The Beauty of Uncertainty

The Rise of Insurance Contracts and Markets in Medieval Europe[a]

Maristella Botticini[1] Pietro Buri[2] Massimo Marinacci[3]

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[1] Department of Economics and IGIER, Università Bocconi, and CEPR
[2] Department of Economics, Princeton University
[3] AXA-Bocconi Chair in Risk, Department of Decision Sciences, Università Bocconi

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Prologue: what's the (Big) question?

- Maritime insurance contracts and markets are one of the greatest innovations of the Commercial Revolution in medieval Europe
- These contracts are the ancestors of all insurance contracts that developed subsequently (e.g., health, life, liability, property, natural catastrophes, cyber risks, new risks, etc.)

Prologue: some figures

- Today global insurance premia represent nearly 7.1% of the world's economic activity, and the weight of the industry has increased by 1% in the last ten years
- The volume of insurance premia worldwide is greater than the GDPs of Spain, Italy, and France combined
- Today, it is hard to envision social and economic development without insurance
- But centuries ago economies and societies lived without any insurance ...

Motivation: Main Questions

Question: from a theory viewpoint

- Before the 1340s, insurance did not exist
- Proto-insurance contracts
  - *Foenus nauticum* (13th century)
  - *Mutuum* (early 14th century)
- Modern insurance contracts developed in Genoa and Florence in the early-mid 14th century
  - Soon after, adopted by Catalan and Sicilian merchants
  - Later by Venice and other European commercial centers

Question: Why was insurance invented in medieval Europe (neither earlier, nor elsewhere)?

Questions: from an empirical viewpoint

Focusing on the origins of insurance contracts and markets

From 1340 to 1500

- Which were the main features of insurance markets (i.e. participants, goods, vessels, routes, seasonality, etc.)?
- Which were the main risks associated with medieval maritime commerce?
- How were insurance premia determined?
  (in a pre-Pascal-Bernoulli world)

Question: from a theory viewpoint

- Why was insurance invented in medieval Europe?
  (neither earlier, nor elsewhere)

Historical Context

Historical context: natural risks in ancient trade

- A lot of goods and merchandise traveled across locations through ground transportation
  - Natural phenomena created modest risks
- Seaborne trade typically occurred along the coasts (longer but safer trips), avoiding winter navigation (less but safer business)
  - No instrumentation for measuring position accurately
  - Route and winds affected traveling times and riskiness
  - Trade-off between duration and riskiness of trips
  - Natural risks possible but minimized

Trade-off: journey duration and natural risks in ancient times

Time is money vs *Have a safe trip back home*

Table 1: Travel times, Alexandria-Rhodes

Route (summer)	(1)	(2)	(3)	(4)
Distance (n.m.)	350	500	750	800
Dangerous winds	yes	partly	no	no
Time in days	5	6	9	10

Note: Source: De Graauw (2022)

Historical context: natural risks in medieval trade

- The Commercial Revolution, Europe 11th–13th centuries
- The re-birth of Europe after the Dark Ages witnessed population growth and urbanization.
- Gradually, (less risky) ground transportation over long distances declined
- Increased demand for seaborne trade that could deliver big quantities in shorter times
- Major nautical progress (e.g., pivoted compass, portolan sailing charts, triremes galleys)
  - Made seaborne trade potentially more profitable (longer distances, whole year)
  - Exposed merchants to higher natural risks (with known probabilities)

Historical context: human risks in ancient trade

- Property rights on land were clearly defined
- Merchants could protect their merchandise traveling over land
  - Through military protection provided by their own rulers
  - Paying tolls / taxes to the rulers of foreign territories
- For maritime trade: no property rights, hence, buying protection was not feasible
  - Main source of human risks were pirates — when major issue, the Roman fleet took care of ”cleaning” the sea from pirates

Historical context: human risks in medieval trade, I

- 13th century — Commercial Revolution: sedentary merchants
- The re-birth of Europe after the Dark Ages witnessed population growth and urbanization.
- Gradually, (less risky) ground transportation over long distances declined
- Increased demand for seaborne trade that could deliver big quantities in shorter times
- 14th–15th centuries: in politically fragmented Europe, states competed for the control of maritime commercial routes
  - Novelty: Corsairs employed by states to damage commercial competitors. (examples: Catalan clashes with Genoa for two centuries; wars between England and France)

Historical context: human risks in medieval trade, II

- *"The entire Mediterranean Sea is full of corsairs."*

[Florentine merchant in Genoa, 2 June 1385]

- *"Catalans and Genoese steal from each other in seaborne trade."*

[Gaspare Bechalla from Genoa, Datini's manager in Barcelona]

- *"Great robberies occurred over the seas between the Catalans and the citizens of Genoa. [...] The practice [of stealing from each other] had become so widespread among the said nations that it resembled a war."*

[Merchants from Barcelona, end of 14th century]

Historical context: human risks in medieval trade, III

- 13th century — Commercial Revolution: sedentary merchants
- 14th–15th centuries: in politically fragmented Europe, states competed for the control of maritime commercial routes
  - — Corsairs employed to damage competitors
- Sedentary merchants with no broad trade and information network lacked information on the probability of attacks by corsairs
  - — New risks with unknown probabilities arose for the majority of merchants

Historical context: more demand for protection in medieval trade

- **Natural risks**
  Nautical progress generated *more natural risks* (with *higher* but *known* probabilities)
- **Human risks**
  Political fragmentation and commercial competition generated new human risks (with *unknown* probabilities)
- Both risks
  - Threatened the growth of seaborne trade
  - Generated more demand for protection

Conceptual Framework

Conceptual framework: the market for protection

Demand Side

A merchant intends to ship his merchandise. Three options

1. bear risk
2. state protection
3. private protection

Supply Side

1. Political institutions
2. Private agents (e.g., merchants)

Model: set up — demand side

- An *uncertainty averse* merchant intends to undertake a shipment
- He faces
  - A known probability of loosing the cargo due to natural risks
  - An unknown probability of loosing the cargo due to human risks
- The merchant can reduce the expected loss
  - By investing in self-protection (e.g., choose a longer route with no dangerous winds, use an armed galley to ship the merchandise)
  - By buying protection from third parties

Model: set up — supply side

- A *risk averse merchant* (the insurer) with capital and a broad information network
  - — Observes the investment (self-protection) made by the merchant to reduce the probability of loss (no moral hazard)
  - — Knows the ”true” probability of loss deriving from human risks (e.g., corsairs) thanks to his broad information network
- The insurer can choose how much risk he wants to undertake at the given price
- The insurer can benefit from pooling risks and selling protection

Model: predictions and insights

The theoretical framework delivers the following predictions.

