

Transparency, Contract Selection
and the Maritime Trade of Venetian Crete, 1303-1351

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Business historians agree that by some point of the 10th century Western Europe had commenced an economic revival that persisted into the early 14th century. “Revival” implies that the economy had experienced decline before the 10th century, yet sorting out when and how decline occurred turns out to be a tricky matter. Denying that there was any decline might be like denying the roundness of the Earth, but while the evidence of the Earth’s roundness is vivid and abundant, the evidence of decline in the Middle Ages is circumstantial.

Western Europe experienced protracted and, perhaps, fitful economic decline at one or more stages between the fragmentation of Roman control of the Western Mediterranean in the 4th and 5th centuries and the eventual consolidation of most of the Mediterranean under Muslim control by the 9th century. The extent to which the fragmentation of Roman authority itself contributed, if at all, to commercial decline remains poorly understood. (See, for example, Pirenne 1925, Luzzatto 1961, and Lopez 1971.) The Gothic kingdoms that succeeded nominal Roman authority in the West at least outwardly preserved Roman institutions and practices. The

[†] The views expressed in this paper do not necessarily reflect those of the US Department of Justice.

Romanized rule of the Goths gave way to Byzantine conquest of much of the former Western Roman Empire in the 6th century, but Byzantine rule itself gave way over time to Lombard invasions in Northern Italy, to local resistance in other regions, and, finally, to sustained Muslim invasions across North Africa, into Spain and France, and through the Levant. Muslim forces even besieged Constantinople itself in 674-677 and in 716-717. Byzantium maintained hold of parts of Southern Italy and Sicily, but Muslim raiders eventually encroached on Sicily and Puglia (the “heel” of Italy) and on points along the Italian coast of the Tyrrhenian Sea. Muslim raiders also set up bases on the French Riviera, Sardinia, Corsica and the Balearic Islands in the Western Mediterranean as well as on Crete in the Eastern Mediterranean.

Somewhere in all of this tumult economic output declined, although no one has yet sorted out the dynamic structure of the decline. Henri Pirenne had long ago advanced a formidable argument that the sequence of Muslim conquests in and around the Mediterranean in the 7th and 8th centuries had incrementally disabled trade between the Eastern and the Western Mediterranean. Partitioning the Mediterranean, presumably, would not only have denied suppliers in the West the opportunity to provision Constantinople, but it would also have cut the West off from the currents of the longest distance trade connecting India and the Far East to the Mediterranean. The vitality of the currents of intercontinental trade may very well have sustained the vitality of intra-Mediterranean trade currents. The Pirenne thesis amounts largely to suggesting that the destabilization of East-West trade routes in the Mediterranean forced the Frankish kingdoms of the West to fall back on their own resources and that falling back denied gains from trade.

Why Muslim raiders would not have converted themselves into traders and enabled themselves and their counterpart Christian traders to realize gains from trade is not a matter explored here. In a Coasean world of zero transaction costs, externalities get internalized, Muslim raiders get paid off, and profitable deals get made. Rather, the first point of this paper is simply that the mechanisms and exogenous factors that prompted decline and stimulated revival remain poorly understood. One thing business historians agree on, however, is that commercial practices of the Late Middle Ages enabled the revival of trade. Principally, historians have asserted a role for the technology of contracting in enabling long distance trade in the Late Middle Ages. (See, for example, Pirenne 1925, pg. 110; de Roover 1963, pg. 43; Lopez 1971, pg. 73; Kedar 1976, pg. 25; and Hunt and Murray 1999, pg. 55.) By the middle of the 1970's historians had synthesized from a century of archival research a thesis about how contracting practices enabled an expansion of trade in the Mediterranean. The kernel of the argument is that commercial contracts enabled the functionaries of trade to share risk and, in turn, to realize gains that a risk-averse agent operating alone with his own resources would have passed up.

In the 10th century the principal functionaries of trade were investors and trading agents. In the historical literature, investors are often labeled “merchants,” but, in any case, we can understand them as the providers of capital and managerial energies. Trading agents provided labor as well as some managerial inputs of their own. Contracts joined an investor and a trading agent in a trade venture. In classical terms, a trade venture constituted a production technology that transformed the inputs of the investor and trading agent into a payoff. Typically, an investor advanced to the agent financing or other capital, the agent would travel to geographically dispersed ports to trade on the behalf of the investor, and the agent would return to the home port

often with cargoes of commodities acquired abroad for re-export or for local distribution. The agent would account to the investor the net gain or loss from the entire round-trip venture, and the two parties would share the return according to some sharing rule. The return was stochastic and so implicated the risk preferences of the contracting parties.

