Coping with Unknown Risks: The Rise of Maritime Insurance Contracts and Markets in Late Medieval Italy

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Motivation and Research Questions

- Maritime insurance contracts and markets are one of the greatest innovations of the Commercial Revolution of the Middle Ages.
- These contracts are the forefathers of all insurance contracts (e.g., life, fire, theft, health, etc.) that developed subsequently.

Three main questions

1. Why were maritime insurance contracts invented in medieval Italy?
2. How was the insurance premium determined? Which were the main risks of maritime commerce?
3. What were the key features of this market (i.e. participants, goods, vessels, routes, seasonality, etc.)?

Understanding the Big Picture

- In the early Middle Ages, nautical progress opened up longer routes and winter navigation, making trade potentially more profitable, but also exposing merchants to higher risks.
- In medieval politically fragmented Europe, states competed for the control of maritime commercial routes, with corsairs employed by the maritime powerhouses to damage commercial competitors.
- New risks threatened the development of maritime trade generating demand for protection.
- A new class of rich merchants had the capital and the information network, which were key to make selling insurance a profitable business.
- The demand for protection from new risks met the supply of protection through the invention of the insurance contract. A new market was born.

Main Findings

Theoretically

1. Higher risks associated with unknown probabilities fostered the rise of insurance contracts and markets.

Empirically

2. Corsairs and risks related to human actions were the main threat to maritime commerce. Insurance premia show that merchants feared the corsairs over the tempest.
3. Few big insurers sold the majority of contracts. Although there was no specialization, the market revolved around a few individuals and the supply side of the insurance market was highly concentrated.

The Origins of the Insurance Contract

Proto-insurance contracts

- *Foenus nauticum* (1200-1300)
- *Mutuum* (Genoa, 1300-1360)
- Fictitious sale contract (Genoa, 1360-1430)

The modern insurance contract developed independently in Genoa and Florence from the mid-14th century.

The Model: Setup

Demand side

- A risk and ambiguity averse merchant wants to undertake a shipment. He faces an unknown probability of loosing the cargo because of shipwreck or because of an attack by corsairs.
- The merchant can reduce the probability of loss by investing in self protection and he can further reduce the risk he is exposed to by buying insurance. The price of the insurance depends on the true probability of loss.

Supply side

- A risk averse insurer observes the investment made by the merchant (no moral hazard) and knows the true probability of loss.
- The insurer can choose how much risk he wants to undertake at the given price.

The two sides of the market differ only in the amount of information they have.

The Model: Insights

Our model intends to show the following

- Higher risks with unknown probabilities made the merchant willing to pay more to reduce them.
- The information asymmetry makes the insurance contract profitable for the supply side.

Our model shows that the increased military instability of the Mediterranean exposed merchants to new risks with unknown associated probabilities. Such new risks generated the conditions for the development of the insurance market.

Empirical Analysis: A Novel Dataset

Summary statistics

Our data ranges from 1326 to 1507 and has been collected from primary (4948 – 72%) and secondary (1880 – 28%) sources.

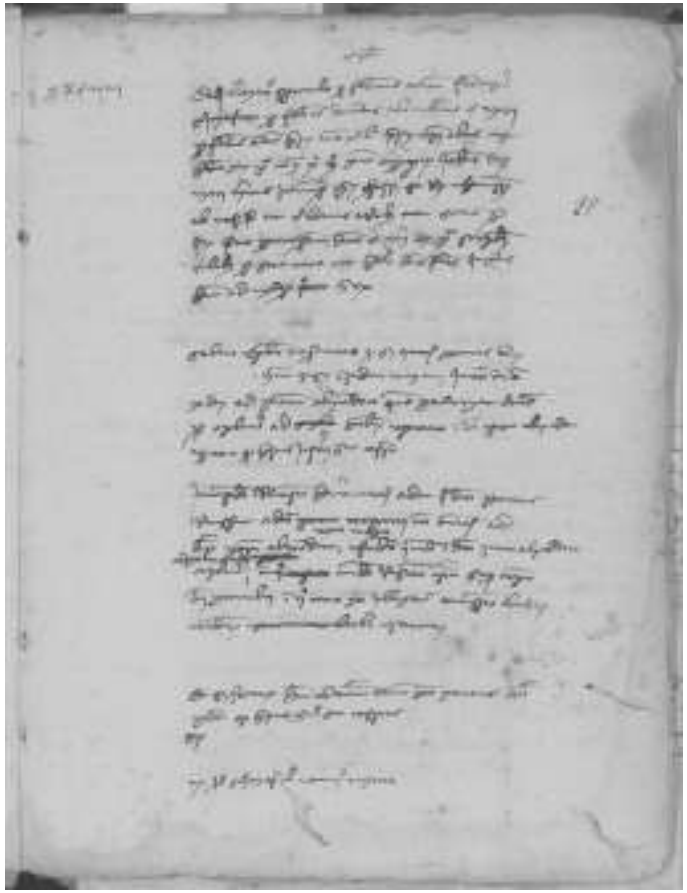
Primary sources

- State Archives of Genoa
- State Archives of Palermo
- Court records from the Archivio della Mercanzia di Firenze
- Datini Archives of Prato
- State Archives of Florence

Secondary sources

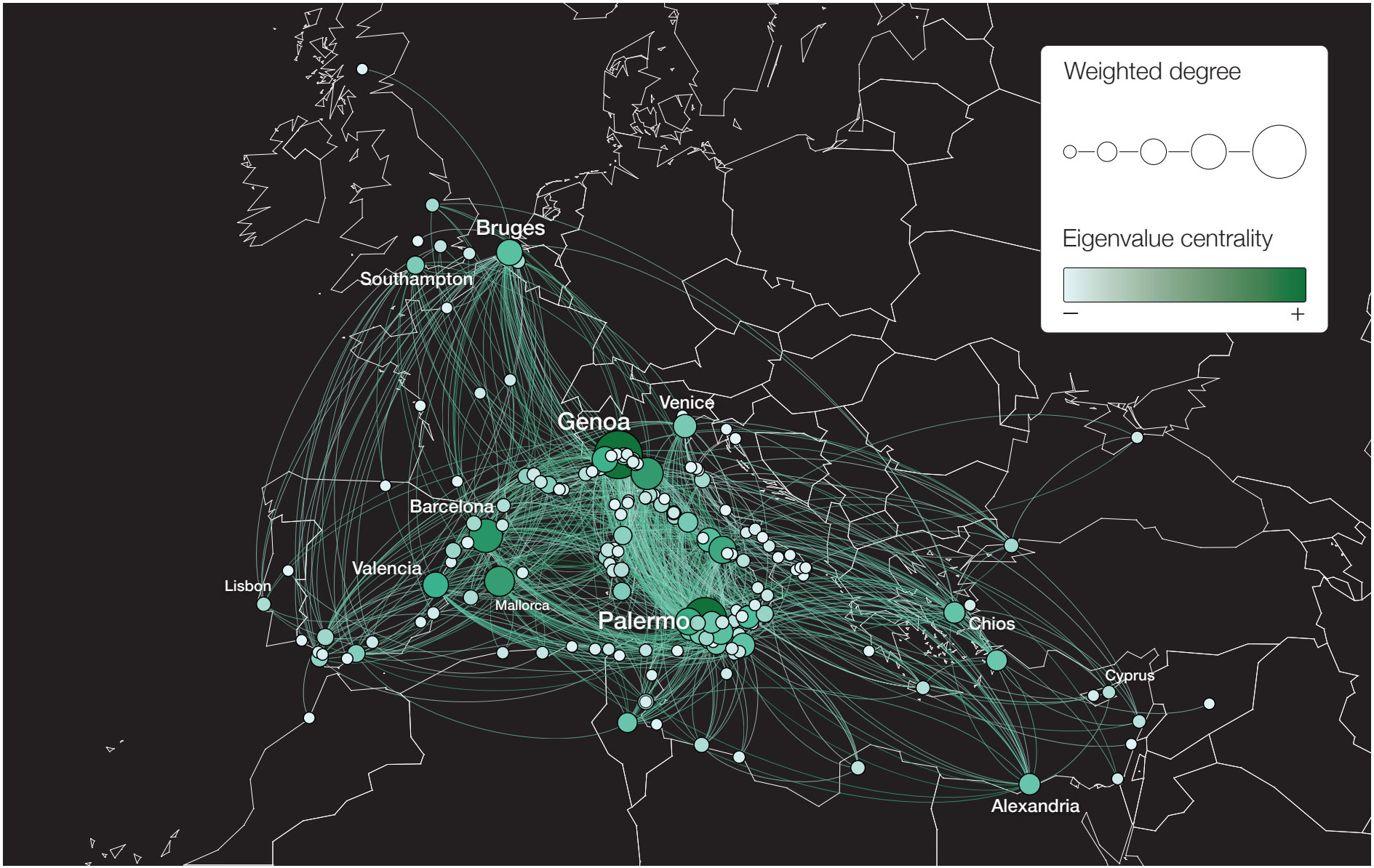
- Data collected by Mario Del Treppo for Catalonia
- Data collected by Sandro Tognetti for Florence
- Data collected by Nehlsen-von Stryk for Venice

Genoa, 1428, notary Branca Bagnara. Archivio di Stato di Genova, Notai Antichi.