1. New risks with unknown probabilities (e.g., human risks like attacks from corsairs) make the uncertainty averse merchant willing to buy more protection to reduce these risks. The information asymmetry with the insurer who knows the ”true” probability of human risks (e.g., attacks by corsairs) thanks to his broad information network makes the newly invented insurance contract profitable for the supply side, who can pool risks. Hence, insurance markets arise.
2. Human risks (with unknown probabilities) have a relatively larger effect on insurance premia compared to natural risks (with known probabilities).
3. *Ceteris paribus*, the higher the human risks (e.g., attacks by corsairs and warfare), the higher the insurance premium. Any mechanisms that mitigate human risks (e.g., shipping the merchandise on an armed galley), reduce the insurance premium.

Theory Meets History, Part I

Question: from a theory viewpoint

- Why was insurance invented in medieval Europe?
  (neither earlier, nor elsewhere)

Theory meets history: state protection in ancient trade

- Trade over land
  - Modest natural risks $\rightarrow$ no demand for protection
  - Human risks $\rightarrow$ state protection (e.g., Roman empire)
- Seaborne trade
  - Natural risks with known frequencies $\rightarrow$ no demand for protection
  - Infrequent human risks (pirates) $\rightarrow$ no demand for protection (or state protection when major issue)
- Because there was no increased demand for protection (when needed, rulers provided it), there was no profitability from selling insurance
- Hence, NO insurance contracts and markets in antiquity

Theory meets history: more demand for protection in medieval trade

- Long distance ground transportation (declined)
  - Modest natural risks $\rightarrow$ no demand for protection
  - Human risks $\rightarrow$ state protection (e.g., tolls/tributes to local rulers)
- Maritime trade greatly increased demand for protection
  - More natural risks (longer routes, winter navigation) with known probabilities
  - Significant human risks (corsairs) with unknown probabilities

Theory meets history: the Venetian way

- Since early times, the Venetian Republic had invested in its armed fleet to expand commercial routes
- This investment made it profitable to use the Venetian fleet to protect its merchants against human risks
  - Venetian merchants traveled in convoys (*mude*) under the protection of the Venetian fleet
- As Venice provided state protection through its armed fleet, NO insurance contracts and markets until the late 15th century
- When insurance markets developed, insurance premia were lower than in other locations

Theory meets history: the Florentine and Genoese way

- During the 13th and early 14th centuries, Florence and Genoa witnessed a major urban and commercial growth
- A small group of very rich merchants emerged with two assets
  - The capital invested in a diversified set of businesses
  - A broad information network all over Europe (e.g., Florentine merchants with courier service in Barcelona and Bruges)
- These two assets were key to make risk pooling and selling insurance a profitable business
- Increased demand for protection from higher risks with known probabilities (natural risks) and new risks with unknown probabilities (human risks) met the private supply of protection through the invention of insurance contracts
- **A new market — the market for insurance — was born**

Theory Meets History, Part II

Questions: from an empirical viewpoint

Focusing on the origins of insurance contracts and markets

From 1340 to 1500

- Which were the main features of insurance markets (i.e. participants, goods, vessels, routes, seasonality, etc.)?
- Which were the main risks associated with medieval maritime commerce?
- How were insurance premia determined?
  (at least two centuries before the formal notion of probability was elaborated)

Data

Data (a long journey in the archives...)

Archival sources

- 5031 insurance contracts drafted by notaries / account books
  - Datini archives in Prato (Francesco Datini was one of the wealthiest merchants in history)
  - State Archives of Florence (carte Strozziane, Cambi, etc.)
  - State Archives of Genoa
  - State Archives of Palermo
- 104 litigation cases dealing with insurance
  - State Archives of Florence, fondo *Mercanzia* (merchants' court)

Secondary sources

- 1882 insurance contracts drafted by notaries / account books
  - Mario Del Treppo for Catalan merchants
  - Sandro Tognetti for Florence
  - Karin Nehlsen-von Stryk for Venice

Dataset: 75% from archival sources, 25% from secondary sources

Insurance contracts: which information?

- Date of the contract / shipment
- Route: origin, intermediate stops, destination
- Merchandise shipped and insured
- Total value insured
- Names of parties involved in the contract (plus intermediaries)
- Quotas of total value underwritten by each insurer
- Type of vessel (owner, captain)
- Insurance premium
- Clauses (e.g., risks covered, deadline to liquidate damages)
- Designated court(s) in case of litigation

Example: insurance contract [State Archives of Palermo]

- 25 February 1347
- From Palermo to Pisa
- 24 ”file” of cheese and 2 ”balle” of leather
- Total value insured: 100 gold florins
- Names of parties
  - Insured: Francesco di Canigliano from Pisa
  - Insurer: Baldassarre Grillo, merchant and citizen of Genoa
- Galley (owner: Oddone de Donna Bona)
- Insurance premium: 7.5%
- Clauses
  - Covered both natural and human risks from departure port to arrival port, including loading and unloading
  - Damage liquidated within one month
- Notary: Stefano Amato

Example: insurance contract [Datini archives, Prato]

- 19 May 1387
- From Genoa to Valencia
- 300 ”sacche” of woad (blue dye)
- Total value insured: 900 gold florins (fl)
- Names of parties
  - Insured: Francesco di Marco Datini from Prato
  - Insurers: messer Niccolò di Pagnozzo & co. (300 fl); Giovannozzo Biliotti & co (300 fl); Bartolomeo di Francesco banker (200 fl); Lemmo di Balduccio & Doffo degli Spini & co (100 fl)
- Ship owned by Matteo Giolato from Barcelona
- Insurance premium: 3%
- Clauses: standard

Example: insurance contract [Datini archives]

- 19 December 1384
- From Porto Pisano (Tuscany) to Barcelona
- 1 ”balletta” of veils (valuable cloth)
- Total value insured: 130 gold florins (fl)
- Names of parties
  - Insured: Francesco di Marco Datini from Prato
  - Insurers: Filippo Burbassi (50 fl); Geri and Lamberto di Domenico (80 fl)
- Ship owned by Francesco Colombiere
- Insurance premium: 6%
- Negative event: on January 6, Istoldo di Lorenzo (Datini’s agent) notified the insurers that the ship was attacked by the galleys of King Charles and the merchandise taken. Within 2 months, the insurers had to repay the insured.

Florence merchants' court records: which information?

- Date of the contract / shipment
- Route: origin, intermediate stops, destination
- Goods shipped and insured
- Total value insured
- Names of parties involved in the contract (plus intermediaries)
- Quotas of total value underwritten by each insurer
- Type of boat (owner, captain)
- Insurance premium
- Clauses (e.g., risks covered, deadline to liquidate damages)
- Detailed information on the cause of the shipwreck (natural vs human), merchandise lost, monetary loss, any litigation involved

Good data?