Risk and risk-sharing alone are not what made trade ventures and the contracting technology interesting. Rather, a problem of asymmetric information that attended the use of agents introduced a contract design problem that has only been partially explored and partially understood in the historical literature. Contracting the services of agents enabled investors to deal with the geographic indivisibility of labor. Investors could, and often did, provide the services of a trading agent themselves, and, indeed, this is how much commerce had been organized up to the 14th century. (Lane 1973, pp. 48-50; Hunt and Murray 1999, pp. 54-57; de Roover 1963, pp. 42-43) “Itinerant merchants” tied up their time, finances, and managerial energies in single ventures; without agents they could not simultaneously participate in other trade ventures. Employing agents could enable investors to manage risk by diversifying their investments across a portfolio of ventures. At the same time, however, employing agents introduced a problem of asymmetric information. An agent would conduct transactions on behalf of the investor in overseas markets. The investor could neither observe these transactions nor verify an agent’s account of transactions at the termination of a trade venture. Accordingly, an agent might misrepresent transactions and expropriate part of the return that the agent otherwise would have rendered to the investor.

The agent's ability to profit by misrepresenting transactions would depend on the way in which the investor and agent shared risk. Very often, investors advanced financing to agents under the terms of simple debt contracts. The agent would guarantee a fixed payoff to the investor – principal plus interest – and would bear all of the commercial risk. Such contracts denied the contracting parties the advantages (if any) of risk-sharing, but debt contracts also neutralized any advantage agents could gain by misrepresenting transactions. An agent could very well lie about the outcome of a venture, but the payoff to the investor remained invariant to the agent's report. At the same time, investors and agents often crafted terms of contract that featured simple, linear sharing-rules. Investors and agents often committed to share gains or losses equally or in proportions such as three-quarters and one-quarter or two-thirds and one-third. Under these contracts an agent could profit by under-reporting gains and losses and pocketing the difference. How could investors protect themselves from expropriation?

The use of debt contracts and contracts featuring risk-sharing demands a theory of contract selection, and it demands a theory that accommodates problems of asymmetric information. The historical literature does not provide a complete thesis according to which we might understand the selection of contracts, but over many decades historians have developed a thesis that provides a way of understanding how and why contracting parties would use contracts featuring risk-sharing. Indeed, these contracts, known generically as *commenda* in the historical literature, are featured in a larger thesis about how contracting practices enabled the functionaries of trade to mobilize investment in trade in and around the Mediterranean in what later historians have come to call the “Commercial Revolution.” (Lopez 1971)

The historical thesis joins concepts of trust and risk-sharing in explaining the role of *commenda* in enabling the revival of trade of the Commercial Revolution. Historians have been sensitive to the prospect that agents retained under the terms of a *commenda* contract might cheat their investors. The principal conclusion of the literature on this count is that investors could resort to *commenda* contracts if they could hire honest agents (Lane 1964, de Roover 1963, Lopez and Raymond 1955) or family members (Byrne 1916). Investors could, of course, trust honest agents to report gains or losses honestly, and family bonds, presumably, would again encourage agents to render truthful reports. The next part of the thesis indicates how *commenda* enabled an expansion of trade. The idea is that contracts featuring risk-sharing enabled contracting parties to participate in ventures yielding the most uncertain returns. (See, for example, Lane 1973a, pg. 139, Kedar 1976, pg. 25.) For example, in characterizing contracting practices in the 13th and early 14th centuries, both Lane and Kedar distinguish between ventures conducted within a physically secure “inner-core zone” conforming to most of the Eastern Mediterranean and an “outer zone” conforming to the fringes of the inner-core and beyond into India and Central Asia. Agents venturing beyond the inner-core would have faced both greater physical hazards and greater uncertainty over the availability of commercial prospects. During the earlier part of the Commercial Revolution *commenda* served the same function in the inner-core when it itself was subject to the same type and degree of hazard associated with the outer-zone in the latter part of the Commercial Revolution.

