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*Managing risk in fifteenth-century Barcelona:  
The insurance practices of the merchant Joan de Torralba*<sup>3</sup>

## 1. Introduction

This paper contributes to current scholarly debates on the intensification of maritime risk in the late medieval Mediterranean, with particular attention to the rising prevalence of piracy and privateering. These phenomena – structural rather than incidental – compelled merchants and financial actors to develop increasingly sophisticated contractual and institutional mechanisms for risk transfer and mitigation. Within this evolving framework, insurance emerged not merely as a commercial tool, but as a critical component of the infrastructure underpinning long-distance trade and the organisation of merchant capital (Casado, 2009, 2012, 2015).

To understand the role of insurance in this context, several analytical dimensions must be addressed. Foremost is the issue of risk and uncertainty, which lies at the heart of all insurance activity. Secondly, it is essential to examine the commercial actors and networks that transformed insurance from an ad hoc arrangement into a systematic economic instrument – particularly in the realm of long-distance trade. Moreover, any historically grounded analysis of insurance must distinguish between different categories of risk: natural risks (such as storms and navigational hazards), human risks (notably piracy and privateering), and the eventual institutionalisation of contractual responses to these uncertainties. This tripartite classification clarifies how insurance developed not only as a financial innovation, but as an adaptive institutional response to increasingly complex and volatile trading environments.

Insurance contracts functioned as more than mere hedges against physical loss. They also served as mechanisms for managing uncertainty in highly fragmented and imperfect markets. In this regard, they addressed what economic theorists term

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Knightian uncertainty – risks that are difficult to quantify and forecast. Merchants and underwriters alike relied on accumulated experience, informal knowledge networks, and notarial documentation to estimate potential losses. While these assessments did not follow the principles of modern actuarial science, they nevertheless reflected a rational logic grounded in expectations of utility within a world of incomplete information (Botticini et al. 2023).

From the early fourteenth century onwards, the Mediterranean maritime economy was subjected to an escalating regime of geopolitical volatility and armed conflict, which rendered navigation increasingly precarious. This period witnessed the proliferation of compound maritime hazards: natural perils such as shipwrecks, tempests, submerged reefs, and hazardous straits were now compounded by systemic risks linked to human agency, most notably the endemic threat of privateering and naval predation (Botticini et al. 2023). These conditions transformed the maritime corridor from a conduit of commercial expansion into a theatre of financial vulnerability. In this multidimensional and asymmetrically distributed risk environment, marine insurance emerged not simply as an auxiliary mechanism of protection, but as an indispensable institutional instrument for the organisation of long-distance trade. In commercial hubs such as Barcelona – characterised by high capital turnover and spatially dispersed ventures – merchants such as Joan de Torralba increasingly resorted to insurance contracts to hedge against loss, distribute exposure, and ensure liquidity across ventures. The integration of insurance into merchant practice marked a decisive evolution in the infrastructure of risk management, enabling the regularisation of commercial flows amidst systemic uncertainty.

Simultaneously, the determinants of premium calculation in late medieval insurance contracts have become the subject of increasing historiographical scrutiny. While early scholarship tended to posit a linear correlation between voyage length and insurance cost, more recent analyses have emphasised the contextual specificity of maritime risk assessment (Cevolini 2016). Rather than operating as a simple function of distance, premium levels were more acutely influenced by the contingent risk profile of individual maritime corridors – factors such as exposure to corsair activity, the seasonal volatility of sea conditions, and the geopolitical instability of transit zones weighed heavily in underwriting decisions. This shift in interpretive emphasis necessitates a granular re-examination of insured routes and suggests that merchants such as Joan de Torralba engaged in a form of corridor-specific actuarial reasoning, pricing risk in accordance with complex matrices of spatial, seasonal, and institutional uncertainty.

This more intricate understanding of premium formation also intersects with foundational debates in the economic theory of insurance. The pricing of maritime risk did not take place in a frictionless informational environment, it was shaped by asymmetries in knowledge, varying degrees of reputational capital among shippers and ports, and uneven capacities for contractual enforcement across jurisdictions. Insurance, in this context, operated not as a hedge against loss but as a mechanism of risk externalisation and redistribution – frequently through multi-underwriter or *polizza collettiva* arrangements that dispersed liability across syndicates of guarantors. Such proto-pooling mechanisms not only mitigated exposure but also contributed to

the early institutionalisation of collective risk-sharing frameworks that underpinned the financial architecture of Mediterranean trade.

Within this conceptual architecture, the figure of the merchant-underwriter assumes particular analytical significance. Far from being a passive recipient of actuarial conventions, they actively participated in the construction and modulation of risk categories. The surviving contracts suggest a high degree of discretionary calibration: premium rates were not standardised but contingent, often negotiated on the basis of recent events, perceived political stability at destination ports, or rumours circulating within mercantile networks. Insurance, therefore, was not solely reactive – it was anticipatory, grounded in a form of merchant empiricism and path-dependent decision-making. The contract, in this sense, became a codified expression of probabilistic reasoning, balancing exposure against projected returns. Notably, many policies in Torralba's portfolio covered not only cargo but also anticipated profits (*lucri esperati*), indicating an embryonic recognition of opportunity cost and temporal risk. Such provisions reveal the extent to which insurance functioned as an instrument for managing not only volatility but also expectation – an early intersection of risk and investment logic that prefigured more formalised financial instruments in early modern markets.

By the early fifteenth century, four principal insurance markets had crystallised within the Crown of Aragon: Barcelona, Valencia, Mallorca, and Perpignan. Among these, Barcelona emerged as the most dynamic node, both in terms of the volume of contracts executed and the geographical breadth of maritime routes insured. While legal historians have meticulously documented the structural form and juridical clauses of Catalan insurance policies (Ferrer & García, 1983), and economic historians have embedded these developments within macro-narratives of mercantile expansion, urban restructuring, and demographic contraction (Del Treppo, 1972; Carrère, 1977), the historiography converges on a salient analytical consensus: the hegemonic influence of Italian capital, legal technique, and commercial personnel – particularly from Genoa and Florence – in shaping the institutional logic of the Crown's nascent insurance economy. Genoese underwriting expertise and Florentine mercantile capital provided not only liquidity but also the contractual templates and enforcement norms that catalysed the domestication of marine insurance in Catalan cities. However, this Italo-centric explanatory model, while broadly valid, risks obscuring the endogenous evolution of local underwriting practices, the role of municipal institutions, and the agency of Catalan merchants in adapting, reinterpreting, and localising imported financial instruments to suit regionally specific configurations of risk, trust, and legal culture.

## 2. Objectives

This study seeks to re-evaluate prevailing interpretations of the late medieval insurance market in the Crown of Aragon through a tightly focused, empirically grounded case study of the Barcelona merchant Joan de Torralba. Leveraging his exceptionally well-preserved and chronologically continuous accounting records, the analysis explores the functional role of insurance within his broader commercial

architecture during the first half of the fifteenth century. Torralba operated a geographically expansive and operationally complex mercantile network that articulated Barcelona with a constellation of major economic nodes across the late medieval Mediterranean. His commercial reach extended westward and southward to Mallorca, Valencia, Palermo, Naples, and various ports of North Africa; northward into the Tuscan and Ligurian corridor – particularly Florence, Pisa, and Venice; and eastward to key Levantine and Aegean entrepôts including Famagusta, Rhodes, Beirut, and Alexandria. His presence in Ragusa (Dubrovnik) further underscores the trans-Adriatic and trans-Mediterranean scope of his operations. Through this network, Torralba was embedded not only in regional trade flows but also in broader circuits of capital and information, positioning him in direct commercial interaction with some of the most powerful Italian merchant dynasties active in the city of Barcelona.