Trade patterns from our insurance contracts dataset match medieval trade patterns described by historians

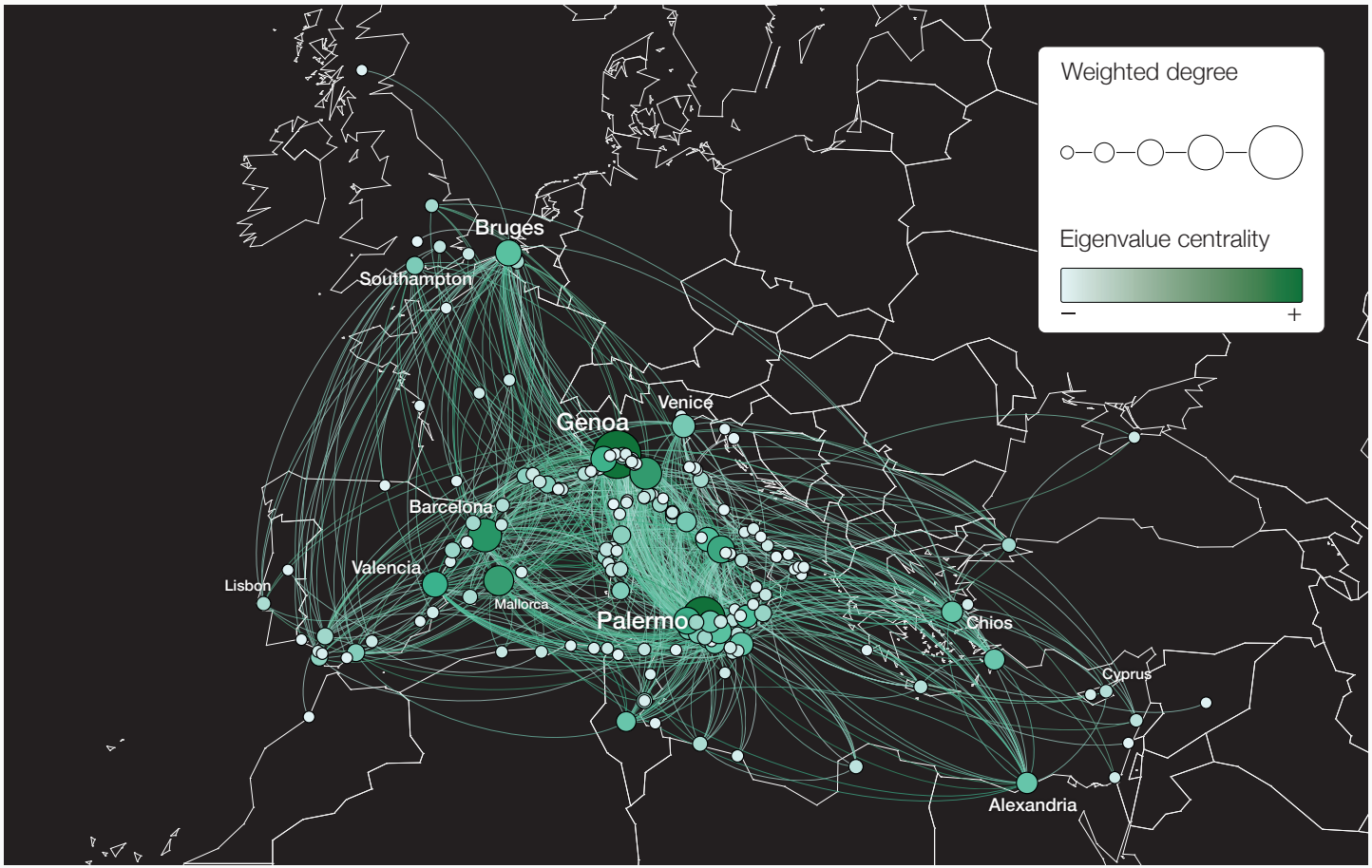

Figure 1: Medieval trade network

Summary statistics

Table 2: Summary statistics

	N	Mean	Sd	Min	p25	p50	p75	Max
Quota insured (fl.)	27659	57.31	58.25	0.65	21.43	42.86	100.00	2600.00
Total amount insured	5200	304.80	372.13	1.29	100.00	200.00	400.00	5000.00
Insurers per contract	6827	4.33	5.57	1.00	1.00	2.00	5.00	70.00
Distance (n.m.)	5292	678.06	583.50	8.00	286.00	490.00	792.00	3134.00
Premium %	2259	5.59	2.63	0.75	4.00	5.00	7.00	22.00

Note: The *Quota* is the value in Florins that one insurers undertakes in one contract. The *Total* is the value in Florins that is insured in a single contract by all insurers combined. The *Distance* is the shortest distance by sea between the origin and destination harbors.

Distances

Table 3: Distances of journeys listed in insurance contracts.

Distance in n.m.	Obs	Mean	Sd	p10	p25	p50	p75	p90
Barcelona	1587	609	408	203	286	558	704	1310
Florence	211	735	578	240	360	496	1062	1408
Genoa	1474	1061	789	213	356	925	1713	2212
Palermo	1944	425	308	171	230	403	538	690
Venice	76	1015	345	457	884	884	1212	1388

Empirical Analysis

Empirical analysis: main features of insurance markets from 1340 to 1500

We study:

1. The main commercial centers and insured routes in medieval Europe
2. Which goods were shipped/insured in each market
3. Insurance contracts by season and type of vessel
4. Participants (insurers, insured) and the structure of insurance markets
5. Major risks related to medieval trade
6. Insurance premia

