mannesmannröhren-Werk AG



MANNESMANN

- Founded in 1890 in Berlin, the company's home bank had been *Deutsche Bank*
- After the economic crisis of 1900, Deutsche Bank "essentially took over the firm":
(Gall et al. 1995; Guinnane 2002)
 - Reorganized management board.
 - Directed investment decisions.
 - Business restructuring in 1908.
- Mannesmann first developed into Germany's leading industrial-pipe producer and subsequently became one of Germany's largest steel producer.
- Geographic proximity as key driver to exert control: both Mannesmann and Deutsche Bank were headquartered in Berlin.

Sectoral Distribution of Sample Firms

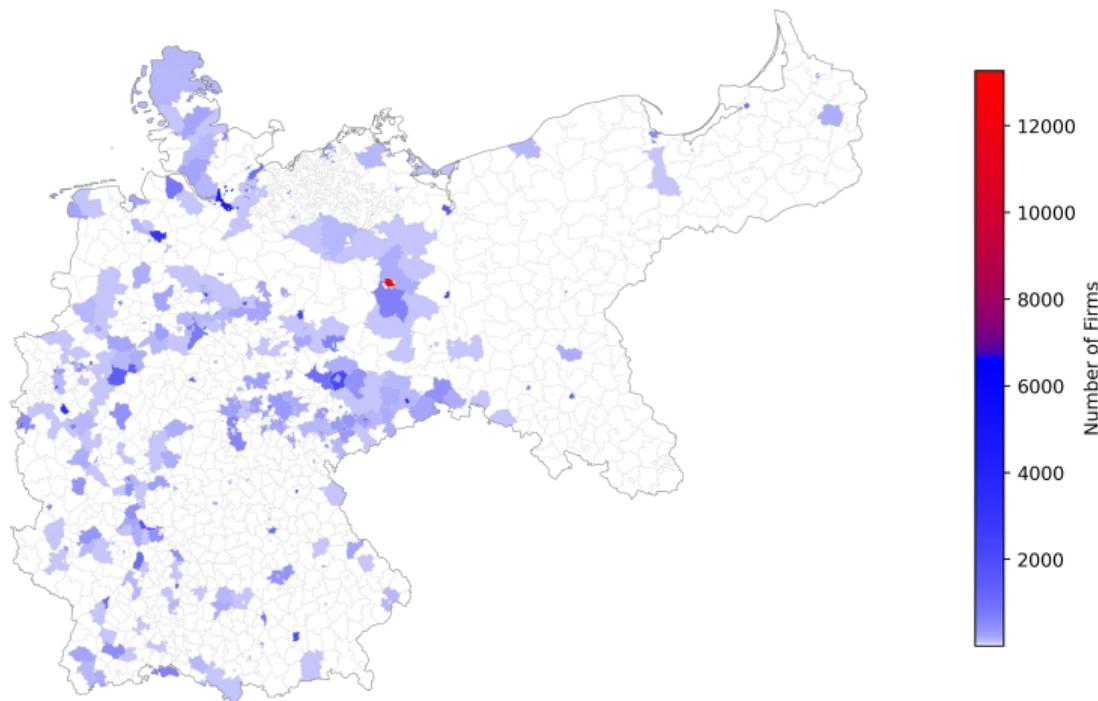
[Back](#)

Sector	Obs.	Percent	Median Firm Size (in Million Marks)
Breweries	7680	12.50	2.01
Textiles	5626	9.16	2.63
Machinery, Foundries & Steel	4977	8.10	2.07
Building Materials & Industrial Minerals	4430	7.21	1.35
Credit Banking	3792	6.17	5.63
Mining & Metals	3522	5.73	4.70
Construction Finance & Real Estate	2857	4.65	2.16
Sugar Production	2833	4.61	1.23
General Transportation	2502	4.07	1.94
Chemicals & Plastics	2329	3.79	2.23
Metal Industry	2012	3.27	1.79
Electrical Equipment & Utilities	1671	2.72	2.88
Utilities	1618	2.63	0.40
Railways	1515	2.47	2.26
Paper Production	1469	2.39	1.88
Printing & Publishing	1422	2.31	0.76
General Food & Beverage	1243	2.02	1.18
Steamship & Harbor Services	1187	1.93	1.74
General Banking	1151	1.87	2.27
Mills & Bakeries	1057	1.72	1.45

