

# Cliques and Directors: Informal and Formal networks between Banks in Republican China

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## Abstract

This paper looks at the evolution of corporate networks with a case study of the domestic banking sector in Republican China during the turbulent Nanjing decade before the Japanese invasion. It explores and contrasts the underlying mechanisms for the evolution of formal networks, such as the interlocking directorate network, with informal networks, such as hometown connections. Utilizing RSiena methodology demonstrates the paper demonstrates the presence and relative importance of network effects, bank fundamentals, and the interaction between the different networks.

Early Stage Work, Missing citations

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# 1 Introduction

Firms are normally linked to other firms in a myriad of ways. One formal way of linkage is the existence of interlocking directorates, so the same person is a director for two distinct firms. Another set of linkage is informal with directors from two firms sharing some social or cultural connection. Modern domestic banks in interwar republican China had an extensive network of interlocking directorates throughout the whole sector (Kong and Ploeckl, 2022) and hometown cliques, so social connections between directors stemming from the same hometown, were an important social link between financial institutions at the time (cite Kong et al.). Both sets of connections can be traced out as networks between these banks, so this paper investigates the co-evolution between the two networks and their interactions during China's Golden Period.

The focus of the finance and financial history literatures is on the impact that such formal and informal networks had on the performance and other characteristics of firms, while substantially less attention is paid to the evolution and formation process of such networks. A main issue is the endogeneity of network links and the firm characteristics and performances in question, which a few common identification strategies such as IV or natural experiment type analyses. Overall, the indication is that network links matter, though the exact nature is of course network and context specific.

Modern domestic Chinese banks were domestically owned and managed banks patterned after their international, especially European counterparts. These banks arose towards the end of the Imperial reign, showed persistence throughout the warlord period, and flourished in number and size during the Nanjing decade before the outbreak of the war with Japan. These banks built a dense, though volatile, web of interlocking directorates throughout the whole sector (cite Kong and Ploeckl). At the same time, the importance of cliques, especially hometown-based ones, was extended from general business to the banking sector as well. The volatility in bank directors not only implied substantial turnover in Interlocking Directorates, it also implied substantial variation in the links of individual banks to specific hometown groups.

This paper takes a different approach and focuses on exploring the comparative evolution of these two networks to understand how different networks between firms co-evolve. It investigates the possible interdependence between formal and informal networks by looking at the co-evolution of the interlocking directorate network, a visible formal link between companies, and a connection network through hometown cliques, an informal link between companies. The context is the domestic Chinese banking sector during the Nanjing decade, which saw substantial turnover in directors, and therefore the interlocking directorate network as well as clique associations, of these banks. These dynamic developments provide an excellent context in which to explore the question of co-evolution.

Methodologically, the paper utilizes the RSiena method, which is a Stochastic Actor Oriented model approach to explore network evolution. The approach has been applied to the evolution of interlocking directorates (Kong and Ploeckl (2018), Finance papers) as well as informal networks (see lit on RSiena), but this is the first application to the co-evolution between the formal ID network and an informal linkage network.

## 2 Chinese Banks

Background information about Chinese banks, their organisation, management, relevance and role within the larger economy, as well as the political and economic context these banks were operating in during the time under study.

### 2.1 Interlocking Directorate

- Basic literature and discussion of formal bank networks and the interlocking directorate network
- Descriptive information about the Interlocking Directorate network of these Chinese banks
- One-mode network configuration

## 2.2 Hometown Clique

- Basic literature and discussion of informal bank networks such as hometown groups
- Descriptive information about the role of hometowns for Chinese banking
- Description of multiple layers of relationships
- Two-mode network configuration

## 3 Data

Data Set description - Interlocking directorate network data based on a data set from Kong and Ploeckl (2022)

- Hometown information based on additional collected biographical information about directors

- Other bank characteristics based on data set from Kong and Ploeckl (2022)

Description of data sets, including summary statistics for approximately 150 banks annually over four years.