1. Main commercial centers and insured routes in medieval Europe

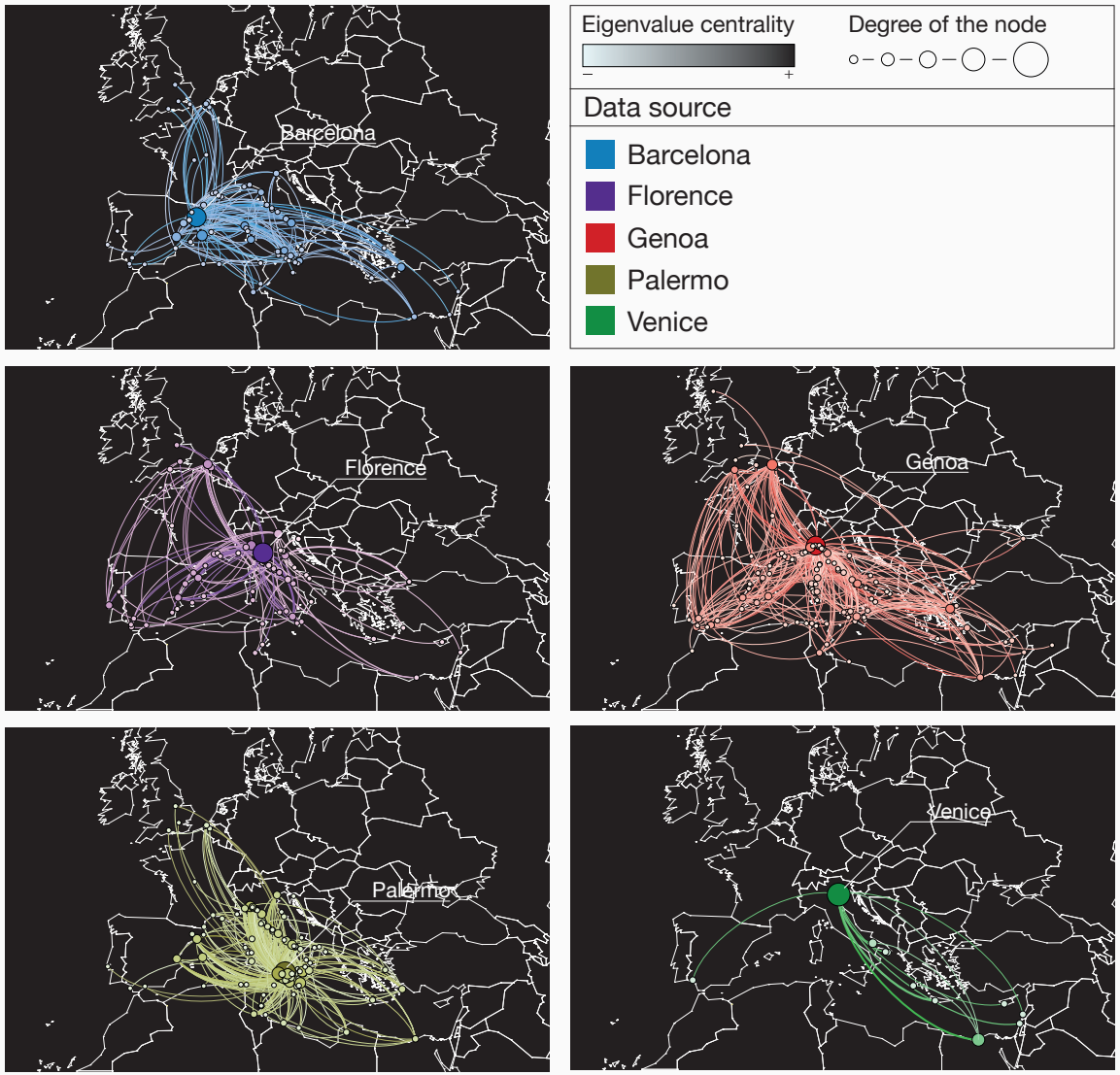

Figure 2: Trade network by city

2. Main goods insured by commercial center

Table 4: Items insured by location.

Market	1st	2nd	3rd	4th
Florence	Textiles (23%)	Silks (14%)	Food (10%)	Leather (5%)
Genoa	Ships and freights (20%)			
Palermo	Food (39%)	Sugar (17%)	Textiles (9%)	Leather (5%)
Venice	Oil and wine (25%)	Luxury goods (10%)	Textiles (2%)	

3. Insurance contracts by season and type of vessel

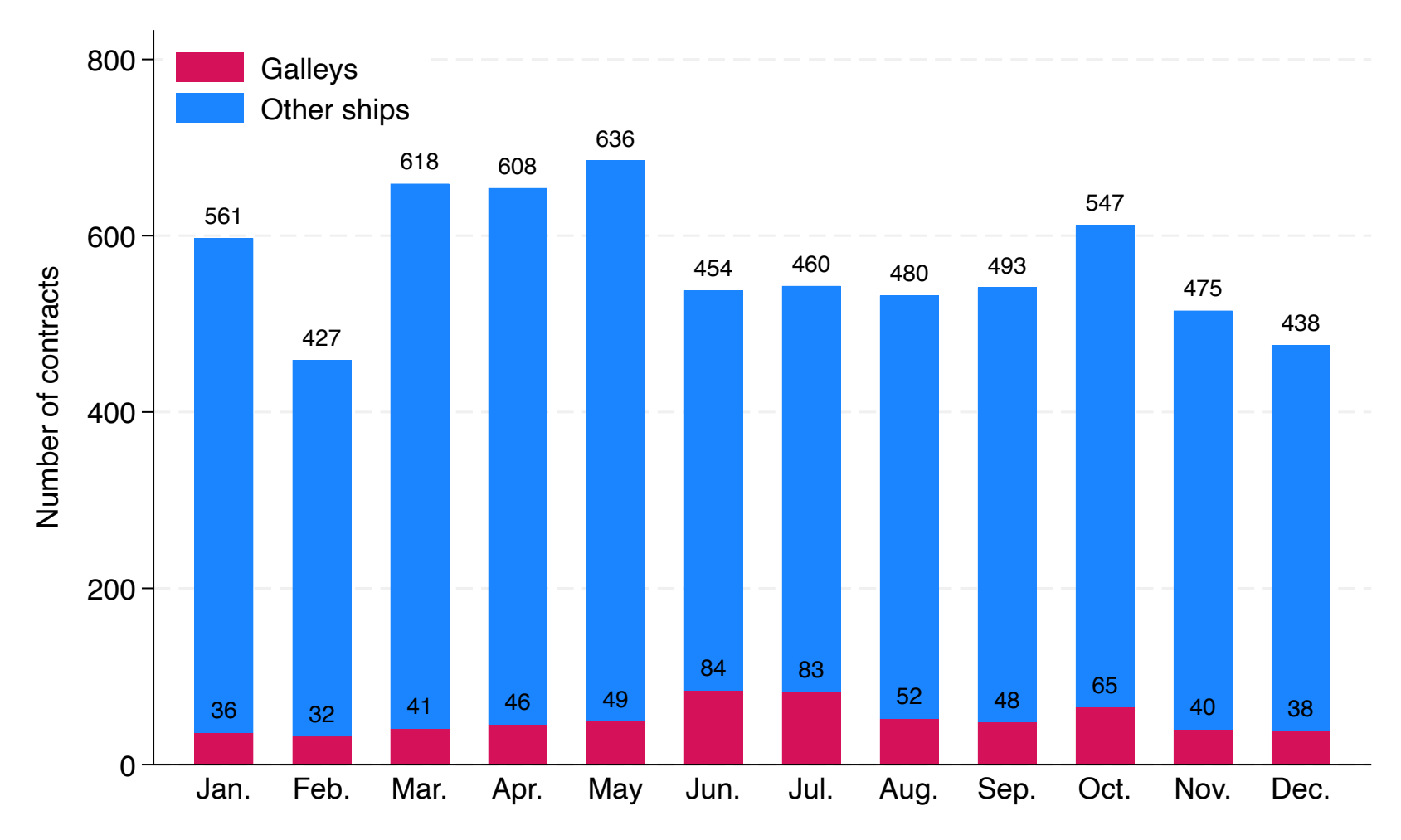

Figure 3: Monthly distribution of contracts.