Taken together, trust and the risk-sharing aspect of *commenda* enabled the functionaries of trade to realize gains that risk-averse parties would have otherwise foregone. Two difficulties with this thesis are 1) it does not explicitly address the trade-offs (if any) encountered in choosing

commenda over debt contracts or vice-versa and 2) it is motivated by heavy interpretations assigned to no more than two anecdotes that have been heavily cited in the literature. The first anecdote relates to the experiences of the Venetian Giovanni Loredan in India. Lopez (1943) indicated that in 1338-1339 Giovanni Loredan ventured to India via the Black Sea with financing provided by family members by *commenda* contracts. This example of traveling to the “outer zone” under a *commenda* has been presented in Lopez (1943, 1951, 1955, 1971), Lopez and Raymond (1955), Lane (1973a), and Kedar (1976) as evidence of the role of the *commenda* in enabling long distance trade. Meanwhile, Kedar (1976) and Lopez (1951) indicate the venture of the Genoese Benedetto Vivaldi in 1315 to India under the terms of a *commenda* contract as further evidence. Kedar (1976, pg. 25) explicitly outlines the thesis with these two examples:

In the outer zone, the prevalent form of partnership was the *commenda*, or as the Venetians usually called it, the *colleganza*... This form of partnership... was perfectly suited to the commercial trips to the distant, only partially known lands of Further Asia. Indeed, both of the commercial voyages to India about which the financial details are known – the voyages of the Genoese Benedetto Vivaldi in 1315 and of the Venetian Giovanni Loredan in 1339 – were undertaken by men who entered into *commenda* contracts.

In earlier times, when voyages in the Mediterranean and in the Black Sea had not yet become regular and market conditions along their coasts were known only in part, the *commenda* was also the basic form of partnership in the sea trade of the inner-core zone.

While these two examples of risk-sharing would have to be folded in to a larger theory of contracting, I submit that they do not themselves establish a plausible theory of contract selection.

This paper advances a simple theory of contract selection and then does what no other research on Medieval commercial practices is equipped to do: it makes the theory stand up to a sizable, representative data set of contracts. The theory provides a way of characterizing salient patterns

in the selection of contracts exhibited in a data set of 760 contracts. All of these contracts derive from unpublished sources maintained at the State Archives of Venice that I perused in the summer of 1997.¹ All of the contracts pertain to the financing of trade between Venetian Crete and other parts of the Mediterranean world in the years 1303-1351. Most contracts were either debt contracts, known in Venice as *prestitti marittimi* or “sea loans,” by which the agent would guarantee to the investor a fixed payoff, or were *commenda* contracts, known in Venice as *colleganza* contracts. Other contracts, known as *cambi marittimi*, (“sea exchanges”) were like the “sea loans” except they indicated repayment to the investor in currencies different from those in which the loan was made.

The empirical analysis markedly indicates that *colleganze* tended to be applied to ventures in which investors could take advantage of informational externalities or spillovers derived from the ventures of other investors and agents. Participating in the trade of commonly traded commodities in markets that were commonly attended by other investors and trading agents could permit an investor to extract information about other parties’ transactions against which the reports of the investor’s agent could be measured. Information about market conditions or other parties’ transactions could easily spillover to the investor thereby enabling the investor to effectively monitor the agent. Easy monitoring would enable the investor to detect cheating. Knowing this, the agent could commit to truthfully reporting transactions, in which case the investor and agent could commit to sharing-risk under a *commenda* contract rather than revert to a debt contract. At the same time, debt contracts tended to be applied to ventures featuring trade

¹ All of these contracts can be found in the *protocolli* (“records”) of the cartularies (logbooks) of notaries preserved in the archival series the *Notai in Candia* maintained at the State Archives of Venice. The records of 19 notaries are featured. The cartularies of 17 of these notaries remain unpublished, but the cartularies of Andrea de Cartura and

in commodities that were uncommonly traded or were traded in uncommonly attended markets. Such trade excluded informational spillovers and so denied the investor the ability to monitor his agent. The outline of a Contract Selection Hypothesis is plain: investors and agents could share risks in contexts in which informational spillovers prevailed, whereas agents would guarantee fixed payoffs to merchants in contexts involving more exotic types of trade for which, accordingly, little or no information was available to spillover.