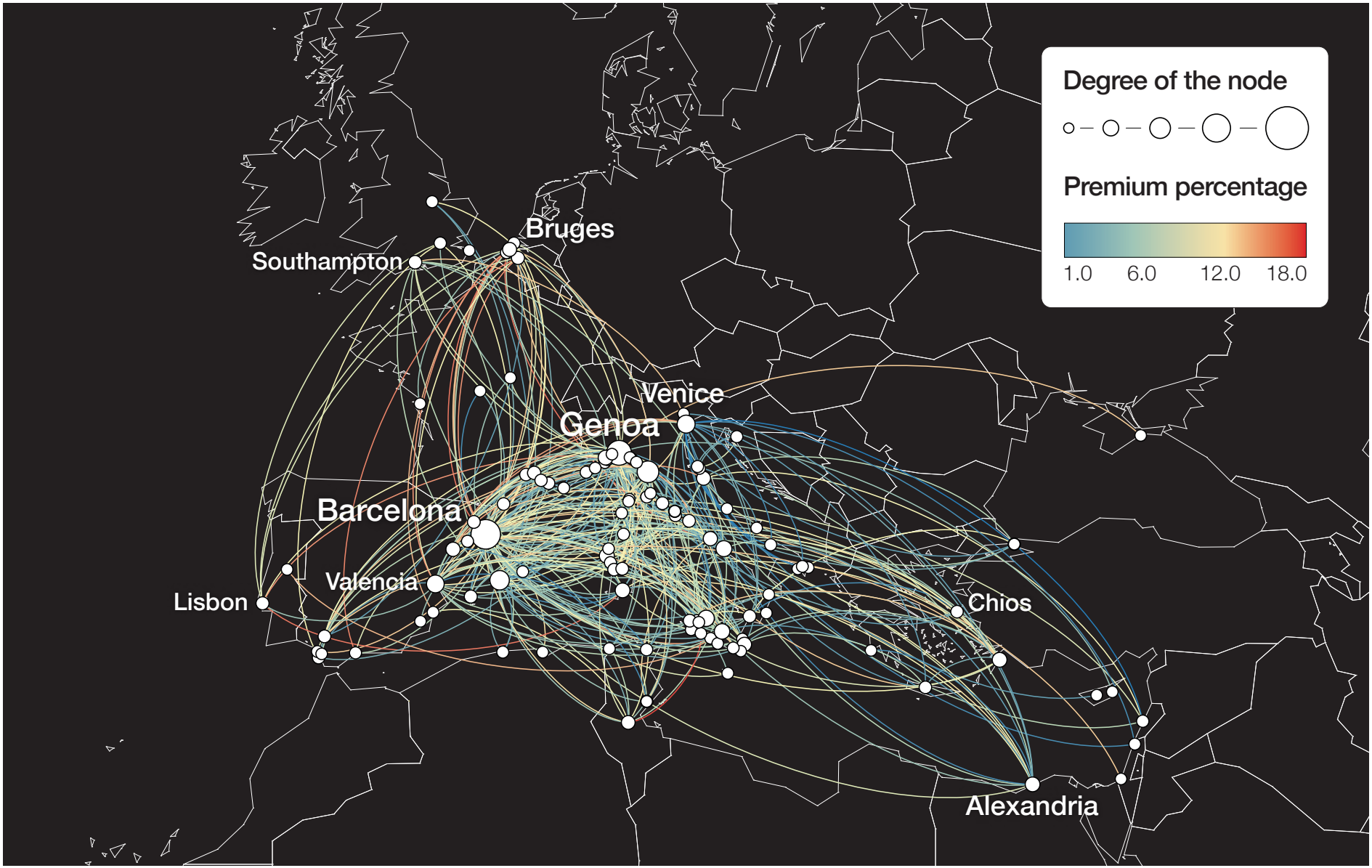
Palermo, 1347, notary Stefano Amato. Archivio di Stato di Palermo, Fondo Notarile.

Our Data well Represents Medieval Trade Patterns



Network Representation: Insurance Premia

Premia, by Location



The Determinants of Insurance Premia

Dep. Var. is Premium Percentage	(1) All cities	(2) Genoa	(3) Florence	(4) Barcelona
Distance (in 1000 nm.)	3.7347***	4.6426***	3.7330***	2.0762***
Distance sq.	-0.7549**	-1.1276***	-0.6909*	0.3603
Seasonal Risk	0.0615*	-0.1770*	0.0970	0.0795***
Galley	-1.6226***	-1.8990**	-1.9206***	-1.7645***
Food Shipment	1.7758**	-0.2702	2.0007***	
Special Clauses	0.6522**	0.9571***	0.6311	0.5077***
Total Insured (in 100 F.)	-0.2581**	-0.3087***	-0.2992***	
Number of Insurers	0.0220	0.1922**	0.4298**	
Observations	2,184	270	226	1,587
Adjusted R^2	0.3200	0.3091	0.3500	0.3142
Location FEs	YES	NO	NO	NO
Decade FEs	YES	YES	YES	YES

Potential Mechanisms

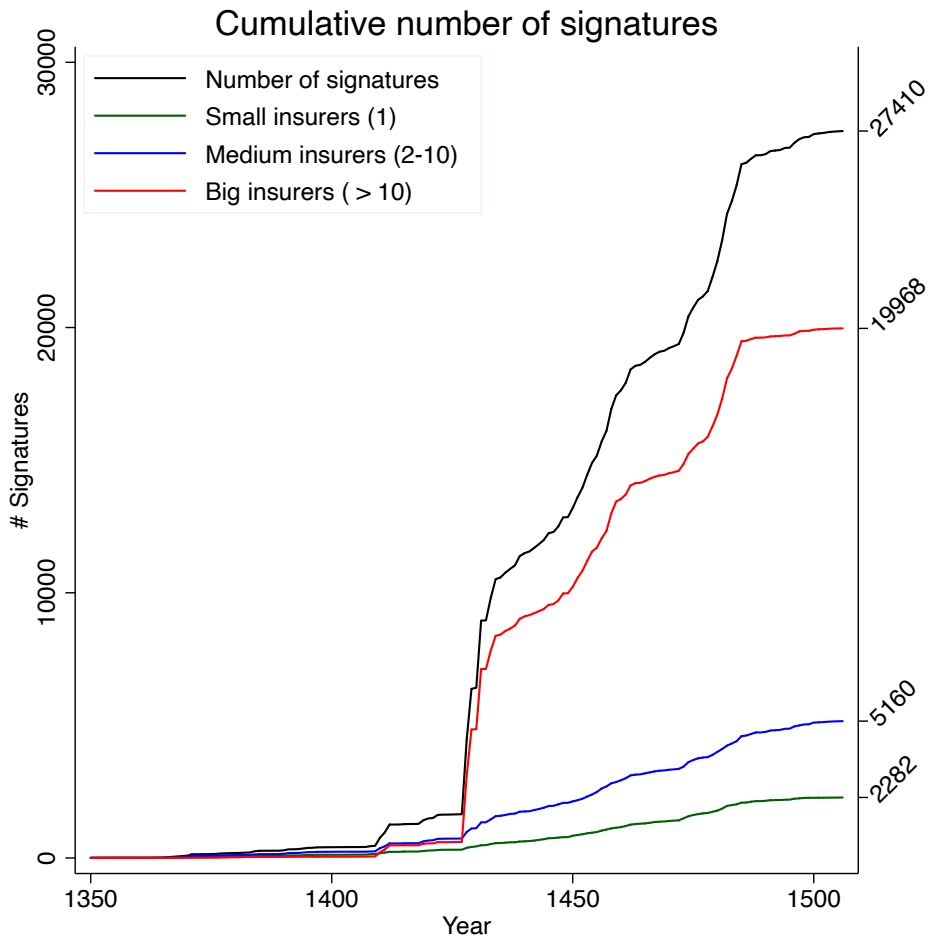
Dep. Var. is Premium Percentage	(1) Genoa	(2) Barcelona	(3) Barcelona
Distance (in 1000 nm.)	4.9271***	4.3579***	3.8188***
Distance sq.	-1.3652***	-0.4929	-0.3975
Seasonal Risk	0.0688	0.0795***	0.0741***
Route: Sardinia	-0.7294	0.0732	
War in Genoa (1456-1458)	0.8337***	-0.1004	
Sardinia $\times$ War in Genoa	4.5687***	0.2259	
Route: Eastern Mediterranean	-1.1245**	-0.4985	
East $\times$ War in Genoa	1.7978	-0.1389	
Galley		-1.1351***	-1.1179***
Catalan Civil War (1462-1472)		3.0325***	2.9832***
Galley $\times$ Catalan War		-1.1292***	-1.0851***
Constant	1.6579***	2.9492***	3.1752***
Observations	271	1,587	1,587
Adjusted R^2	0.5631	0.3576	0.3561