Amidst heightened maritime insecurity, Torralba systematically deployed insurance contracts to mitigate exposure and stabilise capital flows. Yet his engagement with the insurance market was not limited to the defensive logic of hedging, he simultaneously occupied the role of underwriter, strategically leveraging his liquidity, information advantages, and network position to extract profit from the very risks he insured against. In this dual positioning, Torralba emerges as a paradigmatic hybrid economic agent – both insurer and insured – whose activities exemplify the bifurcated nature of late medieval insurance as at once a mechanism for risk dispersion and an avenue for speculative accumulation.

The internal coherence and chronological scope of the documentation permit an unusually granular reconstruction of Torralba's insurance operations. Through systematic analysis of his account books and notarial registers, we identify the maritime routes secured, the typologies and valuations of merchandise covered, the vessels and carriers employed, and the social profiles and contractual configurations of both underwriters and policyholders. This empirical microanalysis affords rare visibility into the operative logic of marine insurance as practiced in situ, beyond the normative frame of legal formularies.

The study proposes that Torralba's commercial strategies constitute not only a singular biography but also a representative and analytically generative case through which to explore the institutional morphology of the insurance market in early *Quattrocento* Barcelona. His records provide a privileged entry point into the lived practices of uncertainty navigation, intertemporal capital allocation, and financial instrumentality within a volatile, transregional economic environment. More broadly, this analysis contributes to ongoing efforts to historicise risk management within the *longue durée* of Mediterranean commerce, while contributing to a more regionally differentiated understanding of insurance culture that complements and nuances the traditionally Italo-centric narratives of its development.

### 3. Working hypotheses

In accordance with the analytical framework proposed, this study advances a set of interrelated working hypotheses aimed at deepening our understanding of the structural logic of insurance practices in fifteenth-century Barcelona. These

hypotheses are grounded in the detailed examination of Joan de Torralba's accounting documentation and seek to contribute to broader debates in economic history concerning institutional development, risk allocation, and commercial sociability.

**Joan de Torralba operated within a business model characterised by a high degree of strategic responsiveness to macroeconomic and political fluctuations.** His investment decisions were shaped by evolving conjunctures – namely, periods of geopolitical instability and increased maritime risk – which opened new opportunities for portfolio diversification. We hypothesise that insurance constituted not only a protective mechanism, but also a site of speculative investment within his wider commercial operations. This suggests the existence of a replicable behavioural model among merchants in the Crown of Aragon, in which capital was flexibly reallocated between trade, finance, and risk intermediation, depending on the perceived structure of incentives and threats.

**Barcelona had, by the final decades of the fourteenth century, emerged as a central node in the trans-Mediterranean commercial and financial network.** Its capacity to attract merchant capital, legal expertise, and underwriting activity from diverse regional and international actors – spanning the territories of the Crown of Aragon, as well as major European and Maghrebi trading centres – enabled it to consolidate its institutional role as a premier insurance market. We hypothesise that Barcelona's position was underpinned not only by its economic weight, but by its ability to provide legal and contractual frameworks conducive to risk transfer, and by the circulation of technical knowledge imported through Italian and other foreign intermediaries.

**Torralba's engagement with the insurance market was embedded in overlapping kinship and sociability networks, which provided the trust-based infrastructure required for commercial and financial intermediation.** While familial capital formed a structural foundation, it was through broader associational and intercultural ties – particularly those linking him to influential foreign communities in Barcelona and Zaragoza – that Torralba was able to construct and sustain flexible underwriting partnerships. Using network analysis and digital prosopographical tools, we aim to reconstruct the composition of the insurance groups in which Torralba participated, identifying patterns of collaboration, co-insurance, and intermediation. These findings may shed light on the social logic of risk-sharing and the informal institutions that facilitated enforcement in the absence of formal regulatory bodies.

Taken together, these hypotheses rest on the assumption that Torralba's documentation constitutes a uniquely valuable case study for analysing the intersection of institutional evolution, commercial risk, and social capital in a late medieval context. Through quantitative and qualitative analysis of his insurance transactions, we aim to assess:

- the relative share of Torralba's capital allocated to underwriting versus coverage;

- the extent to which his partnerships were shaped by his connection to the Tuscan community; and
- whether his increased participation in the insurance market during the 1440s and 1450s can be interpreted as a rational response to the mounting risk environment triggered by broader geopolitical shifts – namely, the conquest of Naples, the military conflicts with Florence and Venice, and the profound dislocation caused by the Ottoman capture of Constantinople.

#### 4. Sources and methodology

This research is grounded in both edited and unpublished documentation pertaining to the Barcelona merchant Joan de Torralba, preserved in the *Arxiu Nacional de Catalunya (Fons Requesens, ANC1-T-960)*. The collection comprises thirteen account books, accompanied by extensive commercial correspondence and ancillary materials related to Torralba's business operations in the first half of the fifteenth century. This documentary corpus constitutes one of the most continuous and voluminous bodies of mercantile evidence extant from the Crown of Aragon in the *Quattrocento*. For the purposes of this study, particular analytical emphasis is placed on two core account books, which serve as the primary evidentiary base for reconstructing Torralba's engagement with the marine insurance market:

1. *Manual onzè de Joan de Torralba* (ANC1-960-T-4240) – The Eleventh Journal of Joan de Torralba (1434-1437)
2. *Manual dotzè de Joan de Torralba* (ANC1-960-T-211) – The Twelfth Journal of Joan de Torralba (1437-1438)

These journals comprise highly structured, chronologically ordered entries that document maritime expeditions, insured cargoes, premium payments, underwriting arrangements, and associated financial transfers. Their internal consistency and temporal resolution permit both microhistorical scrutiny of discrete transactions and the longitudinal reconstruction of evolving commercial patterns. Notably, they also allow for the identification of shifts in Torralba's risk appetite, underwriting strategies, and spatial coverage over time.

Methodologically, the study adopts a mixed analytical framework that combines close qualitative reading of the accounting and notarial material with systematic quantitative reconstruction of financial operations. Particular attention is devoted to capital deployment strategies, risk typologies, spatial itineraries, and the contractual composition of underwriting arrangements. In support of this analysis, we have constructed a comprehensive dataset encompassing the full corpus of identifiable insurance transactions involving Torralba between 1434 and 1446. Each case is disaggregated along multiple dimensions, including voyage destination, insured merchandise, premium amount and rate, underwriting party, and insured counterparty. Where applicable, the dataset also records the presence of intermediaries, money changers, shipmasters, and any ancillary contractual clauses or financial mechanisms embedded in the agreement. This granular architecture enables the identification of

recurring patterns, the modelling of premium variability, and the reconstruction of Torralba's embedded position within wider constellations of commercial actors. In addition, relational network analysis has been employed to visualise the interconnected roles of stakeholders across transactions, shedding light on the structural configuration of risk-sharing communities and the institutional embeddedness of marine insurance within the financial and social fabric of *Quattrocento* Barcelona.

## 5. Who was Joan de Torralba?

Joan de Torralba was a merchant of Aragonese origin whose career exemplifies the dynamism and structural transformation of commerce in the fifteenth-century Crown of Aragon. Born in the village of Torralba near Calatayud, his early trajectory reflects a gradual reorientation from the interior to the maritime economy: first active in Calatayud and Zaragoza, he ultimately relocated to Barcelona, where he established permanent residence in 1405. His formal acquisition of Barcelona citizenship in 1412 marked not only civic integration but also a strategic consolidation of his position within the urban mercantile elite of the Principality.