4.a Early insurance markets highly concentrated

- Capital and information were (and still are) the pillars of insurance markets
- In both medieval Florence and Genoa a few big merchants had the capital and access to a wide information network necessary to pool risks, determine the insurance premium, and profit from selling insurance
- In our dataset
  - Medieval insurance markets were highly concentrated on the supply side
  - Most insurance contracts had at least one big insurer as underwriter

4.b Early insurance markets highly concentrated

Table 5: Supply side market shares.

Contracts per insurer	1	2-3	4-12	13-24	25-60	61-293
Percentile	1-55	56-74	75-89	90-94	95-98	99-100
Shares:						
Contracts	8.39	6.34	15.12	12.93	22.15	35.07
Quotas	7.09	5.51	12.69	11.99	21.84	40.89

Table 6: Demand side market shares.

Number of contracts	1	2	3-6	7-11	12-44
Percentile	1-67	68-82	83-94	95-98	99-100
Shares:					
Contracts	33.20	14.48	23.34	14.62	14.36
Quotas	31.87	13.90	24.82	14.61	14.80

4.c Coinsurance and development of the mkt, 1340–1500

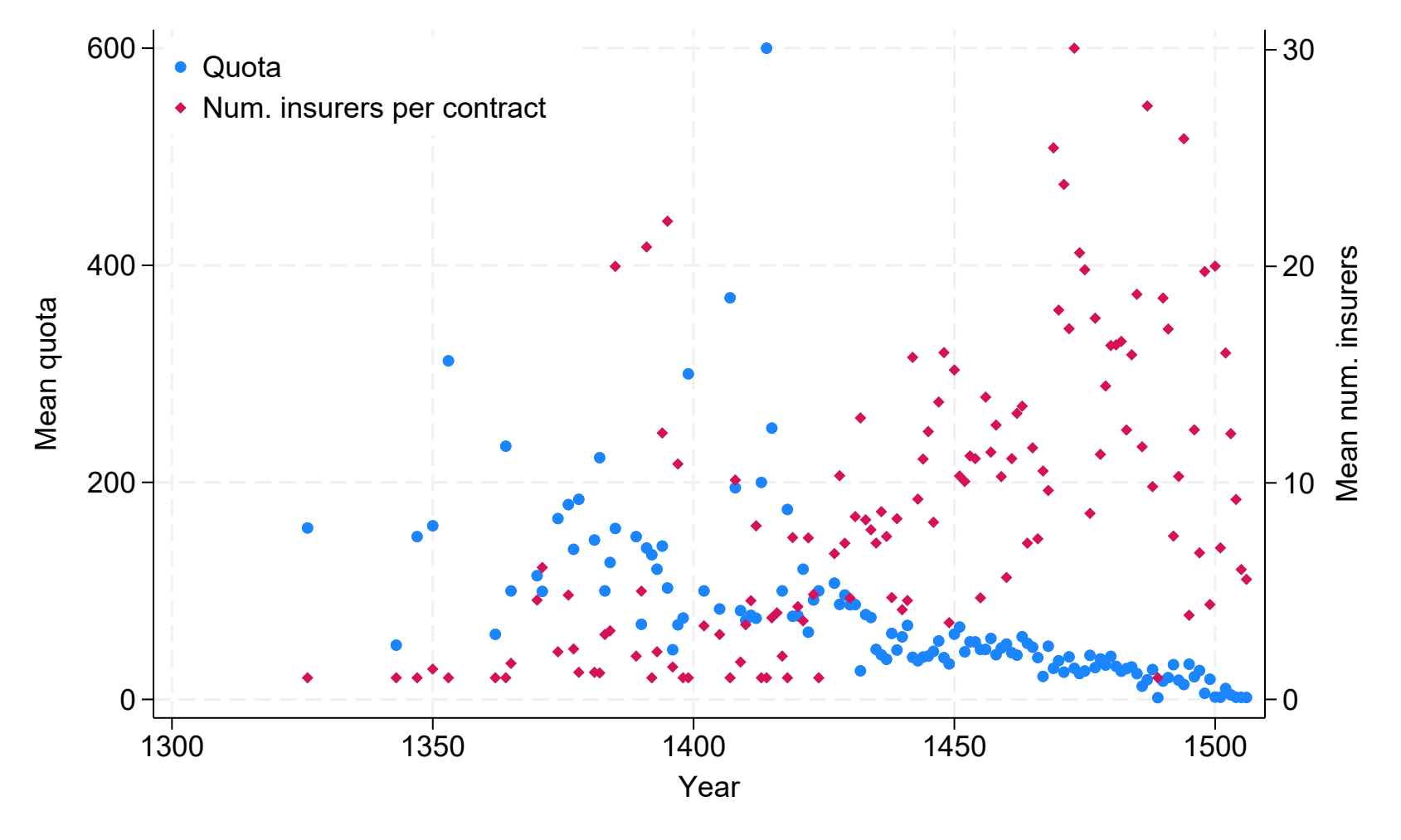

Figure 4: Mean quotas and number of coinsurers

5.a Risks in medieval maritime trade: *Mercanzia* court records

- Early 14th century: merchants' court in Florence established
  - Any litigations dealing with land and maritime trade, frauds, business partnernships, retaliations, etc.
  - Sentences unappealable, enforced across Europe
  - Chaired by foreign official (impartiality)

Cases involving insurance (1379–1430)	Number	%
Natural risks (e.g., thunderstorms)	27	40
Human risks	41	60
— attacks by corsairs/competitors		
— robberies by corsairs/competitors		
Cause of shipwreck not identifiable	36	
Total	104	

- Most "litigated" route: Tuscany — Catalonia

5.b Network representation of claims (1379–1430)