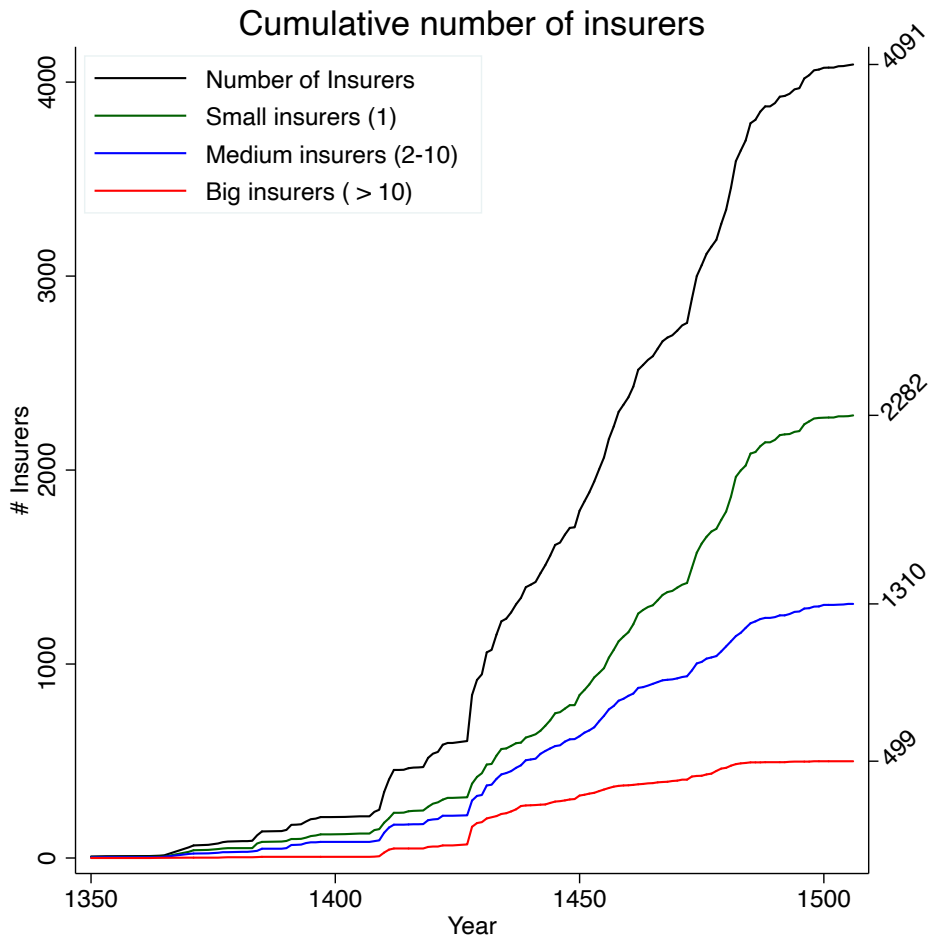
The Market for Insurance was Highly Concentrated

- Information and capital were (and still are) the pillars of insurance markets.
- A few big merchants had the capital and access to a wide information network necessary to determine the premium and profit from selling insurances.
- Medieval insurance markets in our dataset were concentrated (HHI 3892).
- Most insurance contracts had at least one big insurer as underwriter. However, there were many other small insurers.

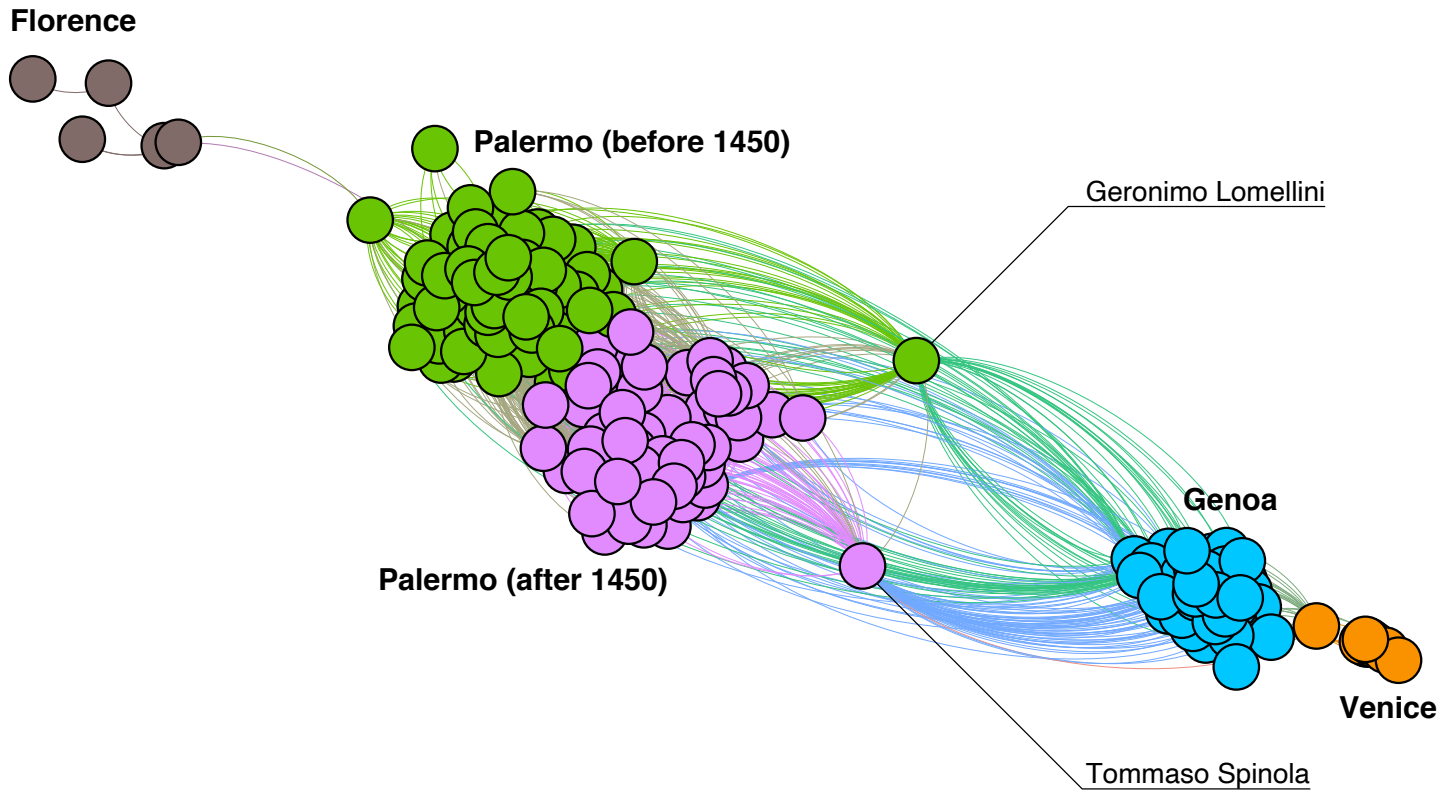
	mean	1st	10th	25th	50th	75th	90th	99th
Size of Biggest Insurer per Contract	141	1	10	47	126	237	283	293
Number of Contracts per Insurer	6.7	1	1	1	1	4	14	98