Joan de Torralba consistently cultivated the identity of a *mercader singular*, maintaining close personal oversight over his operations while simultaneously acting as financier, commercial organiser, and strategic decision-maker. From the 1410s to the late 1440s, however, he also participated in a succession of carefully structured business partnerships, designed to pool capital, diversify risk, and expand operational scope. These companies – typically formed with merchants from Barcelona and Zaragoza – reveal a deliberate strategy of trust-based collaboration across the internal geography of the Crown. Among his most frequent partners were Fortuny de Manariello and Juan de Manariello, while his trading operations routinely interfaced with agents in major Mediterranean cities. Although earlier scholarship occasionally emphasised Genoese links, Torralba's network was more strongly embedded in Tuscan and Catalan circuits of capital.

Across five successive commercial partnerships established between 1425 and 1447, Torralba adhered to a consistent model of equity distribution and internal governance. Typically contributing between one-third and one-half of the total capital, he shared managerial control with one or two principal associates, often structuring firms on principles of symmetrical risk and shared command. These associations were contractually limited in duration but flexible in their renewal and adaptation, allowing him to respond to shifting market conditions and political volatility. His final company was liquidated in 1447, after which he appears to have resumed independent operations until his death in 1458.

Upon his death, his estate passed to his daughter Antònia and was eventually incorporated into the holdings of the aristocratic Requesens lineage. This dynastic transmission, coupled with the preservation of his personal and commercial archive, has yielded an extraordinarily rich documentary legacy. These materials offer unparalleled insight into the mechanisms of late medieval trade, capital circulation, risk mitigation, and inter-city coordination from the perspective of an embedded yet mobile economic actor.

Joan de Torralba thus emerges as a paradigmatic figure of late medieval commercial modernity: at once independent entrepreneur and institutional risk-sharer, flexible organiser of capital and methodical chronicler of his financial world. His career constitutes a unique case study in entrepreneurial continuity, regional integration, and the structural embeddedness of merchant capitalism in the late medieval western Mediterranean. For further discussion of Torralba's life, companies, and commercial strategies, see: López Pérez & Nassar (2024); Abulafia & López Pérez (2020); López Pérez et al. (2019); López Pérez (2013); López Pérez et al. (2022).

## 6. Historiographical context

The historiography on the origins, diffusion, and institutional consolidation of maritime insurance in the late medieval period has long been dominated by the primacy of Italian models. A broad scholarly consensus holds that the practice of *assicurazione a premio* – insurance for a fixed premium – emerged in Florence during the early fourteenth century, crystallising among the city's mercantile elites as a response to increasing long-distance trade volatility. While interpretations diverge on the precise chronology and mechanisms of institutionalisation, it is generally agreed that Florentine merchants formalised insurance as a distinct contractual instrument by the late *Trecento*, and that this innovation gave rise to a recognisable market system in the early *Quattrocento*.

At the same time, regional differentiation in the adoption and operationalisation of the *a premio* model has received growing scholarly attention. Genoa, for instance, followed a notably divergent path: notarial protocols reveal that Genoese merchants continued to favour simulated sales and maritime loans (*foenus nauticum*) as their principal risk-transfer mechanisms well into the fifteenth century. Influential studies – including Giovanni Ceccarelli's *Un mercato del rischio* and *Risky Markets: Marine Insurance in Renaissance Florence*, as well as Sergio Tognetti's analysis of the private account books of Gherardo di Bartolomeo Gherardi – have underscored these institutional divergences, highlighting how insurance markets did not evolve uniformly across the Italian peninsula.

Within this broader framework, the institutional evolution of marine insurance in the Crown of Aragon – especially in Barcelona – has been explored less extensively than its Italian counterparts, though a growing body of scholarship has begun to illuminate its particular dynamics. Evidence suggests that *a premio* contracts were already in use by the late fourteenth century, and that their institutional consolidation accelerated in the early decades of the fifteenth century. The first municipal ordinances regulating insurance in Barcelona were promulgated in 1432, followed by additional enactments in 1435 and 1484, and successive revisions in 1436, 1461, 1471, 1494, and 1513 (García, 1971; Peláez, 1989). Nonetheless, notarial registers from the late *Trecento* attest to the earlier presence of insurance agreements, revealing an emergent practice that preceded formal regulation.

A recurring theme in the dominant historiography is the secondary role played by local Catalan underwriters in the early phases of this institutional development. Italo-Catalan scholarship – most notably the foundational contributions of María

Teresa Ferrer, Arcadi García, Mario Del Treppo, and Claude Carrère – has repeatedly emphasised the determining influence of Italian capital and contractual expertise. Based on extensive analysis of notarial records, Ferrer and García traced the evolution of contractual forms in Barcelona, documenting an initial prevalence of Genoese templates followed by a gradual shift, between 1377 and 1392, toward the adoption of Florentine models. These findings align with Carrère’s broader argument that Italian merchants acted as institutional “masters,” imparting technical knowledge and financial instruments – including insurance and bills of exchange – to Catalan counterparts. Del Treppo, while broadly concurring, nuanced this interpretation by underscoring the proactive disposition of Catalan merchants, who willingly engaged in unfamiliar forms of risk-bearing and experimented with new financial tools under conditions of growing commercial uncertainty.

Perhaps the most illustrative example of Italian predominance is the case of the notary Bartomeu Masons major, who maintained a specialised register exclusively for marine insurance contracts. For the biennium 1428–1429, Masons’ protocols show a preponderance of foreign underwriting activity, with Italian merchants – particularly from Florence and Genoa – occupying a dominant position (Del Treppo, 1976; Carrère, 1977; Ferrer and García, 1983; Soldani, 2001). Carrère further observed that the principal Catalan commercial houses – Llobera, Junyent, Bertran, Manresa, Sirvent, and Roda – largely refrained from underwriting, engaging in insurance primarily as insured parties. He estimated that insurance covered no more than one-quarter of all maritime cargoes in this period, suggesting that the Catalan mercantile elite approached the practice with a degree of caution or even ambivalence. By the 1450s, however, a gradual shift is discernible: smaller investors increasingly entered the market, deploying limited capital in search of modest yet relatively secure returns, thereby contributing to the broader social diffusion of insurance as a speculative financial instrument.

Ultimately, what is at stake in these debates is not merely the question of origin or technical diffusion, but the institutional trajectory and regional adaptation of insurance mechanisms within plural commercial ecologies. While the formative role of Italian models remains foundational, recent work – this study included – seeks to foreground the capacity of Catalan merchants to appropriate, localise, and selectively adapt imported practices in response to local legal traditions, market structures, and risk environments.

### **6.1. Critical discussion and reappraisal.**

While the prevailing historiographical narrative has underscored the formative influence of Italian underwriting models and capital flows in the development of marine insurance in Catalan cities, new evidence drawn from the accounting records of Joan de Torralba invites a partial reappraisal of this framework. A systematic analysis of his ledgers – particularly during the period 1434–1446 – allows us to nuance earlier interpretations and to question the analytical rigidity of models that attribute disproportionate agency to foreign operators. Rather than a binary dichotomy between Italian ‘instructors’ and Catalan ‘recipients,’ the documentation reveals a more

iterative and hybrid process of institutional transfer, characterised by incremental borrowing, situational adaptation, and progressive localisation of underwriting practices.

The contrast between the earlier phase of Italian-led underwriting dominance and the increasingly assertive participation of Catalan merchants in the 1400s – precisely the period during which Torralba reached the height of his commercial activity – raises important historiographical and economic questions concerning the chronology, scale, and character of this transition. Notably, Mario Del Treppo's analysis of notary Antoni Vilanova's registers (1436-1446) indicates a measurable contraction of Italian capital in the Barcelona insurance market during this decade. This withdrawal appears to correlate with broader patterns of Florentine disengagement from the city's financial circuits and coincides with the rise of native underwriting initiatives.

The evidence presented in this study suggests that by the mid-fifteenth century, the underwriting landscape in Barcelona had undergone a structural transformation. Catalan merchants were no longer peripheral participants but had begun to occupy central roles in the design, negotiation, and capitalisation of insurance contracts. The shift reflects not merely increasing participation but a qualitative evolution in merchant behaviour – from contractual compliance to contractual authorship – marking a more advanced stage in the local institutional embedding of marine insurance.