The Contract Selection Hypothesis does more than provide a way of understanding contract selection. It indicates a structural mechanism that can motivate a theory of economic decline and revival of a variety that Henri Pirenne himself started to motivate. Informational spillovers and risk-sharing reinforced each other in a way that permits us to distinguish information-rich (hereafter, “transparent”) environments that supported high volumes of trade from information-poor, low-volume environments. Spillovers contributed to the transparency of the trading environment, thereby enabling parties to share risk rather than revert to debt contracting. Risk-sharing encouraging further investment, further investment generated more informational spillovers, and further investment made trade expand. At the same time, a decline in trade would have threatened the integrity of the trading environment. A sharp decline could trigger a threshold effect – specifically, the loss of transparency – and the loss of transparency would have forced contracting parties to resort to debt contracting in which case they would have had more difficulty mobilizing investment. The depression of trade in the Early Middle Ages might then be interpreted as a shift from a transparent, high-volume equilibrium to an information-poor,

Donato Fontanella have recently been published in a single volume. (See Stahl 2000.) Ninety-two of the 760 contracts derive from the cartulary of Angelo de Cartura, and 3 derive from the cartulary of Donato Fontanella.

low-volume equilibrium.² In turn, the collapse of trade to a low-volume equilibrium in the Mediterranean contributed to decline in the regions, including the Frankish kingdoms of Western Europe, that trade had linked.

The remainder the paper is not occupied with testing a Spillover Hypothesis of decline and revival, but, rather, is occupied with the more modest task of articulating and testing the Contract Selection Hypothesis. While, I think, the richness of the data exercise and the economic content of the entire exercise distinguishes the paper from previous work on Medieval contracting practices, the research owes a substantial debt to earlier work for providing a broadly researched landscape without which I could not have launched the current research. Moreover, inexpensive and portable microcomputing enabled me to pursue analysis of a variety those pioneers of the Italian archives might only have pursued with the assistance of large teams of graduate students slaving away to generate even just the simplest of cross-tabulations. It is perhaps no surprise that archival work on Italian commercial practices of the Late Middle Ages had diminished markedly by the mid-1970's after most of a century of active research. As one historian had remarked to me personally, "It went out of style."

The well known work of Avner Greif abundantly suggests that old styles of research on old topics may give way to new styles and new understandings. And, indeed, I would suggest that the research presented here complements Greif's work on the Maghribi traders of the 10th

² To illustrate (and only to illustrate) the notions of trajectories, threshold effects, and shocks, consider a differential equation $y'(t) = -[y(t)-L][y(t)-T][y(t)-H] + \varepsilon(t)$ where t indicates an index of time, y indicates per capita income, y' indicates a time derivative, ε indicates a stochastic shock, $0 < L < T < H$ where L corresponds to "low" steady state, T corresponds to "threshold," and H corresponds to "high" steady state. Over time, y moves to H (the "high" steady state) if y initially starts at value greater than the threshold, T , and y moves to L (the "low" steady state) if y initially starts at a value less than the threshold, T . The idea here is that the in the early 14th century y was greater than T .

century in that both articulate mechanisms that enabled and sustained a revival of trade. (See Greif 1989 and 1993.) Greif does not work out of a set of contracts but, rather, works out of a set of commercial correspondence derived from the Cairo Geniza. (See Goitein 1967 and 1973.) Greif uses these merchants' letters to identify a set of commercial practices that were distinct from the contracting practices explored here. (Greif 1994 relates to this point.) While the contracting practices explored here relate to the transparency of the commercial environment, the practices Greif examines may have contributed to the transparency of the environment, and may, in turn, have set the scene for those other traders who worked out of a *commenda* framework. Greif identified and examined a type of commitment mechanism, a reputation mechanism, that could explain how the Maghribi traders enabled agency relations and long distance trade. Geographically dispersed traders exchanged correspondence through which they consigned goods to each other and placed orders with each other. While the scope for cheating might seem abundant, the Maghribis established an institution that could support exchange and permit traders to manage risks and deal with unforeseen contingencies. These traders effectively comprised a network of agents that could deny membership to any merchant or could expel any merchant from membership. Insofar as membership afforded benefits that could not be enjoyed outside of the network, the network could exert some discipline on its members.

While the contracting practices explored here relate to transparency and informational spillovers in a fundamental way, it may have been the case that other institutions such as the network of Maghribis induced degrees of transparency without which East-West trade may not have begun to revive. That is a topic, however, that remains for further research. The remainder of this paper

Positive and negative shocks may have buffeted the system over time, but at some point a large negative shock or sequence of shocks shifted y below the threshold T , and y started to move toward L .

proceeds as follows: Part I sets up the analytical framework and describes the contract data. Part II tests hypotheses in a discrete choice exercise (a logit), and the last part concludes.