Distribution of Contracts





Coinsurance Network (Top 5% of Insurers)



Related Literature

Three main strands

- **Historical literature** on the rise of maritime insurance contracts
  - Economic approach (e.g., De Roover (1945), Del Treppo (1972), Melis (1975), Giacchero (1984), Ceccarelli (2012), etc.)
  - Legal approach (e.g., Bensa (1984), Nehlsen-von Stryk (1988), etc.)
- **Theoretical and empirical economic literature**
  - On insurance contracts and uncertainty (e.g., Arrow (1978), Shavell (1979), Laffont (1989), Chiappori and Salanié (2000), etc.)
  - On insurance contracts and ambiguity (e.g., Snow (2011), Alary (2012), etc.)
- **Literature on technological change, institutions and long-run growth** (e.g., North (1987), Greif (1989), Mokyr (1990, 2002, 2016), Acemoglu et al. (2001), De Lara (2008), etc.)

Take Home Message

- We model the invention of insurance contracts and the opening of insurance markets in medieval and early Renaissance Italy.
- We collect and exploit a novel dataset from archival sources to analyze the characteristics of medieval insurance markets.
- We are the first to perform an econometric analysis of maritime insurance contracts in the Middle Ages.
- We show that new risks brought by nautical progress and higher military instability in the Mediterranean during the 14th century increased the demand for protection by merchants. On the supply side, few rich merchants who had capital and access to superior information on trade routes due to their extensive commercial networks could provide fellow merchants with protection through a novel institutional device: the insurance contract.

SUPPLEMENTARY SLIDES

Summary Statistics

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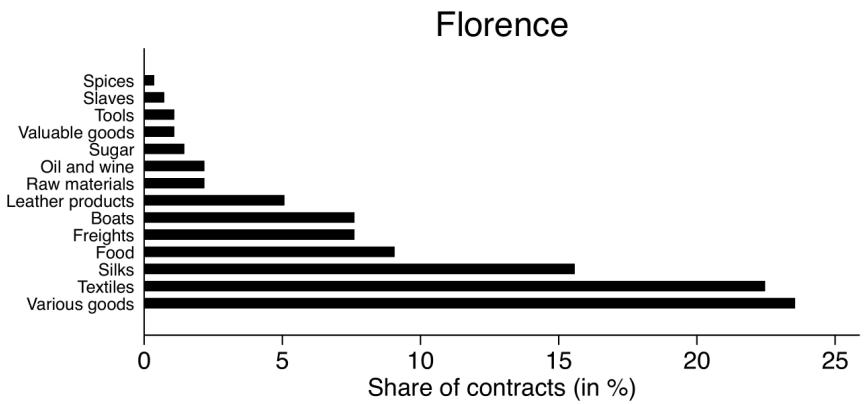
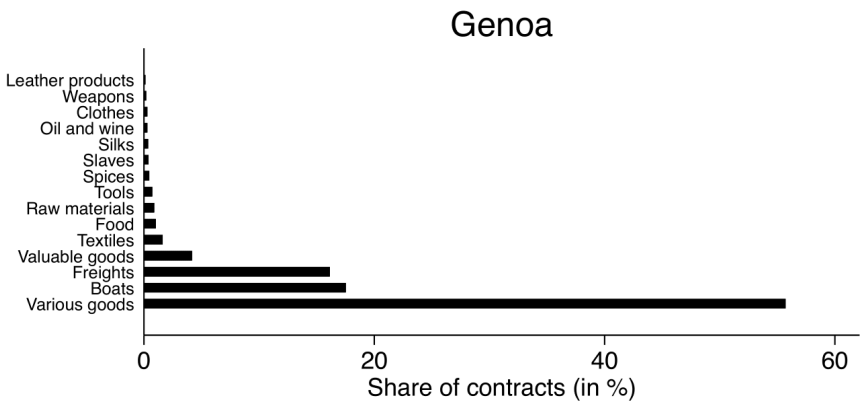
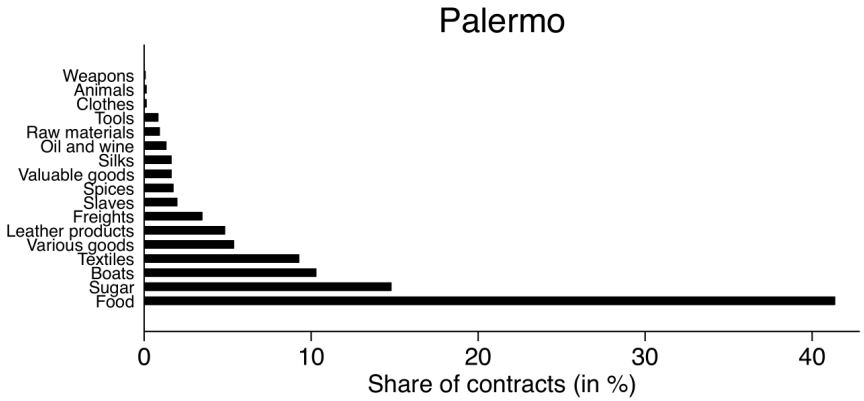
	N	Mean	SD	Min	P25	P50	P75	Max
Continuous variables:								
Quota insured	27460	55.91	52.03	0.65	21.43	42.86	100.00	2000.00
Total amount insured	5110	300.46	356.69	1.29	100.00	200.00	400.00	5000.00
Distance (nm)	3623	707.50	643.02	8.00	240.00	462.00	925.00	3134.00
Premium percentage	641	5.31	2.95	0.75	3.00	5.00	7.00	18.00
Discrete variables:								
Number of insurers	5137	5.39	6.08	1.00	1.00	3.00	7.00	71.00
Number of goods	4897	1.43	0.78	1.00	1.00	1.00	2.00	9.00
Dummy variables:								
Return	5137	0.05	0.23	0.00	0.00	0.00	0.00	1.00
Alternative boarding	5137	0.05	0.22	0.00	0.00	0.00	0.00	1.00
Alternative arrival	5137	0.08	0.26	0.00	0.00	0.00	0.00	1.00