Geographic Distribution of Sample Firms

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Bremen	1506	2.45
Braunschweig	1478	2.40
Hessen	1054	1.71
Anhalt	551	0.90
Oldenburg	502	0.82
Mecklenburg-Schwerin	340	0.55
Sachsen-Meiningen	305	0.50
Reuß jüngerer Linie	297	0.48
Sachsen-Altenburg	294	0.48
Lübeck	284	0.46
Sachsen-Coburg-Gotha	175	0.28
Schwarzburg-Sondershausen	158	0.26
Lippe	146	0.24
Mecklenburg-Strelitz	141	0.23
Schwarzburg-Rudolstadt	117	0.19
Reuß älterer Linie	72	0.12
Waldeck und Pyrmont	12	0.02





The financial system' five main functions (intermediaries & markets):

1. Production of ex-ante information about investment opportunities.
2. Ex-post monitoring of investments.
3. Trading, diversifications, and management of risks.
4. Mobilization and pooling of savings.
5. Exchange of goods and services.
 - Source Levine (2005)

- A notable body of research **qualitatively** investigates the Banking-Growth-Nexus in Imperial Germany. (Jeidels, 1905; Hilferding, 1910; Riesser, 1911; Gerschenkron, 1962; Kindleberger, 2015)
- Only few **quantitative** studies exist:
 - Burhop (2006) Time series analyses of aggregate capital stock and financial depth show that the *Great Banks* influenced economic development between 1851 and 1882 but not in later periods.
 - Becht & Ramirez (2003) Steel and mining firms with close links to the *Great Banks* were less liquidity constraint in the early 20th century.
 - Fohlin (1998) Investment of firms connected to the *Great Banks* is more sensitive to internal liquidity than for others.
 - Fohlin (2007) No correlation between firm performance and connection to the *Great Banks*.

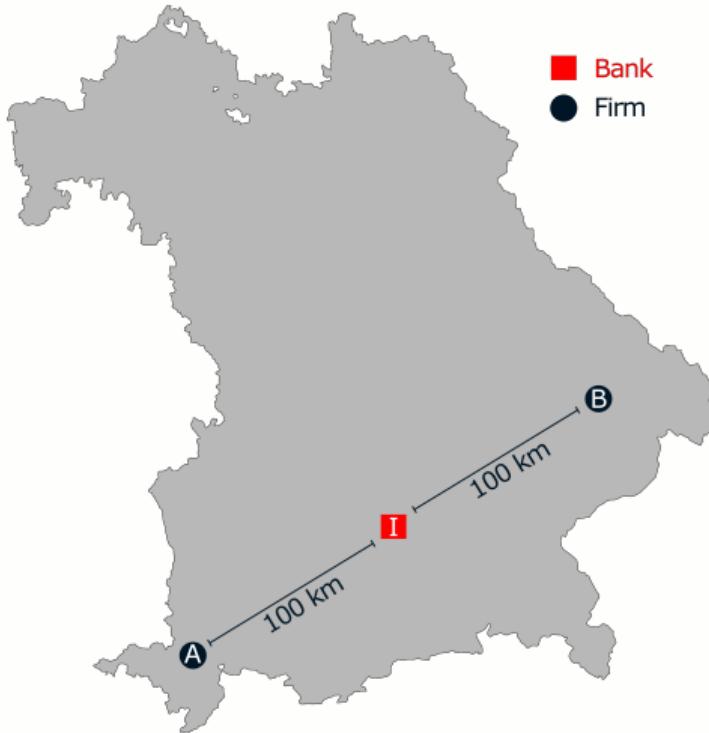
The *EEA Score's* Intuition

$$EEA_{it} = \sum_{b \in B_t} \omega_b (1 + r)^{-\delta_{ib}}$$

We assume:

$$r = 0.03 \text{ (Liebald, 2024)} \quad \& \quad \omega = (B - b + 1)/B$$

The *EEA Score's* Intuition

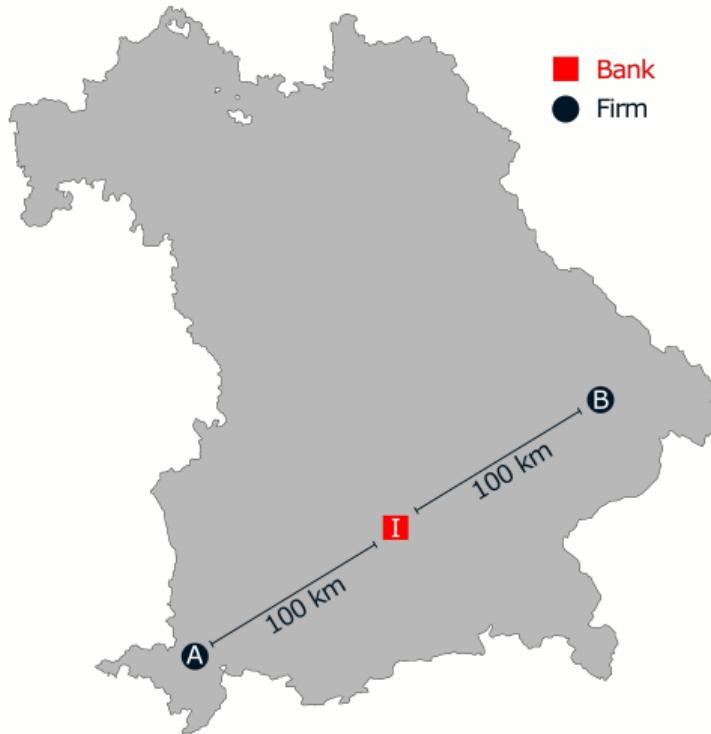


$$EEA_{it} = \sum_{b \in B_t} \omega_b (1 + r)^{-\delta_{ib}}$$

We assume:

$$r = 0.03 \text{ (Liebald, 2024)} \quad \& \quad \omega = (B - b + 1)/B$$

The *EEA Score's* Intuition



$$EEA_{it} = \sum_{b \in B_t} \omega_b (1 + r)^{-\delta_{ib}}$$

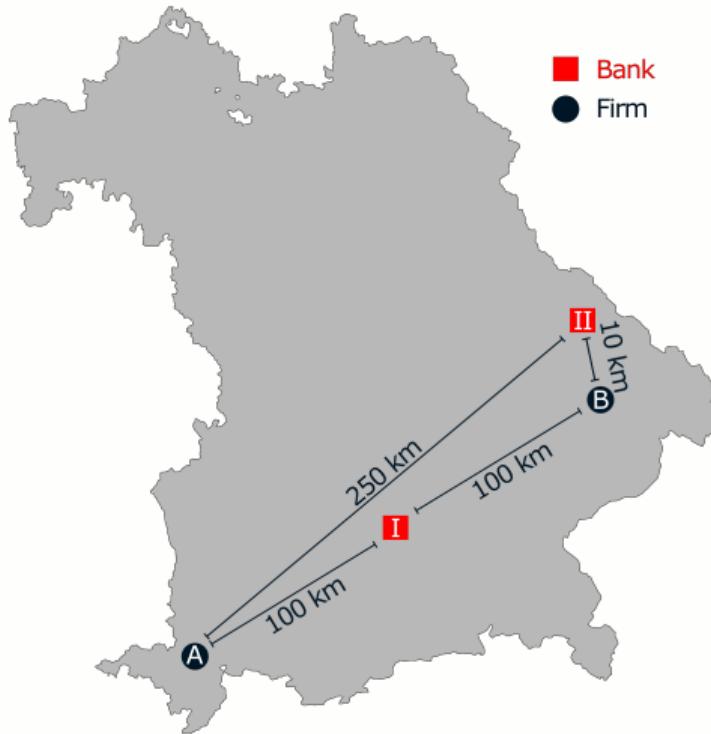
We assume:

$$r = 0.03 \text{ (Liebald, 2024)} \quad \& \quad \omega = (B - b + 1)/B$$

Firm A: $EEA_{t=1} = 1(1.03)^{-100} = 0.052$

Firm B: $EEA_{t=1} = 1(1.03)^{-100} = 0.052$

The *EEA Score's* Intuition



■ Bank
● Firm

$$EEA_{it} = \sum_{b \in B_t} \omega_b (1 + r)^{-\delta_{ib}}$$

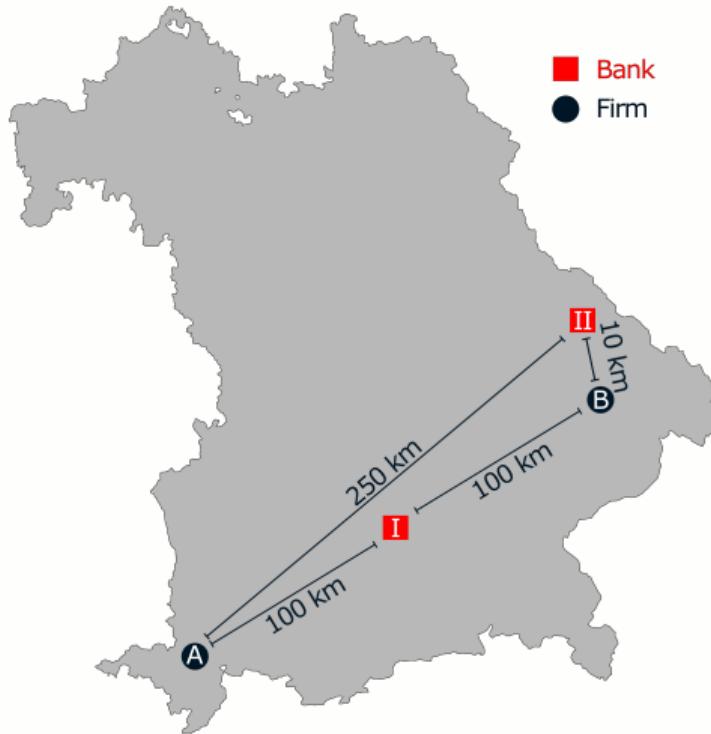
We assume:

$$r = 0.03 \text{ (Liebald, 2024)} \quad \& \quad \omega = (B - b + 1)/B$$

Firm A: $EEA_{t=1} = 1(1.03)^{-100} = 0.052$

Firm B: $EEA_{t=1} = 1(1.03)^{-100} = 0.052$

The *EEA Score's* Intuition



$$EEA_{it} = \sum_{b \in B_t} \omega_b (1 + r)^{-\delta_{ib}}$$

We assume:

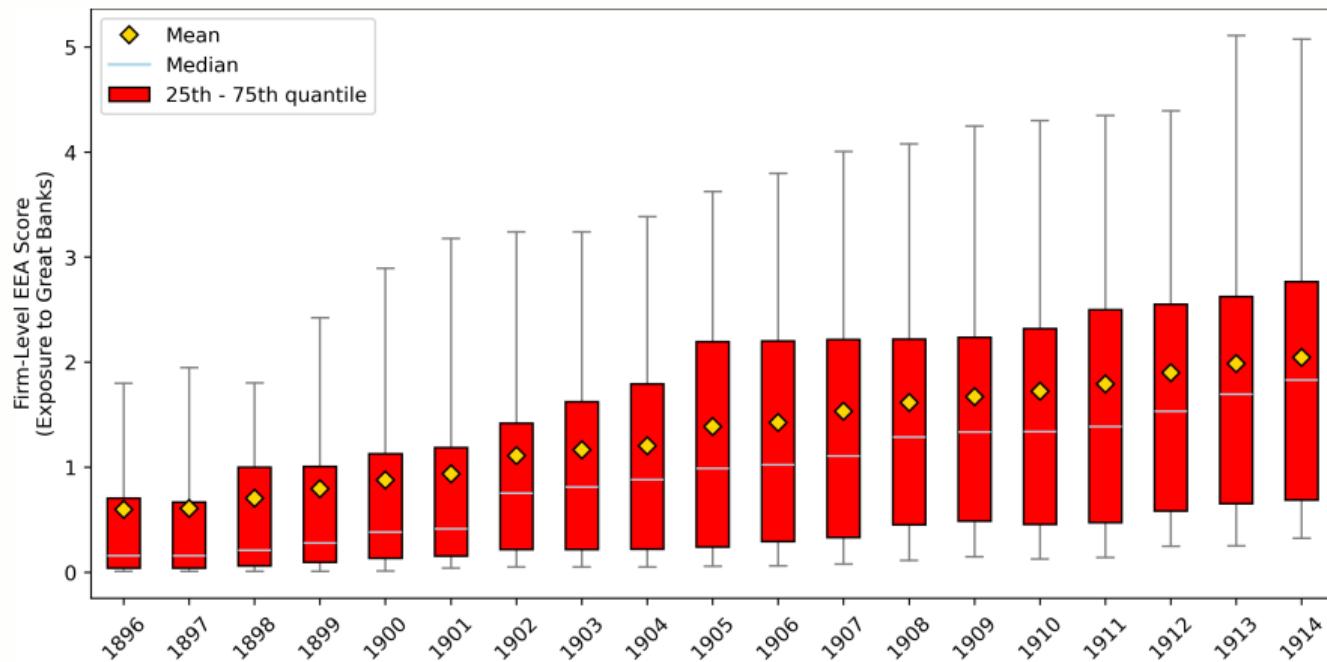
$$r = 0.03 \text{ (Liebald, 2024)} \quad \& \quad \omega = (B - b + 1)/B$$