## 4 Network Evolution

### 4.1 Methodology

Discussion of Siena methodology to study mechanisms for network evolution (Snijders et al., 2010) Discussion of endogeneity between both networks and within networks

### 4.2 Mechanisms

Introduction of main hypotheses to explain network evolution Discussion of mechanisms to test specified hypotheses

- network internal mechanisms (4-cycles, triads, etc)
- bank characteristics (size, ROA)
- network interdependence (influence between the two networks onto each other)

## **5 Results**

### **5.1 Individual network evolution**

Discussion of results of simulating the evolution of both networks individually with the network internal mechanisms as well as bank characteristics

## 5.2 Network co-evolution

Table 1: Co-Evolution between ID and Hometown networks.

Effect	par.	(s.e.)	<i>t</i> stat.
constant IDnetwork rate (period 1)	4.776	(0.521)	-
constant IDnetwork rate (period 2)	1.614	(0.155)	-
constant IDnetwork rate (period 3)	2.664	(0.254)	-
IDnetwork: degree (density)	-4.218***	(0.653)	-6.462
IDnetwork: transitive triads	1.313***	(0.114)	11.564
IDnetwork: betweenness	0.163**	(0.057)	2.847
IDnetwork: 4-cycles (1)	-0.044***	(0.005)	-9.015
IDnetwork: BankTypeNW	0.414***	(0.104)	3.980
IDnetwork: TotalAssets alter	0.191***	(0.030)	6.400
IDnetwork: RoA alter	0.224**	(0.085)	2.630
IDnetwork: RoA abs. difference	-0.298**	(0.094)	-3.179
IDnetwork: BoardSize squared ego	0.026*	(0.012)	2.196
IDnetwork: outdeg.(sqrt) BankGroups activity	-0.900*	(0.429)	-2.100
IDnetwork: from BankGroups agreement	-0.259 <sup>†</sup>	(0.137)	-1.892
constant BankGroups rate (period 1)	1.050	(0.153)	-
constant BankGroups rate (period 2)	0.401	(0.077)	-
constant BankGroups rate (period 3)	0.711	(0.115)	-
BankGroups: outdegree (density)	-4.729***	(0.455)	-10.401
BankGroups: 4-cycles (1)	-0.010	(0.018)	-0.545
BankGroups: indegree - popularity	0.041***	(0.010)	4.099
BankGroups: outdegree - activity	0.187**	(0.069)	2.693
BankGroups: TotalAssets ego	-0.019	(0.315)	-0.060
BankGroups: RoA ego	-0.415 <sup>†</sup>	(0.225)	-1.847
BankGroups: BoardSize ego	0.010 <sup>†</sup>	(0.006)	1.645
BankGroups: RoA ego x degree(sqrt) ID activity	0.067	(0.141)	0.480
BankGroups: degree(sqrt) IDnetwork activity	0.101	(0.184)	0.545
BankGroups: IDnetwork to agreement	0.273***	(0.071)	3.835
BankGroups: closure same BankType	-0.138	(1.634)	-0.085

<sup>†</sup>  $p < 0.1$ ; \*  $p < 0.05$ ; \*\*  $p < 0.01$ ; \*\*\*  $p < 0.001$ ;

convergence *t* ratios all  $< 0.07$ .

Overall maximum convergence ratio 0.12.

### *Network internal effects*

The ID network shows significant positive effects for triads, betweenness, and 4-cycles. This indicates that there are noticeable effects of the existing network configuration onto the development of the network over these years. The Hometown network shows effects for indegree (for Hometown groups) and outdegree (for Banks), which indicates that the number of connections matter for both sides. The absence of a 4-cycle effect, however, indicates that the shape of the two-mode network does not play an important role.

### *Bank Characteristics*

Bank characteristics do play a significant role for the ID network development as well, including the type of the banks, their size in terms of assets as well as board members, and their profitability as well as difference in profitability between the two.

The effect is less noticeable for hometown group links, with asset size not having an effect, board size having a small positive effect, and the higher a bank's ROA the lower the probability that it is linked to a hometown group.

### *Network co-evolution*

There is indicative evidence for a reciprocal effect between the two networks, if two banks are already linked through hometown connection then there are less likely to form an ID connection, but if the two banks have already an ID connection they are more likely to sort into the same hometown group.

## **6 Conclusions**

This paper investigates the co-evolution of two banking networks. The tentative results demonstrate that both networks are shaped by the shape of the respective networks, the impact of bank characteristics, and interaction effects between the two networks.

## References

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