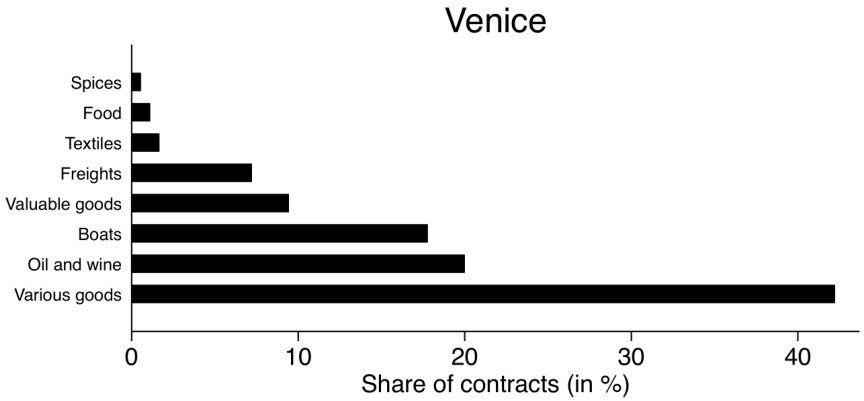
The Goods

Back



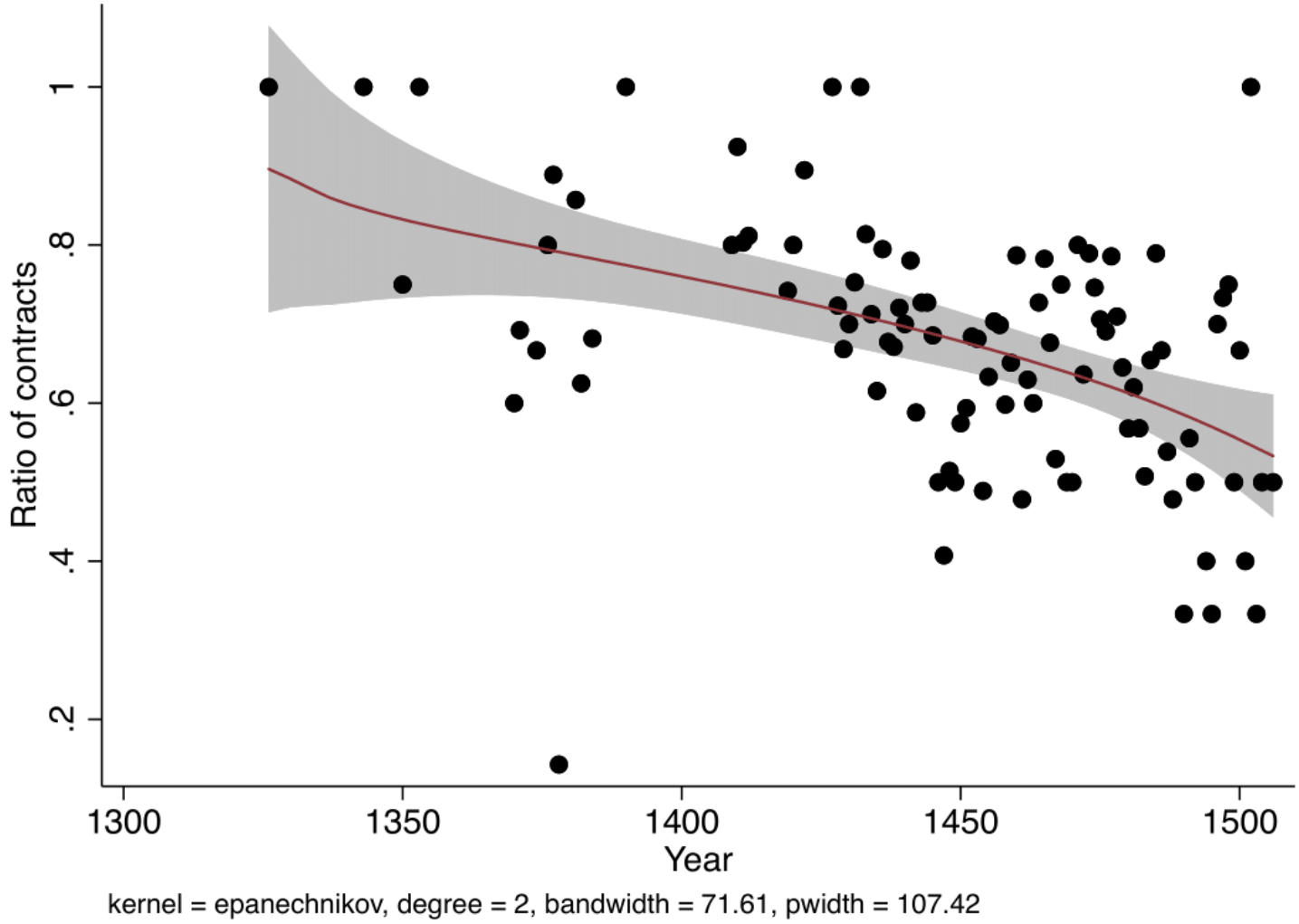






Ratio of Contracts Relative to One Good

Back



Network Representation: The Goods

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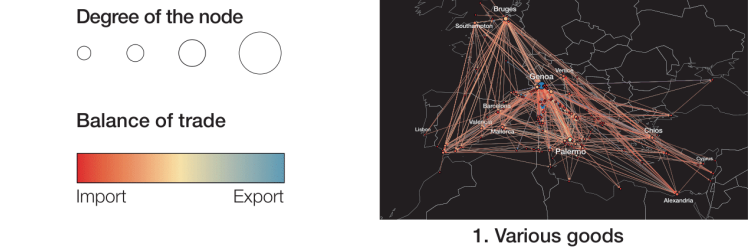
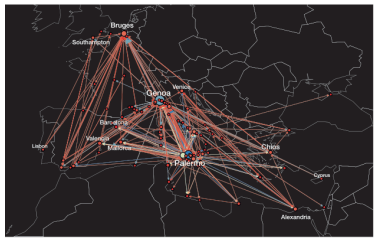
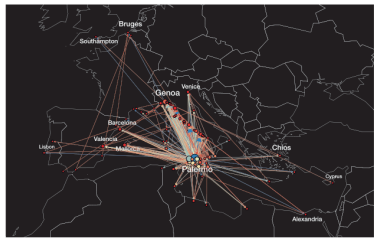