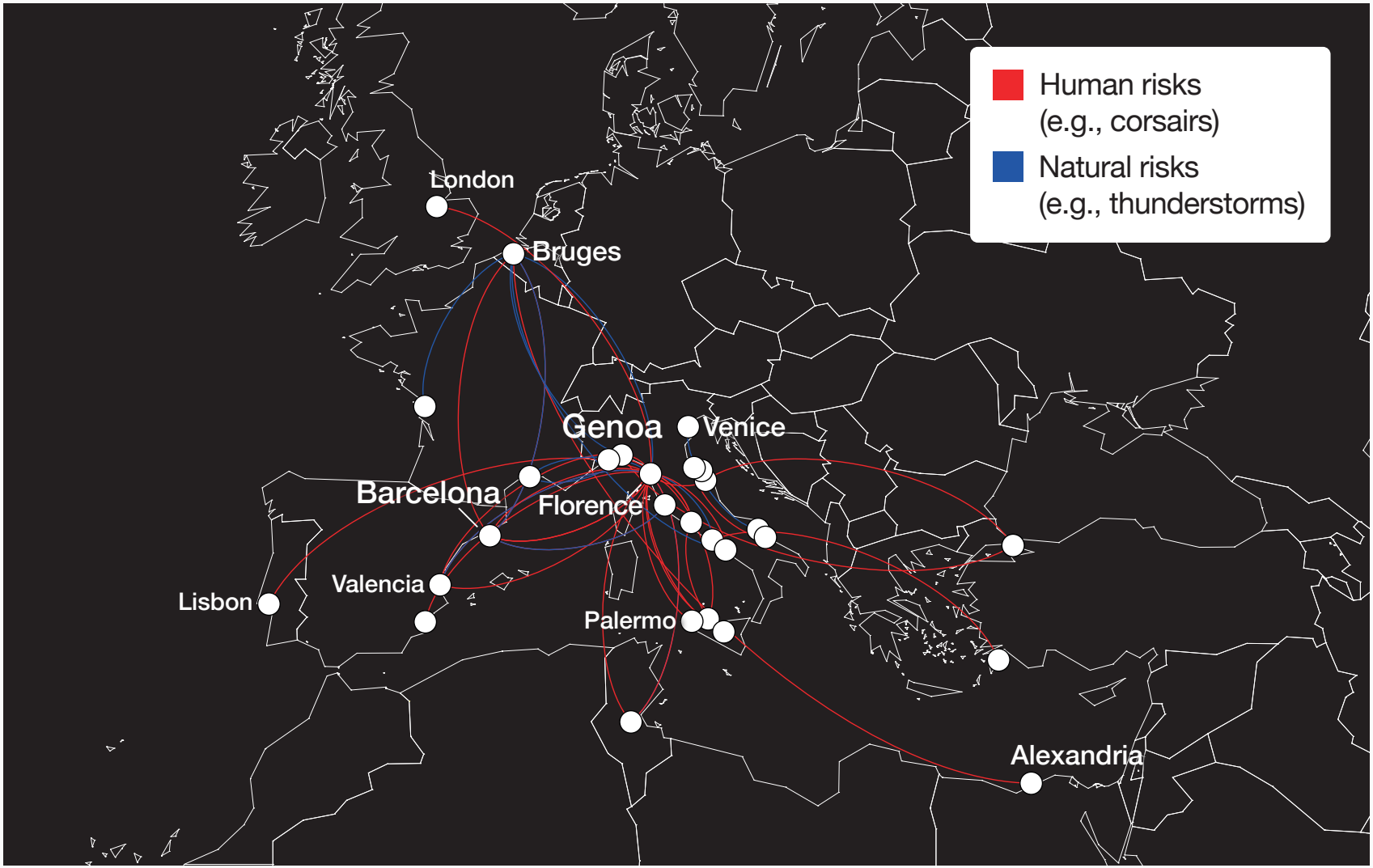

Figure 5: Insurance claims from the *Mercanzia* court records

6.a Network representation: insurance premia

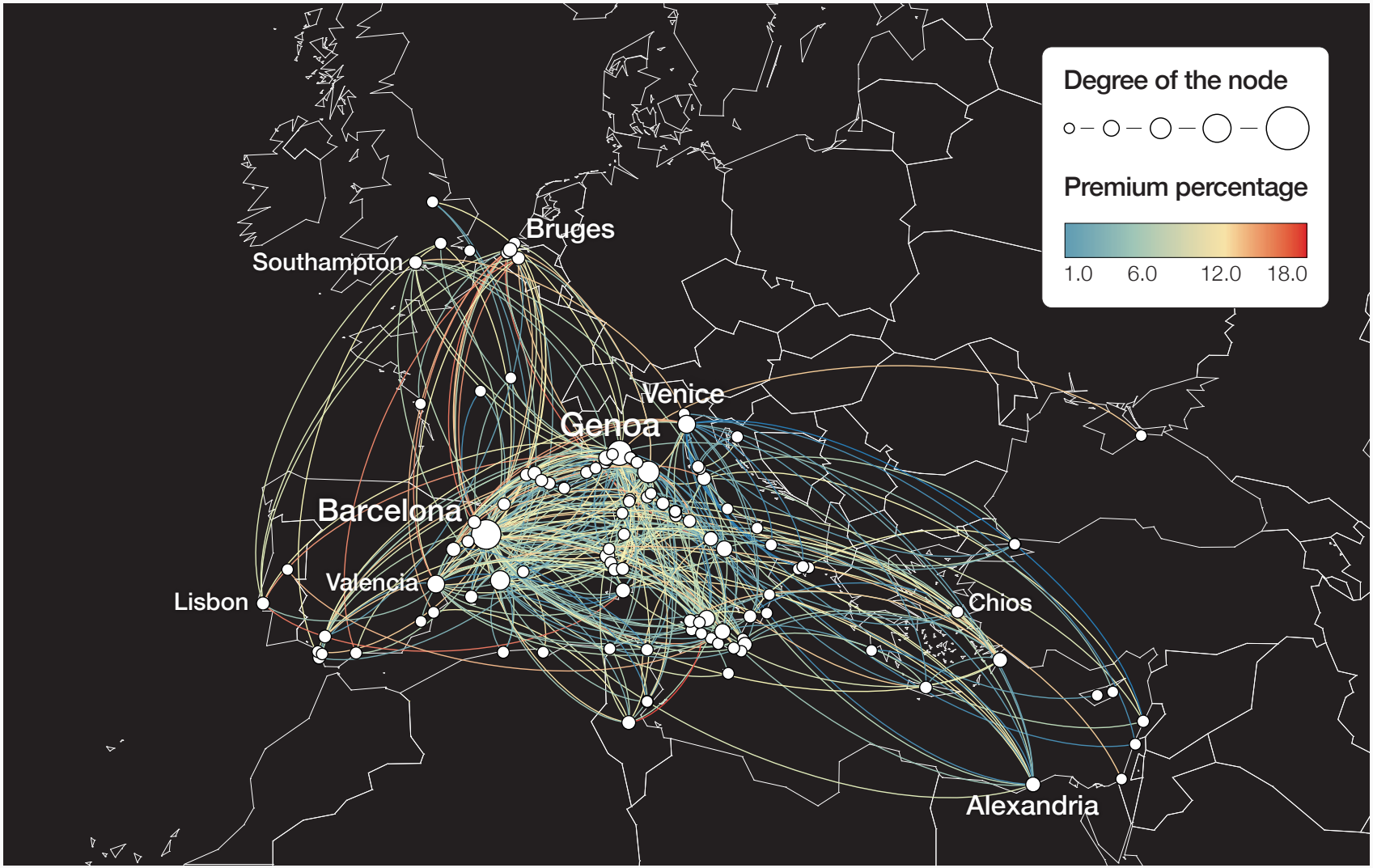

Figure 6: Insurance premia

6.b Insurance premia by commercial center in medieval Europe

Table 7: Premium percentages by location

Premium %	Obs	Mean	Sd	p10	p25	p50	p75	p90
Barcelona	1587	5.67	2.42	3	4	5	7	9
Florence	234	6.51	3.45	3	4	6	8	11
Genoa	335	5.28	2.45	2	4	5	7	9
Palermo	15	7.70	3.66	4	6	7	8	12
Venice	88	2.46	1.32	1	2	2	3	4

6.c Insurance premia without knowing the concept of probability?