I The strategy of the paper

The principal objective of the paper is to examine how contracts line up with attributes of trade ventures. The examination amounts to establishing a mapping from attributes of trade ventures to discrete modes of contracting. To enable examination of this mapping, we need strategies for addressing two operational issues, the identification of attributes of trade ventures and the stationarity of the contracting technology. First, data must be constructed that permit identification of attributes of observed trade ventures. In this paper trade ventures are distinguished between those that involved transactions conducted in transparent environments and those that involved transactions in less transparent environments. Four types of devices are constructed for distinguishing environments. Second, an hypothesis maintained here is that the contracting technology remained stationary through the interval 1303-1351. This hypothesis restricts the degrees of freedom with which salient patterns in the selection of contract can be explained and enables the discrete-choice exercise. Specifically, it disciplines the empirical analysis by ruling out appeals to the innovation of contractual forms as the explanation for salient patterns in the contract data.³

³ Pirenne (1925), and Luzzatto (1954) each suggest that modes of contracting observed in the Late Middle Ages derived from much older trade practices. On my interpretation, the merchants of earlier times encountered much the same contracting problems encountered in the Late Middle Ages. The earlier “solutions” to these problems seem to have been reasonably robust.

Attributes of Trade Ventures

Four types of devices are employed here for distinguishing ventures that entailed relatively transparent transactions from ventures that entailed transactions specific to an agent. The first involves distinguishing ventures that strictly involved trade in the major ports along established convoy routes. In the data examined here, these ports include Constantinople, Venice itself, and Rhodes. Rhodes is interesting, for at least two reasons. First, the Hospitaller crusaders invaded the island of Rhodes in 1306, and within a few years of that the city of Rhodes became a major trading site. Indeed, Italian banking houses were quick to setup branch offices to service the commercial traffic going through Rhodes to and from the Levant, Constantinople, Venice, Crete, and eventually, the Turkish beyliks of Aydin and Monteshe and the Ottoman territories on the Anatolian peninsula. (See Zachariadou 1983 and Hunt 1994 on the establishment of bank branches in Rhodes.) Just as Crete, which Venice had annexed in 1211, provided a secure transit point for commercial and naval traffic coming into the Aegean, so too fortress Rhodes provided a convenient transit point for traffic going into Turkey or eastward to the Levant. The upshot is that traders could go to Rhodes to participate in a vigorous (and well-attended) re-export business. Arguably, such trade entailed transactions conducted in a relatively transparent environment. More interesting are trade ventures going through Rhodes to further destinations in Turkey and other destinations. Arguably, ventures going through Rhodes and terminating elsewhere tended to involve transactions in less transparent environments.

Trade in Turkish territories (the “Turkish trade”) itself provides the second device. While the Turkish presence on the Anatolian peninsula had begun to emerge in the 11th century, consolidation of Turkish beyliks – and the disruption that attended such consolidation – persisted

vigorously through the 14th century and into the 15th century with the consolidation under the Ottoman Turks. The Venetian authorities in Crete established trade treaties with the Turkish beyliks of Aydin and Mentеше in the late 1320's. To be sure, the treaties formalized, to some degree, trade activity that was already underway. Important details had to be established such as the rights of traders in Turkish ports such as the major port of Palatia (formerly the Greek city of Miletos). Also, some provision had to be made for protecting commercial traffic from piracy. Treaties aside, policing pirates remained difficult, and crusading activities against "the Turks" in the 1330's and 1340's complicated trade. All such complications, arguably, made the commercial environment less secure and less transparent.

The third device, the Black Death, arguably also provides a way of distinguishing less transparent from more transparent environments. The Black Death (bubonic plague) descended from Central Asia into the Aegean in 1347, and in the succeeding few years it moved through Western Europe, wiping out a third to a half of the population. Of interest here are the commercial consequences of plague. An interpretation advanced here is that the Black Death delivered a negative shock to the informational structure of the economy. Production and transit of commodities to ports may have been disrupted. Likely, uncertainty about the status of production and availability of commodities in ports in and around the Aegean emerged. Moreover, traders may have lost contacts through whom information on the status of commercial prospects may have been processed. A consequence of all this would, arguably, be the loss of transparency in the entire trading environment.