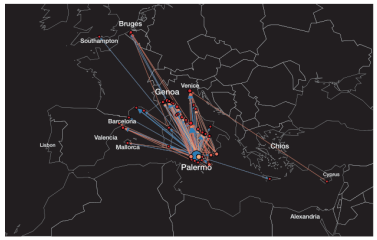
1. Various goods



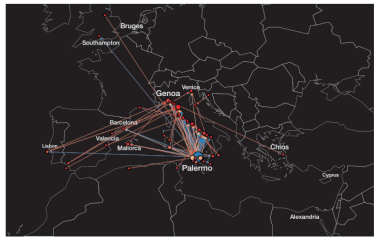
2. Boats and freights



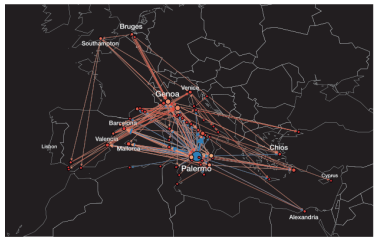
3. Food



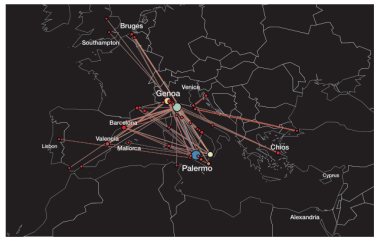
4. Sugar



5. Leather goods



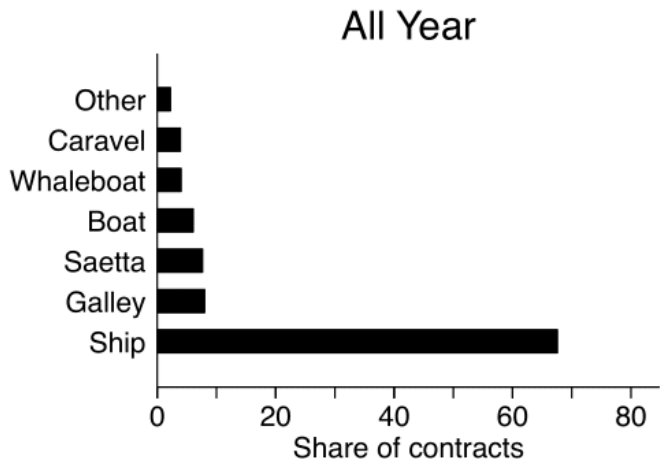
6. Textiles

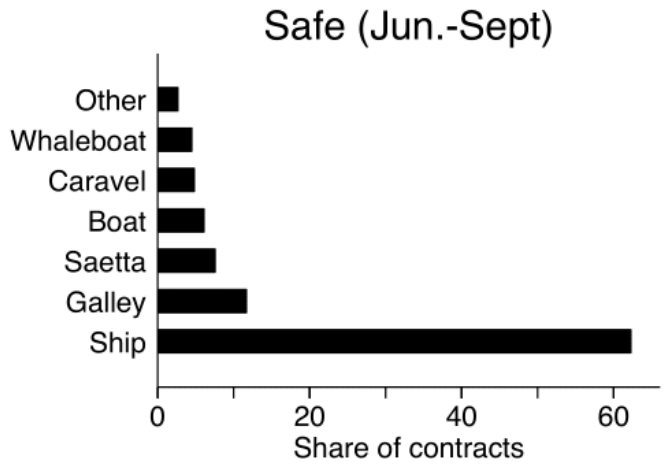


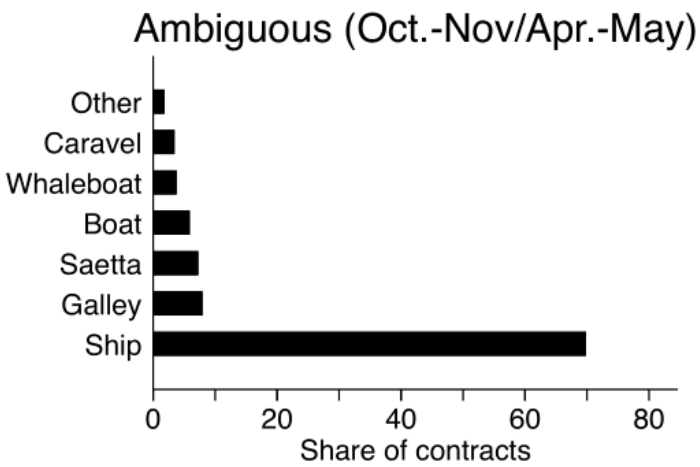
7. Silks

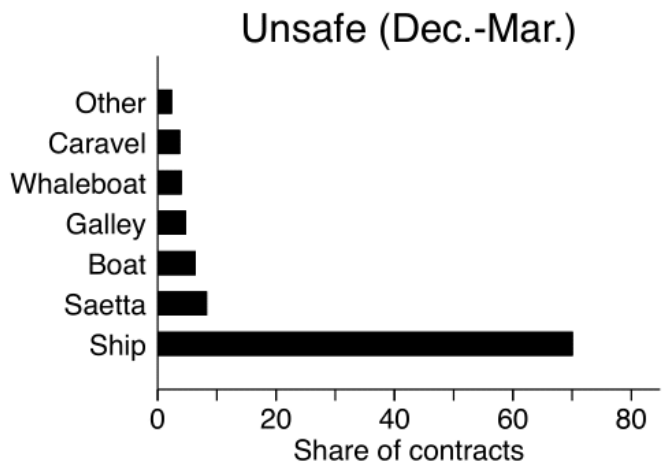
The Boats

Back





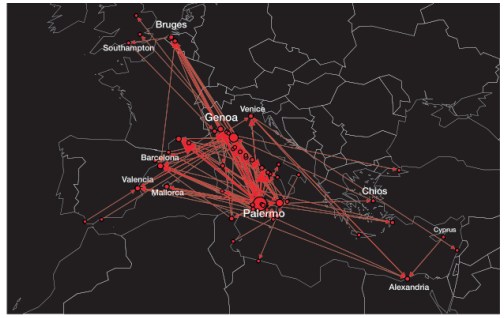




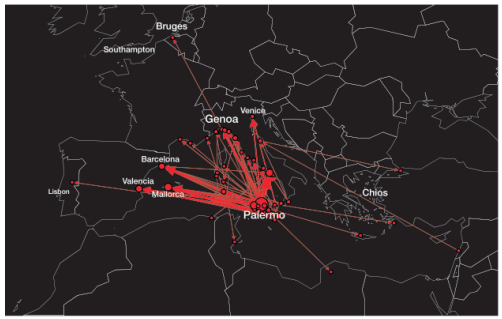
Network Representation: The Boats

Back

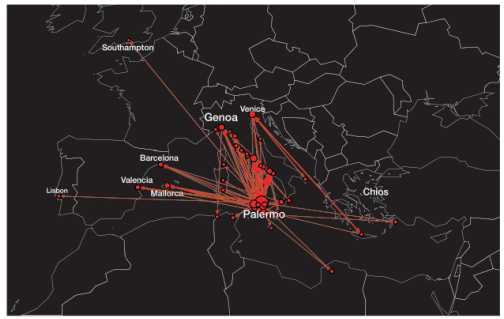
1. Ships



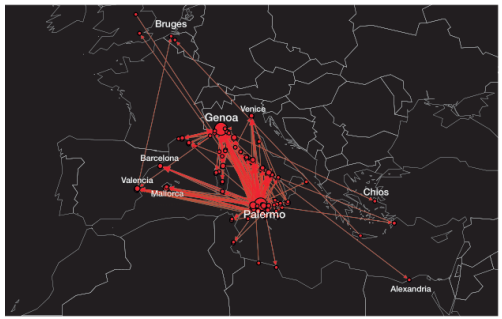
2. Galleys



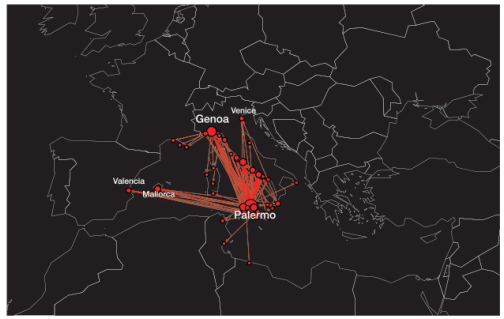
3. Whaleboats



4. Caravels



5. Boats



6. Saette

Contracts by Season

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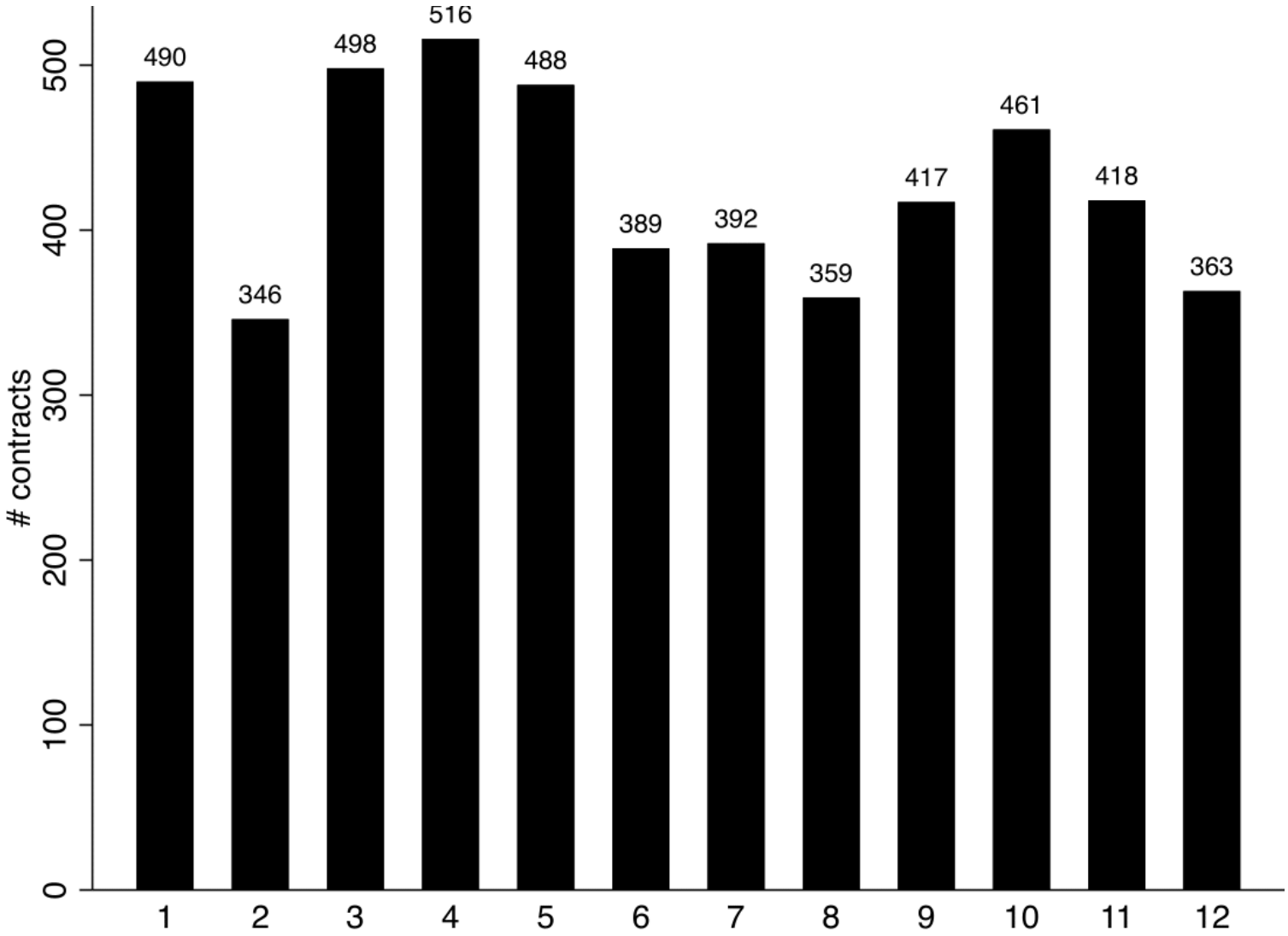
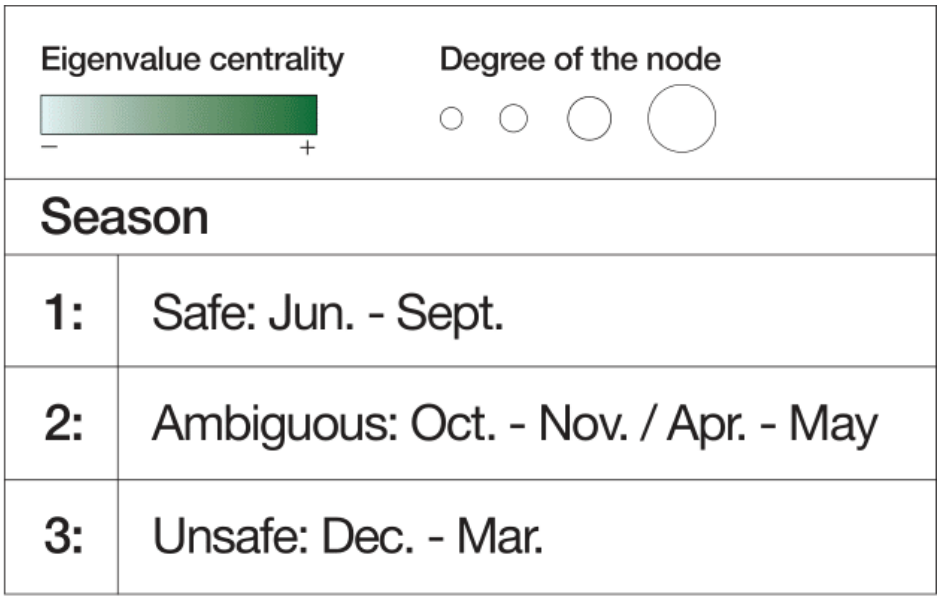


