Interbank competition and financial stability: the case of Dutch cooperative banks in the early twentieth century

Christopher L Colvin, London School of Economics
(c.l.colvin@lse.ac.uk)
Supervisors: Drs Gerben Bakker & Max-Stephan Schulze

Standard paradigms of competition are inappropriate for the analysis of the banking sector due to the presence of strong information asymmetries in financial markets which simultaneously accord banks their *raison d'être* and their source of fragility (Freixas & Rochet, 2008). Unlike many other markets, there is no discernible relationship between the structure of banking markets and the competitive outcome. For instance, a market with just two banks can be very competitive if customers can easily switch their business between them. The nature of the relationship between competition and financial stability is controversial (Berger et al., 2009). The traditional view is that competition encourages bankers to take on high-risk projects, whilst bankers with market power are more risk averse as they stand to lose their monopoly rents. The revisionist view is that competition drives up interest paid out on deposits, reducing bankers' moral hazard and increasing stability.

This paper analyses the industrial organization of the Dutch rural market for small-scale deposits in the early twentieth century. It first measures the nature and level of competition for deposits between *boerenleenbanken,* rural cooperative microfinance banks that dominated this market. It does so for the year 1919, a relatively stable point immediately after the First World War and immediately before a financial crisis. It then determines the nature of the relationship between interbank competition and bank-level financial stability in the Dutch case. This case study is useful because its peculiarities permit the isolation of the two key factors that influence competition in banking: transaction and information switching costs, the first in this case associated with geographic distance and the second with religious segregation. The analysis combines a cross-section of balance sheet financial performance data pertaining to 1,141 banks with socioreligious data from the closest census year, farming survey data, and land registry topographical data.

The ownership structure of *boerenleenbanken* brings particular challenges; cooperatives' business objectives differ significantly from conventional firms as they are owned and run by groups of their customers. This paper meets these challenges by applying intuition from the so-called new industrial organization literature to the specific Dutch historical context; it abandons the traditional structure-conduct-performance (SCP) paradigm and instead infers behaviour directly from an appropriate performance measure. This paper finds that both transaction and information switching costs are important determinants of banks' market power, and finds some evidence of a non-linear relationship between the level of competition and banks' financial stability that is negative up to a cut-off point. This suggests that the traditional view may hold true for interwar Dutch rural financial markets.

Competition and switching costs

Carbó et al. (2009) provide a comprehensive review of the different competition measures used in the banking literature. The most popular is the Herfindahl index, which measures the size of firms in relation to the market. This measure is problematic, especially when applied to banking markets. Bos et al. (2009) show empirically that Herfindahl indices suffer from the fallacy of division, where inferences from the fact that a whole (the market) has a property, to the conclusion that a part of that whole (a single bank) also has that property prove false; not every bank benefits equally from an increase in market concentration. Measurement problems aside, the SCP paradigm, implicit in works that measure competition using Herfindahl indices, has fallen out of fashion because it treats market structure as exogenous, whilst in practice firms' conduct (behaviour) can influence market structure in a feedback loop. This criticism aside, it is often difficult to arrive at defendable (geographic) market definitions in the first place, especially in historical research, rendering Herfindahl indices incalculable.

This study avoids the criticisms lodged at SCP analysis and the problems with Herfindahl indices by inferring conduct directly from performance. It adapts the Boone (2008) competition measure to the incentive structure present in cooperative banks. According to Boone, firms are punished more harshly for inefficiency the more competitive is the market in which they operate. The idea is that competition should homogenize banks' performance, controlling for various other factors. Banks whose performance diverges significantly from the norm are hypothesized to benefit from market power (or suffer from lack thereof), through switching costs. The profit measure Boone uses to infer performance is inappropriate for the incentive structure present in *boerenleenbanken*, cooperatives similar to Germany's Raiffeisen banks (cf. Guinnane, 2001), i.e. with unlimited liability lending, voluntary management, no dividend payments, and bank networks with central audit and clearinghouses (Sluyterman et al., 1998). The principle objective of *boerenleenbanken* was to increase their stock of savings deposits (liabilities), not their profits. Where a conventional firm seeks to maximize returns for its owners and managers, a cooperative's owners and managers maximize their returns by minimizing those of the organization that they co-use, co-own and co-manage. This is partly achieved through charging below-market interest on loans and paying above-market interest on savings. It is only large-scale deposit gathering that afforded *boerenleenbanken* the possibility of lending out a small portion of their liabilities at "mates' rates".