What emerges, therefore, is not a rupture with Italian precedent but a process of endogenous consolidation, whereby imported financial instruments were increasingly recalibrated to suit the institutional ecology of the Crown of Aragon. This transformation cannot be reduced to imitation or delayed reception, rather, it reflects a case of what Douglass North and later Avner Greif have elsewhere characterised as *adaptive efficiency* – the capacity of institutions to evolve by integrating external models into locally viable frameworks. Torralba's dual role as insurer and insured, his control over the structure of underwriting consortia, and his ability to extract rent from premium differentials all point to a deepening of financial expertise within the native merchant class, and to the emergence of Barcelona not merely as a recipient of insurance techniques, but as an active site of financial innovation.

Moreover, this shift coincides with broader dynamics of financial devolution and commercial decentralisation within the western Mediterranean. The declining dominance of large Italian houses, the growing liquidity of local capital pools, and the increasing role of urban notaries as brokers and enforcers of contractual enforcement all contributed to the redistribution of underwriting activity. While earlier decades were marked by asymmetrical dependency on Italian financial infrastructure, the 1420s up to 1440s reveal a moment of recalibration, in which Catalan actors adapted to the retreat of foreign capital not with regression, but with institutional reinforcement. This pattern further challenges Braudelian assumptions of a stable 'centre-periphery' logic in late medieval finance, suggesting instead a more dynamic model of regional capability and institutional pluralism.

## 7. Discussion.

The dataset under examination comprises 195 maritime insurance cases executed in fifteenth-century Barcelona, drawn from the private account books of Joan de Torralba [Table 1]. This corpus provides a rare empirical foundation for analysing capital deployment, risk allocation, and the mechanics of commercial intermediation during a period of institutional consolidation and financial deepening in the western Mediterranean. Out of the 195 total cases, 144 (73.8%) explicitly record insured amounts, while 183 (93.8%) include references to the insurance premium. This discrepancy, though slight, likely reflects selective notarial recording practices and the particular contractual emphasis placed on the monetary dimension of risk. The near-ubiquitous presence of premium entries strongly suggests that *a premio* insurance had, by the 1430s and 1440s, been thoroughly institutionalised as a formalised, monetised, and enforceable mechanism of maritime risk management within the Barcelona marketplace.

Among the 143 recorded premiums, 141 are denominated in *llibres* (Catalan pounds), while only 2 appear in *florins de Florència* (Florentine florins). This distribution confirms the dominance of the local monetary unit in insurance pricing and reflects the deepening monetisation of financial instruments within the jurisdictional and fiscal logic of the Crown of Aragon. At the same time, the occasional use of Florentine currency – though marginal – attests to the presence of transnational capital flows and contracts linked to Tuscan financial circuits. The average premium in *llibres* stands at approximately 152.4, with individual values ranging from as low as 10 to as high as 1,570. A further breakdown shows premiums spanning from 1 *sous* and 6 *diners* to over 135 *llibres*, revealing a wide spectrum of exposure and capital intensity. This heterogeneity illustrates the variegated scale of commercial risk insured and the integration of insurance into both modest and high-value ventures.

The dataset identifies 49 distinct insurees and 78 unique insurers, a pattern consistent with the diffusionist architecture of late medieval underwriting. The imbalance between the number of underwriters and insured parties reflects the widespread adoption of the *multi-insurer model*, wherein liability was subdivided among numerous parties, each assuming fractional risk. This institutional arrangement – well-documented in other Mediterranean hubs such as Florence and Venice – allowed for optimal dispersion of exposure and demonstrates the operational sophistication of Barcelona's insurance ecosystem.

Geographical analysis confirms Pisa as the most frequently insured destination in Torralba's dataset, a pattern that underscores its strategic salience within his maritime geography. This prominence may be interpreted in several, not necessarily mutually exclusive, ways. On the one hand, it likely reflects a high volume of commercial interaction along the Tuscan corridor, linking the port of Pisa with interior economic centres such as Florence, Lucca, and the broader Arno Valley. Pisa's role as a maritime interface for Tuscan capital and Florentine textiles positioned it as a critical node in the overland-maritime logistical chain that connected inland manufactures with western Mediterranean consumption zones. In this respect, its recurrence in Torralba's insurance portfolio is consistent with its broader economic centrality in Quattrocento trade networks.

However, the high frequency of insurance contracts on voyages bound for Pisa should not be interpreted uncritically as a proxy for commercial stability or reduced risk. On the contrary, such regularity may indicate a heightened awareness of specific vulnerabilities – whether related to maritime insecurity, political contestation in the Tyrrhenian corridor. In this sense, the insurability of Pisa-bound ventures may reflect not the absence of risk but its calculability and institutional manageability. Merchants like Torralba may have perceived this route as simultaneously essential and sufficiently exposed to justify frequent risk hedging. The willingness to insure repeatedly on a single corridor also presupposes confidence in enforceable legal frameworks and available underwriting capital – indirect indicators of institutional infrastructure rather than of inherent security.

Thus, Pisa's prominence in the dataset invites a more nuanced reading, it reveals a commercial route that was both indispensable and sufficiently structured to support regularised risk-sharing mechanisms. The logic of repetition – far from being a sign of routine safety – may in fact reflect a dynamic equilibrium in which opportunity and risk were jointly priced, monitored, and redistributed. This interpretation reinforces the argument that marine insurance was not reserved for exceptional dangers but had become structurally integrated into the operating logic of high-volume, high-value commercial circuits.

Other frequently insured destinations – including Palermo, Majorca, Naples, and Famagusta – confirm the expansive, multipolar orientation of Torralba's network. Their inclusion reveals a broader pattern of spatial diversification in trade strategy and supports the thesis that Barcelona's insurance economy functioned as an integral component of trans-Mediterranean capital mobility and interurban risk governance during the mid-fifteenth century.

Brokerage emerges as a structurally embedded and functionally indispensable element in the organisation of marine insurance transactions. The most frequently encountered intermediary is Bartomeu de Simó, a *corredor de lonja* (exchange broker), whose recurring presence in Torralba's records signals the growing formalisation of brokerage as a recognised professional role. His activity suggests that insurance agreements were seldom the product of direct, unmediated negotiation. Rather, brokers acted as facilitators of trust and transactional alignment, matching underwriters with insurees, mediating price expectations, and contributing to the assessment of risk. The involvement of brokers such as Simó – likely operating under municipal oversight – points to the increasing institutionalisation of underwriting processes. It also underscores the extent to which marine insurance in mid-fifteenth-century Barcelona relied not only on legal form but on embedded interpersonal networks structured around reputational intermediation.

Tab. 1. **Basic Statistics of the Dataset (1434-1446). Source: ANC1-960-T-4320 and ANC1-960-T-211**

Metric	Value
Total contracts	195
Contracts with insured amount	144
Contracts with premium	183
Average insured amount [lb]	177.0
Max insured amount [lb]	1570
Min insured amount [d]	18
Average premium [lb]	8.3
Max premium [lb]	135
Min premium [lb]	10
Unique insurees	49
Unique insurers	78
Most common destination	Pisa
Most common intermediary	Bartomeu de Simó

Source: Own elaboration using Python.

Between 1434 and 1446, Joan de Torralba appears as the insured party in approximately 61% of the maritime insurance contracts preserved in his ledgers, while in the remaining 39% of cases, he acted as the insurer (Graph 1). This asymmetric distribution already reveals a dual positionality within the risk economy – at once a merchant seeking indemnification against contingent loss and a provider of underwriting capital assuming exposure on behalf of others. The coexistence of these roles situates Torralba within what economic theory would define as a transitional actor between the *risk-averse agent* and the *risk-neutral intermediary*, capable of converting liquidity and trust into returns through calculated risk assumption.