Network Representation: Seasonality

Back



Season	
1:	Safe: Jun. - Sept.
2:	Ambiguous: Oct. - Nov. / Apr. - May
3:	Unsafe: Dec. - Mar.

Distribution of Contracts: Supply Side

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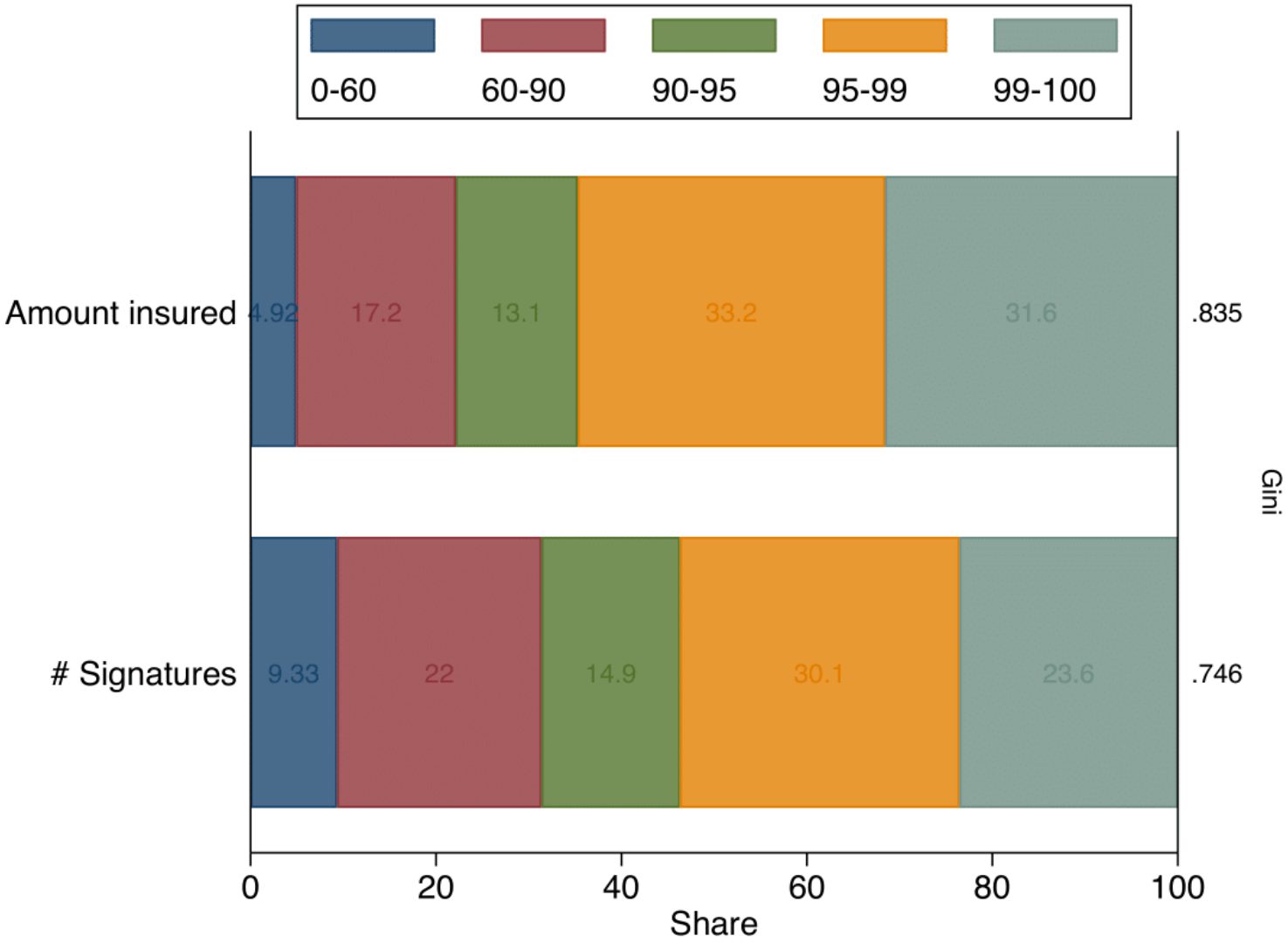
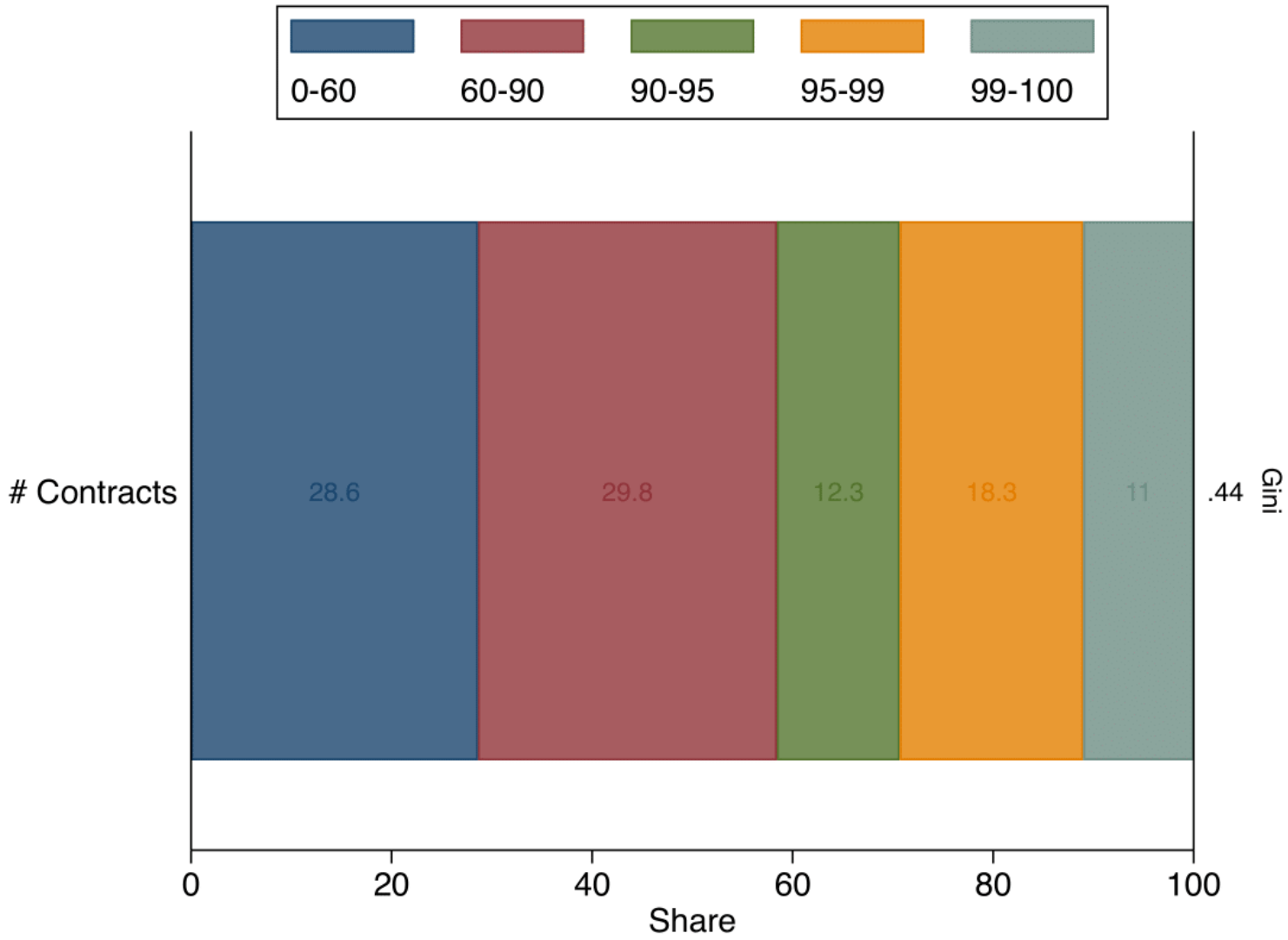