Dutch market data for small-scale rural savings permit the isolation of transaction from information switching costs given the country's social segregation by religious affiliation, a phenomenon known as the *verzuiling* (pillarization) (De Rooy, 1995). Independent Raiffeisen-style banks sprang up across rural areas from the 1890s and dominated the market by the late 1910s. Nearly all joined one of three cooperative networks: a Christian/Catholic network headquartered in Eindhoven (469 members), a neutral *de facto* Protestant network headquartered in Utrecht (627 members), and a small Catholic network headquartered in Alkmaar (45 members). The Netherlands was in many areas religiously divided, and so villages often had two or more banks, one for each network. The data employed pertain to every *boerenleenbank* operating in 1919 that belonged to a network. Other financial service providers are not analysed, a limitation of this study. The geographic distance between banks, a measure of transport costs or spatial competition that follows Degryse & Ongena (2005), is calculated using topographical data. Census data report the religious make-up of each municipality, a measure of information costs; Protestant cooperators may be unable to accurately monitor Catholic farmers' efforts as they belong to a different church community.

Definitions of and summary statistics for the variables used are reported in Table 1. The models measure the effect of switching costs on the average annual percentage growth in savings held at bank *i* over the year 1919 ($growth_i$), or identify the source of banks' market power. Model (1) is as follows:

$$growth_i = \beta_0 + \beta_1 distown_i + \beta_2 distother_i + \beta_3 cathbank_i + \beta_4 majbank_i + u_i \quad (1)$$

where $distown_i$ and $distother_i$ capture transaction costs and are expected to have positive coefficients if these are indeed important, whilst $cathbank_i$ and $majbank_i$ capture information costs. Model (2) adds nine variables to control for factors that do not relate to switching costs directly, but instead to the economic attractiveness of bank *i* to (potential) savers and the economic circumstance of (potential) savers themselves. Model (3) adds farming region fixed effects.

The coefficients of the distance variables (β_1 and β_2) are positive and significant in model (1), suggesting that larger distances bring more market power. The relative difference in their size suggests that banks compete less with neighbours of a different network. The addition of control variables in models (2) and (3) reduces the significance of the second measure, strengthening this finding. The location of banks is endogenous in that banks are likely established where there is some demand for their services. This further strengthens the relationship as it systematically biases results against showing a distance effect. Adding fixed effects in model (3) improves the significance of the coefficients of the religious segregation variables (β_3 and β_4), suggesting that switching to a bank affiliated with a different Christian denomination within the same farming region is costly. But the significance of many of the control variables suggests that farmers deposited their savings where it was most beneficial for them to do so, not only out of religious attachment.

Table 1: *Summary statistics for sample of 1,081 banks for 1919*

Variable	Description	Mean	St. Dev.	Min.	Max.
growth	growth in savings deposits over year, %	24.66	44.66	-85.36	616.24
distown	distance to neighbour in same network, km	3.76	2.17	0.01	28.60
distother	distance to neighbour in another network, km	18.76	18.06	0.06	75.23
cathbank	dummy=1 if bank is Catholic	0.45	0.50	0	1
majbank	dummy=1 if bank of area's majority religion	0.84	0.37	0	1
IR	interest rate paid out by clearinghouse, %	3.76	0.05	3.75	4
D/M	depositor to member ratio	1.18	0.91	0.08	12.23
d/l	total deposits to total loans ratio	12.89	82.56	0	1,994.64
accs	savings accounts, number	216.80	167.08	3	1804
age	age of bank, years	10.43	5.36	0	22
perccath	Catholics in bank's area, %	47.91	40.51	0	100
percagri	agricultural land, %	43.80	24.94	1.80	93.83
percown	farms owner-occupied, %	49.05	18.09	11.15	98.85

Note: 60 (new) banks were eliminated from the original 1,141-bank sample after distances were calculated, as their deposit growth is incalculable.

Table 2: *Cross-sectional OLS regressions of the percentage growth rate in savings over 1919*

Variable	Model (1)		Model (2)		Model (3)	
	Coefficient	(P-value)	Coefficient	(P-value)	Coefficient	(P-value)
constant	13.366	(0.023)	37.672	(0.649)	-9.585	(0.922)
distown	1.492	(0.056)	1.988	(0.004)	1.795	(0.030)
distother	0.192	(0.014)	0.076	(0.338)	-0.040	(0.815)
cathbank	-6.456	(0.018)	-6.496	(0.173)	-9.660	(0.026)
majbank	5.912	(0.184)	2.809	(0.461)	-2.328	(0.602)
IR			8.117	(0.705)	21.214	(0.398)
D/M			-3.888	(0.002)	-2.394	(0.051)
d/l			0.011	(0.228)	0.011	(0.185)
accs			-0.012	(0.033)	-0.004	(0.545)
age			-10.592	(0.000)	-11.262	(0.000)
age^2			0.395	(0.000)	0.425	(0.000)
perccath			-0.001	(0.984)	-0.001	(0.996)
percagri			0.123	(0.031)	0.047	(0.685)
percown			0.169	(0.031)	0.343	(0.105)
fixed effects?	no		no		yes	
n	1,081		1,081		1,081	
R^2	0.018		0.204		0.295	

Note: P-values (in parentheses), obtained from Huber-White robust standard errors, are the probabilities of obtaining a result at least as extreme as the ones observed. Fixed effects correspond to 83 farming regions defined by Directie van den Landbouw (1920).