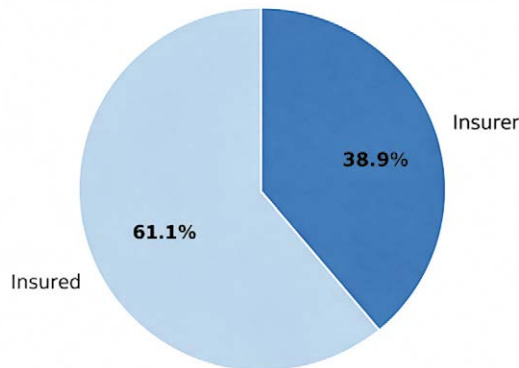
What becomes analytically significant, however, is the structural inflection that occurs around 1445. From this point forward, the data indicate a decisive reorientation in Torralba's insurance activity. Whereas earlier he had primarily sought protection from exogenous hazards – storm, piracy, market disruption – he now emerges as a consistent underwriter, assuming responsibility for third-party risk across a variety of maritime routes. This strategic repositioning marks a fundamental shift in his commercial function: from hedging uncertainty to actively commodifying it. Such a transformation presupposes not only growing capital reserves and enhanced informational capacity, but also a refined calibration of actuarial judgement – what Frank Knight might describe as the conversion of 'uncertainty' into 'calculable risk' (Knight 1921).

Notably, although the majority of contracts in which Torralba appears as insurer are anchored in departures from the port of Barcelona, the documentation also

records his underwriting participation in policies originating from Mallorca – especially those covering voyages to the Maghreb. This expansion beyond his primary geographic base suggests the extension of his underwriting capacity across nodal points of the western Mediterranean, reinforcing his status not merely as a merchant but as a regional provider of marine financial services. In economic terms, this implies the development of an intermediary profile structurally embedded in the distributed architecture of Mediterranean trade finance.

The trend is corroborated by evidence from the *Llibre Quart* (Fourth Ledger), covering the final decade of his career (1448-1458), in which 60 additional insurance contracts have been identified – all of them listing Torralba exclusively as insurer. When integrated with the earlier dataset, this yields a total of 253 insurance cases, of which 118 (46.6%) list him as insured, and 135 (53.4%) as insurer. This shift from net risk purchaser to net risk provider signals a reconfiguration of his economic role. He no longer operated merely as a participant in risk-averse exchange but had effectively repositioned himself as a *financial intermediary* – a redistributor of maritime risk, profiting from premium differentials while supplying counterparties with contractual certainty. Torralba thus exemplifies a broader transformation within late medieval merchant ‘capitalism’, wherein commercial actors increasingly leveraged informational asymmetries, liquidity advantages, and network centrality to convert contingent volatility into structured financial opportunity.

Graph 1. Roles of Joan de Torralba in insurance cases (n=195) (1434–1446).



Source: ANC1-960-T-4320 and ANC1-960-T-211. Own elaboration using Python.

Continuing with the structured analysis of the dataset drawn from the two journals of Joan de Torralba, we turn to Graph 2, which illustrates the percentage distribution of destinations covered by maritime insurance contracts in which Torralba participated, either as insured or insurer. This visualisation offers a spatial mapping of Torralba's insurable activity between 1434 and 1446, providing insight into the geographic architecture of his commercial and risk-allocation strategies. The chart reveals a clear concentration of insurance contracts linked to Pisa – accounting for over 35% of recorded cases – followed by Venice, Ragusa, and Barcelona. This distribution points to the structural centrality of the Tyrrhenian and Adriatic corridors within Torralba's commercial ecosystem and, by extension, to the strategic gravitational pull of key Italian maritime hubs for Catalan merchants in the early fifteenth century. Pisa's, already discussed, prominence is consistent with its role as a maritime gateway to Florence, while the recurrence of Venice and Ragusa confirms Torralba's active integration into the eastern Adriatic trade axis. Other notable nodes – Genoa, Palermo, Alexandria – further underscore his operational reach across the trans-Mediterranean commercial space. In contrast, the limited incidence of contracts involving Tunis, Rhodes, or Valencia likely reflects episodic ventures or marginal diversification beyond his principal routes.

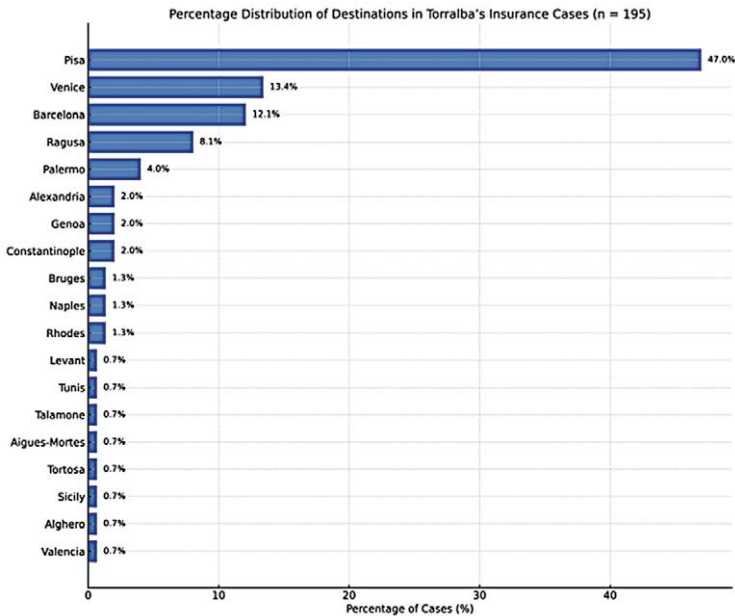
This spatial concentration of insurable routes reflects not only commercial gravity but also calibrated exposure to environmental, political, and logistical risks. When interpreted through the lens of *expected utility theory*, Torralba's behaviour appears to conform to the rational decision-making profile of a risk-averse agent operating under uncertainty. The logic underpinning repeated coverage of specific routes suggests that he engaged in probabilistic reasoning based on subjective estimations of loss likelihood – whether grounded in maritime conditions, corsair threat levels, or jurisdictional instability. In particular, the emphasis on insuring voyages to Pisa, Venice, and Ragusa implies that these corridors – while commercially vital – were simultaneously assessed as sufficiently exposed to adverse events to justify premium expenditure. This is consistent with utility-maximising behaviour under risk aversion, wherein the expected disutility of a major loss outweighs the fixed cost of insurance, prompting systematic hedging.

At a more structural level, this pattern of selective and repeated insurance suggests that Torralba's commercial decisions were shaped by bounded rationality and incomplete information, filtered through a framework of practical experience and institutional mediation (Sent, 2018). Rather than relying on formalised actuarial models, his insurance activity likely operated within an *economy of signals*, where prior outcomes, circulating news, and the advice of brokers and notaries collectively informed the perceived riskiness of specific routes. In this context, the act of insuring a voyage functioned not solely as protection against loss but also as a market signal – expressing private risk assessments and shaping shared expectations across the underwriting community. This behaviour reflects a broader phenomenon in pre-modern commercial systems: the translation of qualitative perceptions into contractual valuations. By systematically insuring voyages to certain destinations, Torralba both revealed and reinforced a set of implicit risk hierarchies, in which maritime corridors were differentially priced according to their volatility, strategic value, and institutional visibility. Insurance, therefore, emerges not only as a tool of capital protection but also as a

relational practice of risk communication – embedded in a wider ecology of commercial information, trust networks, and reputational economies (Kingston, 2014).