- The newly developed insurance market was based on a practical understanding of probability that preceded, by at least a couple of centuries, the emergence of its theoretical understanding in the 16th and 17th centuries, most notably through the works of Cardano, Huygens, and Pascal.
- Consider this quote from the seminal mid-15th century business compendium written by Benedetto Cotrugli

  Every ship needs to be insured, because one compensates for another, and if many are insured the merchant cannot but gain overall. And he must do this boldly, because if from excessive prudence he insures one ship and not another, if some misfortune befalls the uninsured ship, there will be no compensation for the loss

- This quote clearly shows the understanding of the relevance of frequencies and risk pooling for the insurance business.

6.d Empirical determinants of insurance premia

Table 8: Insurance premia and risks of navigation

Dep. var. = Premium %	All cities (1)	All cities (2)	Genoa (3)	Florence (4)	Barcelona (5)
Log(distance)	1.4878		0.9462	1.8279	1.5803
	(0.1986)		(0.6149)	(0.0428)	(0.2902)
Seasonal risk	0.0699	0.0564	-0.0761	0.1229	0.0931
	(0.0333)	(0.0244)	(0.0096)	(0.0447)	(0.0346)
Ship = galley	-1.6417	-1.7618	-1.5105	-1.5238	-1.7287
	(0.2608)	(0.1463)	(1.4091)	(0.2400)	(0.3006)
Food shipment	2.4842	0.4340	-0.4825	2.6115	
	(0.7714)	(0.4432)	(0.9414)	(0.9082)	
Return	0.5721	0.5445	2.7484	0.4948	-0.5139
	(0.6351)	(0.6355)	(0.4978)	(1.0834)	(0.1513)
Special clauses	0.5828	0.1290	0.7116	0.6928	0.6346
	(0.2378)	(0.1658)	(0.3571)	(0.4472)	(0.2956)
Total insured (in 100 fl.)	-0.4653	-0.1191	-0.1652	-1.2124	
	(0.1297)	(0.0517)	(0.0362)	(0.5577)	
Number of insurers	0.0411	0.0168	0.0543	1.3076	
	(0.0233)	(0.0211)	(0.0270)	(0.8323)	
Mean Premium %	5.588	5.588	5.283	6.510	5.670
SD Premium %	2.627	2.627	2.449	3.447	2.422
Observations	2,157	1,998	270	199	1,587
Adjusted R^2	0.3252	0.5860	0.4825	0.4724	0.2782
Location FEs	✓	✓			
Decade FEs	✓	✓	✓	✓	✓
Route FEs		✓			

Note: Standard errors in parentheses are clustered at the location-decade level in columns (1) and (2), and at the decade level in columns (3) to (5). The dependent variable is the premium percentage of a contract. The variable *Seasonal risk* is defined as the distance in months from June or July—the closest of the two. *Return* is a dummy taking value one if the contract covers the return trip as well. *Special clauses* is a dummy taking value one if the contract specified intermediate stops or that the departure/ destination harbors could change. The total insured is the total value in gold florins of the contract, summing across the insurers. The mean and standard deviation of the dependent variable are calculated in each column for the corresponding subset.

6.e Theoretical prediction — Insurance premia: natural risks?

- Natural risks have a relatively smaller impact on insurance premia compared to human risks

6.e Empirical finding — Small impact of natural risks proxied by season on insurance premia

Table 8: Insurance premia and natural risks

Dep. var. = Premium %	All cities (1)	All cities (2)	Genoa (3)	Florence (4)	Barcelona (5)
Log(distance)	1.4878		0.9462	1.8279	1.5803
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Ship = galley	-1.6417	-1.7618	-1.5105	-1.5238	-1.7287
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Location FEs	✓	✓			
Decade FEs	✓	✓	✓	✓	✓
Route FEs		✓			
Additional controls	✓	✓	✓	✓	✓

Note: Standard errors in parentheses are clustered at the location-decade level in columns (1) and (2), and at the decade level in columns (3) to (5). The dependent variable is the premium percentage of a contract. The variable *Seasonal risk* is defined as the distance in months from June or July—the closest of the two. The mean and standard deviation of the dependent variable are calculated in each column for the corresponding subset. We control for the additional variables shown in the full Table (8) included in slide 52.

6.f Theoretical prediction — Insurance premia: human risks?

- Anything that reduced human risks (e.g., armed galley) reduced insurance premia
  - extreme case: in Venice no insurance
- Anything that increased human risks increased insurance premia
  - Corsairs
  - Warfare
  - Specific goods loaded on vessels (e.g., wheat)

6.f Empirical finding — Galleys reduce, wheat cargoes increase premium

Table 8: Insurance premia and human risks

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	(0.2608)	(0.1463)	(1.4091)	(0.2400)	(0.3006)
Food shipment	2.4842	0.4340	-0.4825	2.6115	
	(0.7714)	(0.4432)	(0.9414)	(0.9082)	
Mean Premium %	5.588	5.588	5.283	6.510	5.670
SD Premium %	2.627	2.627	2.449	3.447	2.422
Observations	2,157	1,998	270	199	1,587
Adjusted R^2	0.3252	0.5860	0.4825	0.4724	0.2782
Location FEs	✓	✓			
Decade FEs	✓	✓	✓	✓	✓
Route FEs		✓			
Additional controls	✓	✓	✓	✓	✓

Note: Standard errors in parentheses are clustered at the location-decade level in columns (1) and (2), and at the decade level in columns (3) to (5). The dependent variable is the premium percentage of a contract. The variable *Seasonal risk* is defined as the distance in months from June or July—the closest of the two. The mean and standard deviation of the dependent variable are calculated in each column for the corresponding subset. We control for the additional variables shown in the full Table (8) included in slide 52.

6.g Theoretical prediction — Insurance premia: human and natural risks combined?