Liquidity, solvency and competition

Bank stability is difficult to measure and requires the combined use of financial ratios for liquidity and solvency. Liquidity describes banks' short-term ability to meet withdrawal demand whilst solvency is their longer-term viability as going concerns. Maintaining a certain degree of liquidity is necessary to meet (unexpected) withdrawal demand from depositors. Without external intervention, illiquidity may lead to insolvency; with central bank (or other) lender-of-last-resort (LLR) provision, temporarily illiquid but otherwise solvent banks can be saved. But during a crisis, illiquidity and insolvency are hard to differentiate (Goodhart, 1999). And to complicate matters further, an illiquid (or less liquid) bank may be more solvent than a liquid one; a bank may be able to sustain its business with low levels of liquidity exactly because it enjoys LLR provision, or because of other institutional, economic or political factors.

Table 3: *Summary statistics for sample of 1,128 banks for 1919*

Variable	Description	Mean	St. Dev.	Min.	Max.
LiqRat	most liquid assets to total assets, %	45.08	26.03	0	99.51
MatProf	callable loans to long-term loans	1,386.10	13,995.86	0	284,996
SolvRat	long-term assets to long-term liabilities, %	39.04	51.38	0	1,156.86
distown	distance to neighbour in same network, km	3.79	2.19	0	28.60
distcentral	distance to central clearinghouse, km	73.09	45.49	0.33	188.37
D/M	depositor to member ratio	1.77	0.92	0	12.23
accs	savings accounts, number	209.05	167.78	0	1,804
age	age of bank, years	10.01	5.62	0	22
perccath	Catholics in bank's area, %	47.75	40.56	0	100
percagri	agricultural land, %	43.98	24.86	1.81	93.83
percown	farms owner-occupied, %	49.23	18.30	11.16	98.85
Eindhoven	dummy=1 if CCB-Eindhoven member	0.41	0.49	0	1
Alkmaar	dummy=1 if CCCB-Alkmaar member	0.04	0.20	0	1
Utrecht	dummy=1 if CCRB-Utrecht member	0.55	0.50	0	1

Note: 13 banks were eliminated from the original 1,141-bank sample, as they took no deposits in 1919.