A further insight emerges when the dataset is cross-referenced with premium data. Preliminary analysis suggests a correlation between destination and average premium: routes associated with greater perceived or actual volatility – due to exposure to piracy, open-sea navigation, or unstable political conditions – tend to command higher premiums. By contrast, voyages to established or routinely traversed trading centres generally exhibit lower premium rates. This suggests that Torralba's insurance pricing was not uniform, but reflected *route-specific risk differentials*, likely shaped by both market consensus and individual expectation. The presence of such a gradient opens the door to a more granular analysis of premium elasticity and risk-pricing rationality, which will be addressed in the following sections.

Graph 2. percentage distribution of destinations in Joan de Torralba's Insurance Cases (1434-1446)



Source: ANC1-960-T-4320 and ANC1-960-T-211. Own elaboration using Python.

This observation opens the door to a more analytically rigorous and empirically grounded exploration of risk valuation within Torralba's insurance portfolio [Table 2]. To assess the relationship between insured destination and the pricing of maritime risk, we isolate only those contracts in which both the monetary premium and the insurance rate are simultaneously recorded. While the broader corpus contains a wider range of destinations, many entries document only one of the two required

variables, rendering them unsuitable for consistent econometric modelling. To preserve statistical validity and mitigate bias arising from missing data, the analysis is restricted to a subset of 77 fully specified contracts. These concern voyages to Alexandria, Barcelona, Constantinople, Pisa, Ragusa, and Venice – the only destinations for which Torralba’s documentation permits coherent observation of both premium value and rate of insurance.

Tab. 2. **Linear Regression Model Estimating the Determinants of Insurance Rate in Torralba’s Maritime Contracts (1434–1446).** *Source: ANCI-960-T-4320 and ANCI-960-T-211. Own elaboration using Matlab.*

MODEL SUMMARY	
R-squared:	0.6500
F-statistic:	21:3618
p-value:	0.0000
Error variance:	0.0002
Variable	Coefficient
“Intercept”	0.08752
“Premium”	1.04e-05
“Destination: Alexandria”	-0.0087278
“Destination: Barcelona”	-0.021196
“Destination: Constantinople”	0
“Destination: Pisa”	-0.017477
“Destination: Ragusa”	-0.17472
“Destination: Venice”	0.035357

On this refined basis, we apply a cross-sectional Ordinary Least Squares (OLS) regression to estimate the determinants of insurance pricing<sup>4</sup>. The dependent variable

<sup>4</sup> While the use of OLS provides interpretable and statistically tractable estimates, its application to small-sample historical datasets presents inherent limitations. First, the reduced number of observations ( $n = 77$ ) increases the risk of overfitting and limits the model’s ability to detect subtle or non-linear relationships. Second, the potential presence of heteroskedasticity—common in historical economic data due to uneven reporting practices—may bias standard errors and inflate significance levels. Although residual diagnostics suggest acceptable model behaviour, the absence of contemporaneous control variables (e.g. cargo type, ship tonnage, seasonality) introduces omitted variable bias. Finally, the reliance on archival material introduces structural selection effects, as not all contracts were equally preserved or recorded with full financial detail. For these reasons, the regression should be interpreted not as a predictive model but as a

is the insurance rate (expressed as a percentage of the insured value), while the primary explanatory variables include the absolute monetary premium (measured in *diners*) and a series of categorical dummies capturing destination-specific effects. The choice of OLS is appropriate given the nature of the dependent variable (continuous, bounded away from zero), the structure of the dataset (non-panel, non-time series), and the interpretive clarity it affords – particularly in testing the marginal impact of voyage characteristics on risk pricing. The model achieves a strong degree of explanatory power, with an R-squared of 0.65, indicating that 65% of the variation in insurance rates can be attributed to differences in premium size and route geography. The model's joint significance is confirmed by an F-statistic of 21.36 ( $p < 0.0001$ ), underscoring the collective explanatory strength of the regressors.

The coefficient on the *premium* variable is positive and statistically significant, albeit modest in magnitude ( $1.04e-05$ ), suggesting that higher absolute premium amounts are associated with marginally higher insurance rates. This result is consistent with exposure-adjusted pricing frameworks, whereby the total expected loss (premium  $\times$  rate) reflects an endogenous calibration of risk in proportion to capital at stake. Alternatively, it may reflect a mild form of adverse selection, wherein higher-value ventures were perceived as more vulnerable to targeted predation or non-random hazards and were consequently priced at a premium. This also aligns with principles from the expected loss model in insurance economics, where the rate adjusts not only for probability but also for severity.

Turning to spatial variables, the model reveals notable heterogeneity in risk pricing across destinations. Ragusa is associated with a large and statistically significant negative coefficient ( $-0.1747$ ), implying that voyages to or from Ragusa were systematically insured at substantially lower rates relative to the reference category (Constantinople). This may reflect a confluence of factors: relatively secure Adriatic navigation, robust local governance, or strong creditworthiness among Ragusan merchants – all of which would reduce perceived underwriting exposure.

Conversely, Venice displays a positive and significant coefficient ( $+0.0354$ ), suggesting a structural risk premium attached to voyages involving that corridor. Given Venice's centrality in high-volume, high-value trade and its frequent entanglement in regional conflicts, this elevated rate may reflect both market perception of increased volatility and higher aggregate exposure in absolute value terms. Other destinations – Alexandria, Barcelona, Pisa – do not exhibit statistically significant deviations from the baseline, suggesting that insurance pricing for these ports was either more stable or more tightly clustered around the perceived average.

From a historical perspective, these findings offer compelling evidence that Torralba's underwriting practices incorporated route-specific risk differentiation, shaped by a mixture of empirical precedent, market convention, and institutional memory. Insurance was not priced uniformly, but in accordance with geographic risk profiles, filtered through the lenses of political uncertainty, navigational danger, and commercial density. The model thus reveals that even within a largely pre-statistical regime, late medieval merchants such as Torralba engaged in implicit risk

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historically contextualised estimation of risk-pricing tendencies within a specific documentary and commercial ecosystem.

segmentation, leveraging experience and contractual standardisation to generate differentiated premiums. This pattern strongly supports the view that marine insurance had evolved – at least in part – into a rationalised financial instrument capable of encoding heterogeneous uncertainty into monetisable contractual form. The logic underlying this behaviour can be synthesised econometrically in a stylised model of implicit risk segmentation, capturing the interaction between premium, exposure, and spatially embedded perceptions of risk.

*Sample model: Implicit risk segmentation in Late Medieval marine insurance:*

Let:

$R_i$ : Insurance rate for contract  $i$

$Premium_i$ : Nominal premium value for contract  $i$

$Exposure_i$ : Total insured capital (cargo value)

$RouteRisk_{d(i)}$ : Latent risk profile associated with destination  $d$

$Z_i$ : Vector of observed voyage-level characteristics (e.g. season, port of departure, shipmaster reputation, political events)

$\epsilon_i$ : Unobserved disturbance term

We can posit a historical pricing function of the following form:

$$Rate_i = \alpha + \beta_1 * \log(Premium_i) + \beta_2 * \log(Exposure_i) + \sum_d \gamma_d * DestinationDummy_{d(i)} + \delta'Z_i + \epsilon_i$$

Model Interpretation:

$\beta_1 > 0$ : Reflects marginal increase in rate associated with higher nominal premiums – may capture risk aversion, strategic pricing, or selection bias toward higher-value cargoes.

$\gamma_d$ : Destination fixed effects capturing *route-specific pricing premia*, interpreted as historical proxies for perceived risk (piracy, conflict, maritime hazards).

$Z_i$ : Controls for contextual factors that merchants might have internalised (e.g., sailing season, inter-port tensions, duration).

**Log transformation:** Imposes diminishing marginal sensitivity to size of premium and exposure – historically plausible given non-linear perceptions of large-scale losses.