- Distance mattered
- But route mattered more!
  - Longer routes increased natural risks (but mostly avoidable)
  - Regardless of distance, specific routes were more plagued by human risks (e.g., the Tyrrhenian and western Mediterranean) which were harder to avoid, especially for the majority of merchants who did not have a broad trade and information network

6.g Empirical finding — Routes matter more than distance

Table 8: Route vs. distance

Dep. var. = Premium %	All cities (1)	All cities (2)
Log(distance)	1.4878	
	(0.1986)	
Seasonal risk	0.0699	0.0564
	(0.0333)	(0.0244)
Ship = galley	-1.6417	-1.7618
	(0.2608)	(0.1463)
Food shipment	2.4842	0.4340
	(0.7714)	(0.4432)
Mean Premium %	5.588	5.588
SD Premium %	2.627	2.627
Observations	2,157	1,998
Adjusted R^2	0.3252	0.5860
Location FEs	✓	✓
Decade FEs	✓	✓
Route FEs		✓
Additional controls	✓	✓

Note: Standard errors in parentheses are clustered at the location-decade level in columns (1) and (2). The dependent variable is the premium percentage of a contract. The variable *Seasonal risk* is defined as the distance in months from June or July—the closest of the two. The mean and standard deviation of the dependent variable are calculated in each column for the corresponding subset. We control for the additional variables shown in the full Table (8) included in slide 52

6.h Potential mechanisms

Table 9: Mechanisms

Dep. var. = Premium %	Genoa (1)	Barcelona (2)	Barcelona (3)
Log(Distance)	0.6662	2.1994	1.9179
	(0.4960)	(0.2945)	(0.1265)
Seasonal risk	-0.1037	0.0790	0.0850
	(0.0728)	(0.0383)	(0.0281)
War in Genoa (1450-1458)	0.2565	-0.3063	
	(0.4659)	(0.2690)	
Route = short	-1.2862	1.1983	
	(0.3709)	(0.2963)	
War × short	1.2608	-0.1601	
	(0.1011)	(0.4571)	
War in Barcelona (1462-1472)			3.1643
			(0.2435)
Ship = galley			-1.0620
			(0.5449)
Galley × war			-1.4165
			(0.5423)
Return	3.0577	-0.6599	-0.5785
	(0.4045)	(0.3008)	(0.1946)
Constant	5.3122	6.5818	6.6604
	(0.2064)	(0.3111)	(0.3384)
Mean Premium %	5.283	5.670	5.670
SD Premium %	2.449	2.422	2.422
Observations	271	1,587	1,587
Adjusted R^2	0.4709	0.1676	0.3309

Note: Standard errors in parentheses are clustered at the decade level in all columns. The dependent variable is the premium percentage of a contract. The variable *Seasonal risk* is defined as the distance in months from June or July—the closest of the two. The variable *War in Genoa* takes value one during the years (1450-1458) of the naval blockade of Genoa by Catalan corsairs. The variable *War in Barcelona* takes value one during the years (1462-1472) of the Catalan civil war. The variable *Route = short* takes value one for routes below the median value in the sample of reference. *Return* is a dummy taking value one if the contract covers the return trip as well. The mean and standard deviation of the dependent variable are calculated in each column for the corresponding subset.

6.h Theoretical prediction: Potential mechanisms at work

- Political fragmentation and instability, wars and commercial competition with the use of corsairs increased risks with unknown probabilities
- Insurance premia should be higher in periods with increased political and military instability

6.h Example: Catalan naval blockade of Genoa in 1450s

Table 9: Insurance premia higher in Genoa

Dep. var. = Premium %	Genoa (1)	Barcelona (2)
Log(Distance)	0.6662	2.1994
	(0.4960)	(0.2945)
Seasonal risk	-0.1037	0.0790
	(0.0728)	(0.0383)
War in Genoa	0.2565	-0.3063
(1450-1458)	(0.4659)	(0.2690)
Route = short	-1.2862	1.1983
	(0.3709)	(0.2963)
War × short	1.2608	-0.1601
	(0.1011)	(0.4571)
Return	3.0577	-0.6599
	(0.4045)	(0.3008)
Constant	5.3122	6.5818
	(0.2064)	(0.3111)
Mean Premium %	5.283	5.670
SD Premium %	2.449	2.422
Observations	271	1,587
Adjusted R^2	0.4709	0.1676

Note: Standard errors in parentheses are clustered at the decade level in all columns. The dependent variable is the premium percentage of a contract. The variable *Seasonal risk* is defined as the distance in months from June or July—the closest of the two. The variable *War in Genoa* takes value one during the years (1450-1458) of the naval blockade of Genoa by Catalan corsairs. The variable *Route = short* takes value one for routes below the median value in the sample of reference. *Return* is a dummy taking value one if the contract covers the return trip as well. The mean and standard deviation of the dependent variable are calculated in each column for the corresponding subset.

6.h Example: Catalan Civil war of 1462–1472

Table 9: Insurance premia higher in Barcelona

Dep. var. = Premium %	Barcelona (3)
Log(Distance)	1.9179
	(0.1265)
Seasonal risk	0.0850
	(0.0281)
War in Barcelona (1462-1472)	3.1643
	(0.2435)
Ship = galley	-1.0620
	(0.5449)
Galley × war	-1.4165
	(0.5423)
Return	-0.5785
	(0.1946)
Constant	6.6604
	(0.3384)
Mean Premium %	5.670
SD Premium %	2.422
Observations	1,587
Adjusted R^2	0.3309

Note: Standard errors in parentheses are clustered at the decade level in all columns. The dependent variable is the premium percentage of a contract. The variable *Seasonal risk* is defined as the distance in months from June or July—the closest of the two. The variable *War in Barcelona* takes value one during the years (1462-1472) of the Catalan civil war. *Return* is a dummy taking value one if the contract covers the return trip as well.

Concluding remarks

The Beauty of Uncertainty: summary

- Political fragmentation, military instability, and commercial competition among states in medieval Europe clearly brought negative consequences.
- Yet, one positive feature of this turbulent historical period was the invention of one of the most important business practices and financial instruments that today is a pillar of our contemporary economies and societies.
- The “beauty of increased uncertainty” back in medieval times is that nowadays individuals, families, firms, and governments benefit from having insurance contracts and markets.

The Beauty of Uncertainty: road map

- We ask: why was insurance invented in medieval Europe (not earlier, not elsewhere)?
- A theoretical framework helps address this question
- Narrative evidence supports the theory insights
- We then ask:
  - How were early (1340 – 1500) insurance markets organized?
  - Which were the main risks in medieval trade?
  - How did medieval merchants determine insurance premia?
- The archives in Florence, Genoa, Palermo, Prato, Venice & Barcelona provide wonderful (!!!) data
  - Empirical findings consistent with theory insights
- Infinite gratitude to the European Research Council
  - This research project would remain a dream without ERC funding

Epilogue: take-home message

- Was this a big question?
- Maybe it is not a big question
- But it is a question that keeps us awake at night and eager to learn more about it
- We enjoyed immensely the journey of learning involved in this project
- And this is all it matters for us