Table 4: *Cross-sectional Tobit regressions of liquidity and solvency in 1919*

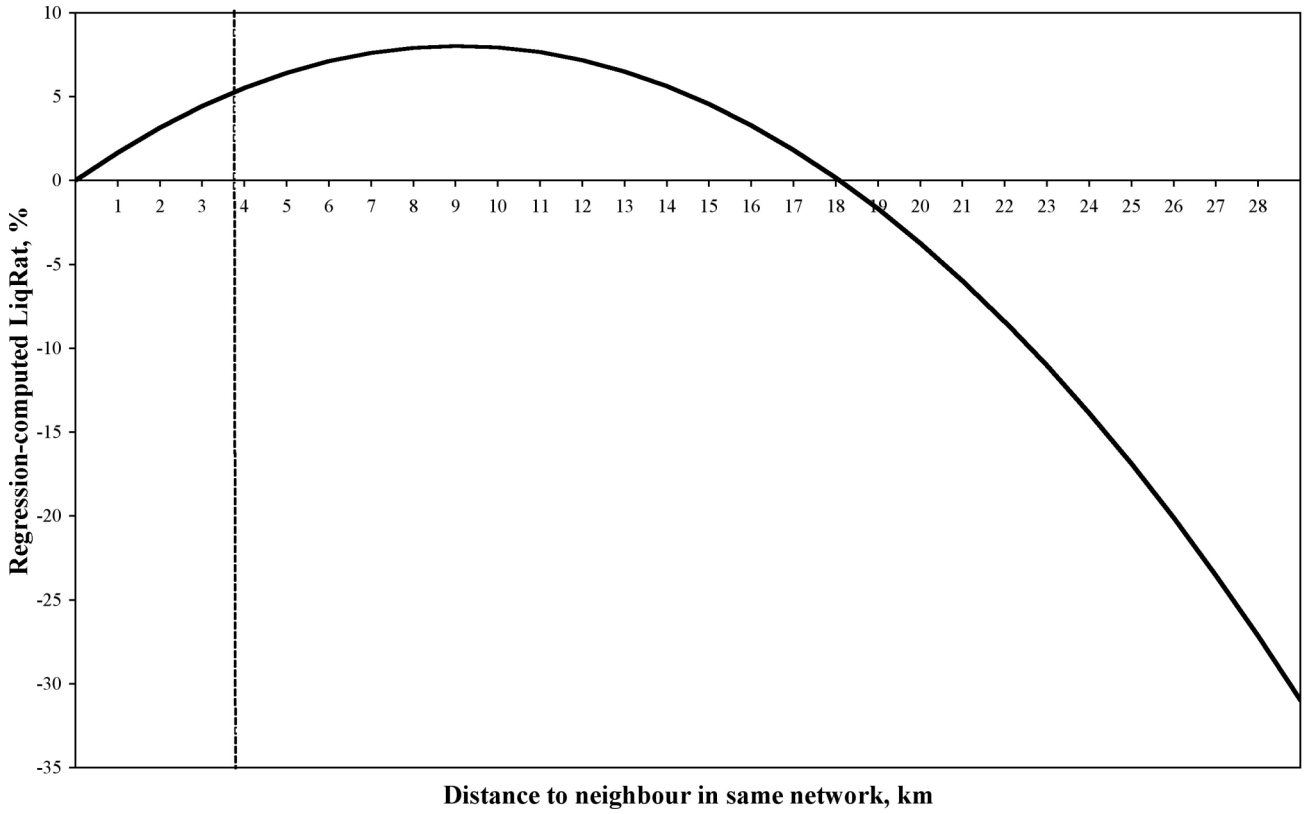
Dep. variable:	*LiqRat*		*MatProf*		*SolvRat*	
Variable	Model (4)		Model (5)		Model (6)	
	dy/dx	(P-value)	*dy/dx*	(P-value)	*dy/dx*	(P-value)
distown	1.326	(0.034)	-8.649	(0.961)	0.336	(0.695)
$distown^2$	-0.075	(0.037)	-9.229	(0.438)	-0.004	(0.932)
discentral	-0.124	(0.009)	-17.545	(0.139)	0.036	(0.578)
D/M	4.666	(0.000)	193.042	(0.330)	-5.455	(0.000)
accs	-0.023	(0.000)	0.030	(0.980)	0.009	(0.185)
age	-0.070	(0.864)	-15.533	(0.877)	-0.104	(0.852)
age^2	0.011	(0.565)	1.377	(0.762)	-0.004	(0.880)
perccath	-0.058	(0.106)	-3.739	(0.679)	0.083	(0.091)
percagri	0.537	(0.029)	42.690	(0.502)	-0.507	(0.131)
percown	-0.431	(0.044)	-24.956	(0.629)	0.232	(0.429)
Alkmaar	-21.161	(0.000)	-825.345	(0.525)	14.189	(0.084)
Utrecht	-8.721	(0.001)	-619.707	(0.360)	7.162	(0.051)
fixed effects?	yes		yes		yes	
n	1,128		1,128		1,128	
censored obs.	9		183		30	
McFadden-R^2	0.043		0.016		0.026	

Note: see Table 2.

The previous section argues that transaction costs proxied by distance are an indicator of interbank competition. Models (4), (5) and (6) attempt to explain liquidity and solvency with distance, the latter with two ratios as defined in Table 3; *MatProf* captures the maturity profile of banks' investments, whilst *SolvRat* measures balance sheet "mismatches". Censored Tobit regressions are used because the dependent variables are only observed at or above a cut-off point. The reported parameters in Table 4 are marginal effects, and can be read like OLS coefficients.

The combined quadratic effect of *distown* on *LiqRat* is depicted in Figure 1, and suggests that competition worsens banks' liquidity, but only if (potential) savers still consider a bank located further away to be a real alternative, reminiscent of Hotelling's (1929) linear city model. No competition effect is found on the two solvency ratios. Distance to a cooperative's central clearinghouse proves an important determinant of *LiqRat*; banks maintain less liquid portfolios the more distant they are from their clearinghouse. Agency costs measure *D/M* and the network dummy variables are important determinants of *SolvRat*. Network membership may capture the fact that only two of the networks' clearinghouses (CCB-Alkmaar and CCRB-Utrecht) enjoyed LLR access to the Dutch central bank.

Figure 1: *Combined effect of distown and distown*^{2} *on LiqRat*



Note: dashed vertical line is at mean value (3.79km).

Conclusion

This paper finds that distance to the closest neighbouring bank belonging to the same network is an important determinant of the growth in farmers' savings deposits, which in turn implies that banks competed with one another. It thus quantifies how rural religiosity did and did not affected farmers' choice of bank. This result could not have been gleaned from SCP analysis because it is impossible to define these banks' (geographic) market given the available data. This paper finds some limited evidence of a non-linear competition-stability relationship; the traditional view that competition worsens stability holds up to a cut-off point for one measure of bank-level stability. However, the complex relationship between liquidity and solvency means that this result may not explain the sector's subsequent good overall performance during the Dutch financial crisis of the early 1920s.

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