This model embodies:

**Bayesian learning logic:** Merchants estimate  $RouteRisk_d$  based on prior experience and network information.

**Expected loss pricing:** Rates are a function of probability  $\times$  severity, where probability is embedded in  $\gamma_d$  and severity in  $Exposure_i$ .

**Institutional memory:** Through  $\gamma_d$ , past events (e.g. corsair attacks on Pisa route) are "priced in" despite no formal data system.

**Embedded rationality:** The model does not presume full statistical optimisation, but bounded rational approximation rooted in experience, contract custom, and peer behaviour.

Empirical Adaptation (with our data):

$Rate_i$  (dependent variable)

$Premium_i$

Destination dummies

→ As existing OLS is a reduced version of this general model, missing the  $\log(Exposure_i)$  term (cargo value) and  $Z_i$ .

If cargo values is available, it is possible re-estimate a richer model. If not, this structure still gives a **theoretical foundation** to justify interpreting coefficients as reflections of embedded, route-specific risk valuation.

From an economic perspective, the results of the regression model confirm key features of risk-pricing logic in late medieval maritime insurance. The observed positive relationship between the premium amount and the insurance rate is consistent with a non-linear pricing mechanism whereby underwriters adjusted rates upwards in response to increasing capital exposure. This pattern aligns with the predictions of expected utility theory, in which risk-averse agents demand compensation proportional to both the probability and magnitude of potential loss. That is, higher insured values not only increase expected liability but also amplify the marginal utility cost of uncertainty for the underwriter, thereby justifying elevated rates. This behaviour reflects the absence of actuarial neutrality in pre-modern insurance and instead signals the presence of risk-adjusted premium elasticities responsive to scale.

Equally important is the evidence of spatially differentiated risk pricing, as captured through the significant variation in destination coefficients. The higher insurance rates associated with Venice – as opposed to Pisa or Ragusa – illustrate how merchants and insurers engaged in geographically encoded risk valuation, incorporating multiple factors beyond mere distance. While piracy remains a persistent explanatory factor in the literature, it is unlikely to fully account for this premium, given that Genoese corsairs were more active in the western than in the Adriatic or Aegean corridors. Instead, the Venetian coefficient likely reflects a composite perception of increased voyage length, heightened exposure to open-sea navigation, the high value and volatility of Venetian-bound cargoes, and the city's involvement in complex regional conflicts. In this light, Venice commanded a risk premium not solely as a locus of danger, but as a node of high-stakes commercial intermediation.

Conversely, the systematically lower rates associated with Ragusa point to the operation of what might be termed a reputational discount mechanism – wherein ports known for institutional reliability, diplomatic neutrality, and navigational familiarity reduced perceived underwriting exposure. Despite its proximity to Venetian spheres of influence, Ragusa maintained a high degree of de facto independence and

was renowned for its strong notarial infrastructure, predictable port regulations, and network of bilateral treaties. These features would have lowered enforcement risk, mitigated uncertainty, and anchored trust-based pricing conventions within the underwriting community.

These findings resonate with theoretical frameworks developed under information economics and market segmentation theory. The observed pricing heterogeneity supports the notion that Joan de Torralba and his contemporaries operated under conditions of asymmetric information, where individual route profiles were priced based on embedded reputation, accumulated merchant intelligence, and the shared epistemologies of the underwriting ecosystem. Torralba's differentiated premiums were not arbitrary but formed part of a rationalised strategy for navigating imperfect and fragmented capital markets, in which contractual monetisation of perceived risk substituted for statistical calibration. While such segmentation lacked the formal stochastic structure of modern actuarial modelling, it nonetheless reflects a pre-modern logic of endogenous risk valuation, rooted in institutional memory and commercial pragmatism.

Finally, the relatively neutral coefficients for Constantinople and Alexandria – despite their considerable geographical distance – suggest a partial normalisation of trade risk in the Eastern Mediterranean by the 1430s and 1440s. This phenomenon may be explained not by proximity or maritime safety per se, but by the existence of stable diplomatic frameworks and durable institutional guarantees, most notably the peace and trade treaties established between the Crown of Aragon and the Mamluk Sultanate. These agreements conferred a quasi-privileged status upon Catalan merchants operating in Alexandria, Beirut, and other Levantine ports, facilitating access to markets and offering effective protection against arbitrary confiscation, port duties, or judicial uncertainty.

In the case of Constantinople, then still under Byzantine control, the persistence of long-standing commercial ties with Western merchants – alongside the continued operation of Latin trading quarters and embassies – may have similarly contributed to a perception of predictable, if complex, trading conditions. In both instances, the risk landscape was structured less by proximity than by institutional predictability and treaty enforcement, which in turn were internalised by underwriters in the form of moderate and stable premiums.

By contrast, Barcelona – Torralba's home base – displays a slight discount in insurance rates, which may reflect informational asymmetries in favour of the insurer, as well as the reduced logistical complexity of coastal or regional routes. Yet the broader contrast remains analytically significant: while the Western Mediterranean was exposed to intense privateering, shifting inter-urban rivalries, and less clearly institutionalised protections, the Eastern Mediterranean – despite greater distance – appears to have been perceived as contractually safer. In this light, the geography of insurance rates reveals not only spatial differentiation but a deeper logic of risk institutionalisation, wherein diplomatic infrastructure and legal foresight translated directly into economic valuation.

## 8. Conclusions

This study has drawn upon the systematic analysis of Joan de Torralba's accounting registers, focusing on a corpus of 195 maritime insurance operations recorded between 1434 and 1446. These records constitute a granular and internally consistent datasets currently available for examining the institutional architecture and operative logic of marine insurance in the Crown of Aragon during the mid-fifteenth century. The formal structure of the entries varies depending on Torralba's contractual position. As a policyholder, the entries tend to exhibit a high level of informational density – detailing the identity of underwriters, insured values, individual premiums, voyage trajectories, and cargo types. Conversely, when Torralba appears as an underwriter, the notations become terser and more schematic, though still sufficient to permit partial reconstruction of his capital exposure and co-insurance arrangements.

One of the principal findings concerns the composition and geographic profile of the insured–insurer networks. The data suggest a measurable shift towards the endogenous consolidation of underwriting capacity among Catalan merchants, particularly those embedded in the institutional milieu of Barcelona. While Tuscan operators – especially Florentines and Pisans residing in the city – remain visibly active in underwriting roles, their dominance appears increasingly circumscribed. This evolution is best interpreted not as a rupture but as a process of institutional assimilation: a gradual localisation of foreign expertise into Catalan commercial routines, facilitated by contractual standardisation, notarial routinisation, and reputational convergence within a common Mediterranean legal culture.

The spatial distribution of insured itineraries further corroborates this interpretation. Torralba's own policies exhibit a pronounced concentration on Italian destinations – most notably Pisa, Venice, and Ragusa – thereby confirming the strategic orientation of his activity towards the northern Tyrrhenian and Adriatic corridors. At first glance, the documentation reveals a notable predominance of policies covering outbound voyages; however, this does not imply the systematic absence of return insurance. Rather, the structure of several contracts – particularly those with higher premiums or extended temporal coverage – suggests the existence of round-trip policies that implicitly or explicitly covered both legs of the journey. Where such coverage is absent, it remains possible that return voyages were insured via separate contracts executed in the destination ports, or, alternatively, that return cargo was not acquired in sufficient volume to justify separate protection.

This interpretation is reinforced by Torralba's observable reliance on bills of exchange for capital repatriation. The repeated use of such instruments suggests a commercial model oriented towards the liquidation of goods at destination and the subsequent financial transmission of profits – particularly from the sale of wool – rather than the physical reinvestment in return cargo. In this light, the configuration of Torralba's insurance portfolio reflects a hybridised strategy, securing outbound shipments with high merchandise exposure, while using financial instruments to reduce the need for return voyage risk coverage unless required by specific commercial arrangements.