Firm A: $EEA_{t=2} = 1(1.03)^{-100} + \frac{1}{2}(1.03)^{-250} = \mathbf{0.053}$

Firm B: $EEA_{t=2} = 1(1.03)^{-10} + \frac{1}{2}(1.03)^{-100} = \mathbf{0.796}$

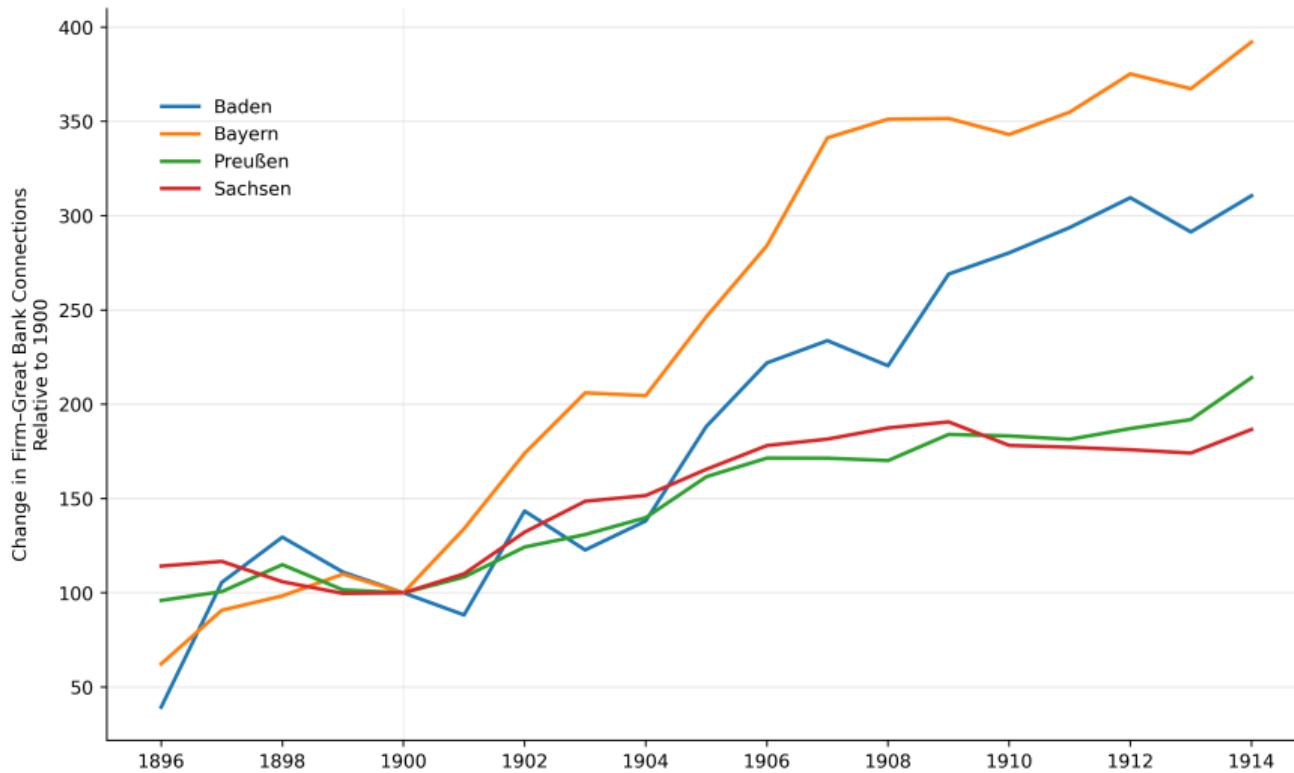
Exposure to *Great Banks* Over Time

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Great Bank-Firm Links Across States

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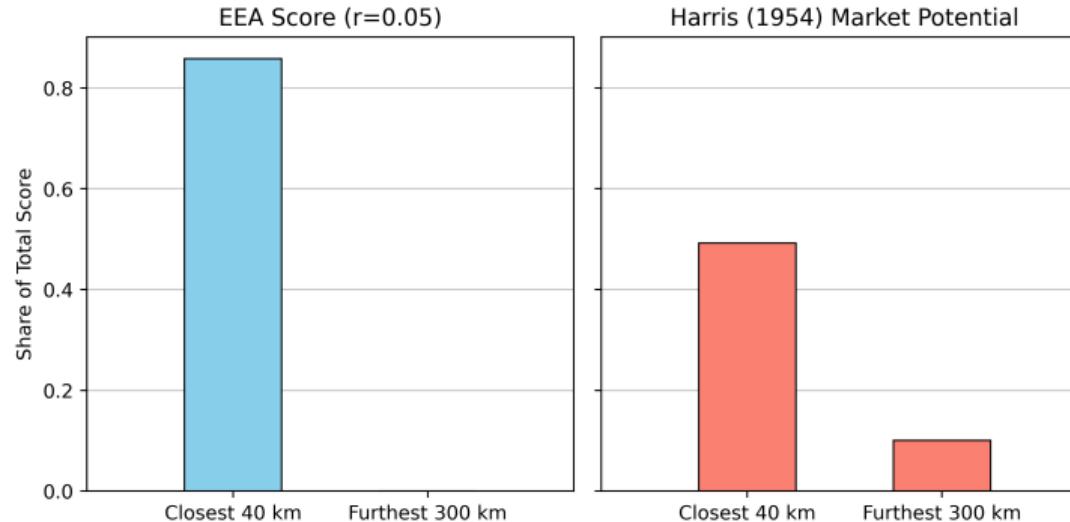


Exponential vs. Power-Law Decay

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$$EEA_i = \sum_{b \in B_t} (1 + r)^{-\delta_{ib}}$$

$$MP_i = \sum_{b \in B_t} \frac{M_b}{\delta_{ib}^\alpha}$$



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