Distribution of Contracts: Demand Side

Back



Premia, by Location

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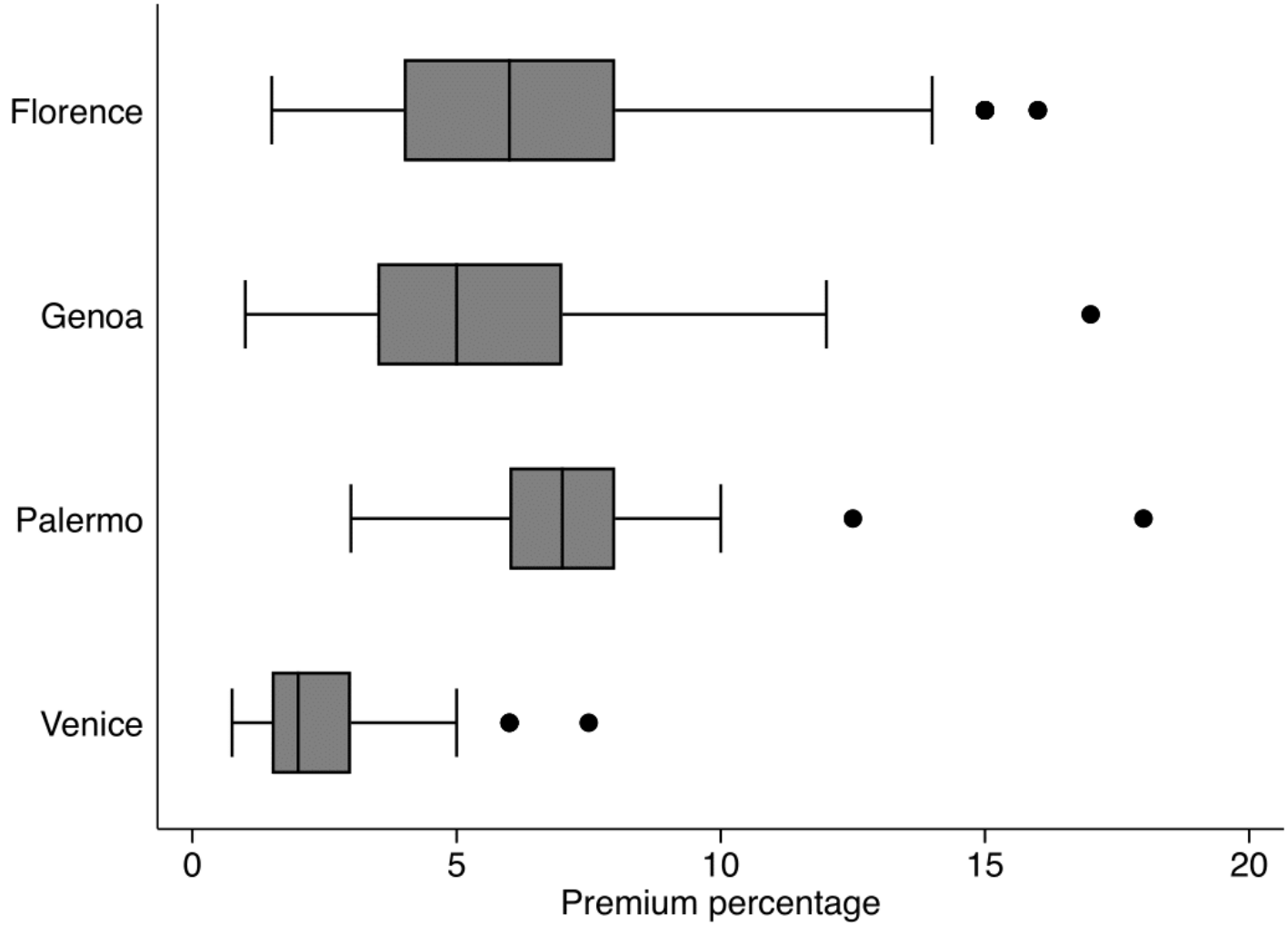

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Distance (in 1000 nm.)	3.7347***	4.6426***	3.7330***	2.0762***
	(0.7985)	(0.9879)	(1.0879)	(0.5705)
Distance sq.	-0.7549**	-1.1276***	-0.6909*	0.3603
	(0.3600)	(0.4256)	(0.4033)	(0.3395)
Seasonal Risk	0.0615*	-0.1770*	0.0970	0.0795***
	(0.0329)	(0.0936)	(0.1213)	(0.0303)
Galley	-1.6226***	-1.8990**	-1.9206***	-1.7645***
	(0.2606)	(0.7633)	(0.5238)	(0.1688)
Food Shipment	1.7758**	-0.2702	2.0007***	
	(0.8334)	(1.0201)	(0.6871)	
Special Clauses	0.6522**	0.9571***	0.6311	0.5077***
	(0.2680)	(0.2600)	(0.6967)	(0.1306)
Total Insured (in 100 F.)	-0.2581**	-0.3087***	-0.2992***	
	(0.1085)	(0.0827)	(0.1096)	
Number of Insurers	0.0220	0.1922**	0.4298**	
	(0.0201)	(0.0785)	(0.1764)	
Observations	2,184	270	226	1,587
Adjusted R^2	0.3200	0.3091	0.3500	0.3142
Location FEs	YES	NO	NO	NO
Decade FEs	YES	YES	YES	YES

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, *p<0.1

Potential Mechanisms

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	(1.0088)	(0.6120)	(0.5530)
Distance sq.	-1.3652***	-0.4929	-0.3975
	(0.4241)	(0.3449)	(0.3305)
Seasonal Risk	0.0688	0.0795***	0.0741***
	(0.0821)	(0.0280)	(0.0277)
Route: Sardinia	-0.7294	0.0732	
	(0.9148)	(0.1338)	
War in Genoa (1456-1458)	0.8337***	-0.1004	
	(0.2550)	(0.1484)	
Sardinia × War in Genoa	4.5687***	0.2259	
	(0.9488)	(0.2226)	
Route: Eastern Mediterranean	-1.1245**	-0.4985	
	(0.5255)	(0.3042)	
East × War in Genoa	1.7978	-0.1389	
	(1.2215)	(0.2661)	
Galley		-1.1351***	-1.1179***
		(0.1797)	(0.1809)
Catalan Civil War (1462-1472)		3.0325***	2.9832***
		(0.1690)	(0.1544)
Galley × Catalan War		-1.1292***	-1.0851***
		(0.4141)	(0.4060)
Constant	1.6579***	2.9492***	3.1752***
	(0.5305)	(0.2245)	(0.1894)
Observations	271	1,587	1,587
Adjusted R^2	0.5631	0.3576	0.3561

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, *p<0.1