Crucially, Torralba's involvement in the insurance market extended beyond the protective logic of risk mitigation for his own cargoes. He systematically engaged in

underwriting as an investment strategy, transforming informational asymmetries and access to capital into a speculative position within the broader risk economy. The insurance records reveal a diverse set of beneficiaries, overwhelmingly comprised of fellow merchants, with only a single documented instance of a woman acting as an insurer – highlighting both the commercial and gendered dynamics of marine insurance as a financial instrument. Furthermore, Torralba's underwriting activities encompassed voyages departing from a range of Mediterranean ports, often outside his core trading network, indicating a capacity to evaluate unfamiliar corridors using translocal intelligence and reputational inference.

This behaviour reveals a sophisticated exploitation of relational informational infrastructures. The ledgers frequently document incoming correspondence from agents stationed in Genoa, Pisa, Venice, and other critical nodes, suggesting that underwriting decisions were made in response to real-time assessments of political volatility, seasonal risk, and port-specific enforcement reliability. Insurance premiums thus emerged not as fixed market prices but as negotiated assessments of contingent liability – anchored in probabilistic reasoning, institutional trust, and strategic positioning. In some instances, coverage extended beyond cargo to include hull or fractional vessel ownership, indicating both an expansion of insurance as a financial product and a diversification of risk portfolios.

Taken collectively, these findings support the interpretation of marine insurance in mid-fifteenth-century Barcelona as a semi-autonomous financial sub-system, integrated into – but not wholly dependent upon – Italian mercantile hegemony. While the foundational models remained Florentine and Genoese in origin, their replication and adaptation within the Catalan context produced an increasingly endogenous logic of risk intermediation. Torralba exemplifies the dual role of the late medieval merchant as both entrepreneur and insurer, mediating between commercial uncertainty and capital allocation through an emerging institutional infrastructure that transformed subjective risk into monetisable certainty.

Beyond the structural and institutional conclusions detailed above, several further insights emerge from the econometric and relational analysis undertaken:

***Insurance as a hybrid instrument of protection and profit:***

Torralba's dual role – alternating between insured and underwriter – epitomises the hybrid function of marine insurance in late medieval commerce: simultaneously a mechanism for hedging exposure and a speculative vehicle for yield. From the mid-1440s onwards, his progressive shift toward underwriting corresponds to an increasingly financialised posture, whereby capital surplus and informational advantage were strategically deployed to absorb and price external risk. This behavioural shift aligns with Schumpeterian notions of the entrepreneur as a bearer of uncertainty and anticipates the emergence of the “merchant-financier” archetype that would later dominate early modern trade system (Schumpeter & Swedberg, 2005).

***Spatial risk differentiation and merchant rationality:***

The regression results offer empirical confirmation that Torralba and his contemporaries engaged in route-specific risk pricing, applying differentiated premiums according to distance, geopolitical risk, and maritime exposure. The statistically

significant premium differential associated with Venetian routes illustrates a rudimentary, yet rational, application of spatial arbitrage and expected utility optimisation. In effect, Torralba's underwriting decisions reflect a form of anticipatory calculation within an environment of incomplete information – suggesting the presence of tacit actuarial logic well before the formalisation of probability theory (Stefansson, 2022).

***Partial codification and institutional path dependence:***

The heterogeneity in contract formatting – especially when Torralba functioned as insurer – demonstrates the coexistence of evolving notarial conventions with enduring informal norms. While a degree of contractual standardisation is evident in recurring linguistic formulas, premium structures, and routing clauses, deviations persist due to personalised trust mechanisms, idiosyncratic notarial styles. This evidences a path-dependent institutional evolution, in which legal and financial routines crystallise incrementally through localised praxis rather than top-down codification (Acemoglu et al., 2021).

***Gendered dimensions of financial intermediation:***

Although numerically marginal, the appearance of a female insurer within the dataset – presumably a widow or capital-owning woman – signals the permeability of certain institutional boundaries. In a commercial landscape dominated by male agents, such an anomaly reveals the latent potential for female participation in capital markets, particularly under conditions of inheritance, marital dissolution, or urban property ownership. This observation invites further research into the microhistorical and gendered pathways through which women accessed high-risk financial instruments in the late medieval Crown of Aragon.

***Barcelona as a regional hub of contractual innovation:***

The results affirm Barcelona's increasing role not as a passive recipient of Florentine or Genoese financial models, but as a dynamic node of adaptation and institutional consolidation. The expanding involvement of local underwriters, the diversity of insured routes, and the formalisation of brokerage and documentation practices collectively suggest the maturation of an endogenous financial infrastructure. While Italian capital remained influential, Torralba's case illustrates the emergence of a structurally differentiated, locally governed insurance market embedded within a broader Mediterranean commercial system. In this regard, Barcelona by the mid-*Quattrocento* may be seen as an early site of financial innovation and cross-jurisdictional contract experimentation.

To conclude, this study was framed around three working hypotheses concerning the structure, function, and embeddedness of Joan de Torralba's engagement with maritime insurance in mid-fifteenth-century Barcelona. Each has been systematically examined through quantitative modelling, archival reconstruction, and contextual historical interpretation.

The first hypothesis posited that Torralba operated within a business model marked by a high degree of strategic responsiveness to macroeconomic volatility and

political uncertainty. This proposition is substantiated by the econometric evidence: premiums were not uniform but varied according to destination, reflecting a differentiated risk pricing system that internalised route-specific threats, commercial expectations, and external shocks. The observed correlations between premium values, routes, and rates suggest that Torralba's underwriting logic was shaped by a historically contingent process of value construction, in which insurance became both an adaptive response to perceived risk and a rationalised financial tool.

The second hypothesis concerned the role of Barcelona as a central node within the trans-Mediterranean commercial-financial system by the final decades of the fourteenth century. While not entirely novel, this assertion has traditionally been obscured by crisis-centric historiography that emphasised the economic decline of late medieval Catalonia. The present findings, in line with recent scholarship, refute this narrative. The evidence drawn from Torralba's accounting books and insurance engagements points to a mature, resilient, and autonomous financial culture. Barcelona, along with Mallorca, appears not only as an early adopter of a *premio* insurance practices, but as an institutional innovator. The synchronisation of local ordinances with Mallorcan and Genoese norms, the density of underwriting activity, and the integration into broader Maghrebi and Levantine circuits all indicate a confluence of factors – geopolitical, commercial, and personal – that positioned the city as a pivotal hub in the evolution of late medieval marine insurance. Whether this prominence emerged from the agency of Catalan merchants, from their intermediary position between East and West, or from the catalytic role of Italian expertise, remains a question that requires further holistic investigation.

The third hypothesis maintained that Torralba's participation in the insurance economy was deeply embedded in overlapping structures of kinship, sociability, and trust. This is supported by the relational patterns discerned in the contracts themselves: repeated underwriting partnerships, reliance on known brokers and money-changers, and consistent references to commercial correspondents suggest a finely grained trust architecture rooted in personal familiarity and reputation. In this regard, Torralba's business model reflects the broader principles of *informal institutional economics*, in which enforcement is not solely legal but also social, and where trust substitutes for formal guarantees in an environment of high transactional risk (Greif, 1997, 2006, 2025). The accounting books – when read not only as financial artefacts but as documentary expressions of social capital – affirm that Torralba's insurance activities were sustained by, and contributive to, an evolving network of informal institutions, whose origins can be traced to the overlapping traditions of Catalan urban mercantilism and the broader Mediterranean culture of contractual flexibility.

Taken together, these findings do not simply reconstruct the insurance activity of a single merchant. They offer a window into the complex interplay between economic rationality, institutional development, and social infrastructure in a late medieval Mediterranean city – an interplay that underpinned the emergence of early financial capitalism well before the advent of modern actuarial regimes.

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