While plague may have exacerbated informational hazards encountered in contracting agency services and may, in turn, have implicated contract selection, more obviously plague imposed physical hazards. An implication for contracting, conceivably, was that physical hazards may have complicated contract selection and may have, in some contexts, dominated contract selection. Indeed, patterns in the data suggest that one form of contracting not anticipated by the modeling exercise tended to be used during particular crises that threatened the physical well-being of trading agents. This mode of contracting, indicated here as the “pooling contract,” first appear in the data set in 1339, the year that a broad coalition of Turks launched a massive offensive across the Aegean region. These contracts appear most prominently in the data in 1347.

The fourth device is derived from the data itself. Ventures involving investors who themselves had previously provided agency services are distinguished. An interpretation that one could assign to these ventures is that they involved a party (the investor, in this case) who was better informed about particular commercial prospects in foreign markets. The investor may have been advantaged, for example, by having established contacts in overseas markets through whom intelligence about the availability of selected commodities may have been transmitted. The consequence of this is that the investor – hereafter, the “informed” investor – may have endeavored to secure transactions in environments that were less, rather than more, transparent.

In the data examined here “informed” investors show up in distinctive ways. None of the trade ventures that terminate in Rhodes feature informed investors, yet more than a third of trade ventures going through Rhodes and terminating in Turkish territories feature these informed

investors. Informed investors were also more likely than all other investors to have secured agency services by means of contracts (debt contracts) that impose residual claimancy on trading agents, and, indeed, they relied almost exclusively on debt contracts for the Turkish trade going through Rhodes. At the same time, all other parties of investors were also more likely to have relied on debt contracts in the Turkish trade going through Rhodes. The data also indicate that the emergence of plague in 1347 motivated a mass substitution out of contracts featuring risk-sharing into debt contracts.

The data also indicate some patterns that could not have obviously been anticipated, and the data indicate some surprises. The data suggest that the Turkish trade can be partitioned into at least two parts: the Menteshe trade and all other Turkish trade. Informed investors show up prominently in the Menteshe trade whereas they participated in the other Turkish trade – the trade with Aydin, the Ottoman territories, and all other Turkish territories – with no greater frequency than other investors. The data also indicate a form of contract, the “pooling contract,” by which parties to contract would pool investment resources and would place the pool under the management of, it seems, a subset of the investors who would travel and trade collectively in overseas markets. Under these contracts, the investing parties would share proceeds as a function of the proportions in which they had invested.

Pooling contracts seem to have been motivated by concerns investing parties may have had for the survival of their trading agents. Losing a trading agent overseas could complicate efforts to extract one’s investments, but engaging one’s investments in a pool under the management of a team of agents promoted the prospect that some subset of agents on the team would survive and

would, accordingly, be able to remit payments. At the same time, concerns about informational hazards may also have motivated the selection of pooling contracts. The team of trading agents operating under a pooling contract would make transactions conducted by the team transparent to the team members. The agents might collude to cheat the investors who did not physically participate in the trade ventures, but transparency itself might complicate collusion.

Accordingly, these contracts may have been applied to environments that were themselves less conducive to transparency, and, indeed, it turns out these contracts were heavily used in the environment dominated by plague.

Hypotheses

The various devices enable examination of a pair of simple qualitative hypotheses:

Hypothesis 1: Debt contract prevail in non-transparent environments.

Hypothesis 2: *Colleganza* contracts prevail in transparent environments.

The data set discussed here features contracts that involved ventures in which the investor was required to rely exclusively on the agent's report of realizations and ventures that involved abundant (and low cost) public information against which agents' reports could be compared.

Accordingly, "sea loans" should dominate contracting of the former variety of ventures whereas *colleganza* contracts should only appear among ventures involving public information.

Pooling contracts lend themselves to a third prediction that relates not to informational hazards but rather to physical hazards:

Hypothesis 3: During the emergence of plague, contracting parties substitute out of debt contracts and *colleganza* contracts into pooling contracts.

Hypotheses 1 and 3 setup a question that can only be explored empirically: When transactions are not transparent and the physical hazards such as plague prevail, do debt contracts or pooling contracts dominate? Any one of three answers might obtain: informational hazards dominate, in which case debt contracts more likely obtain; physical hazards dominate, in which case pooling contracts more likely obtain; or neither hazard may dominate the other. The data, it turns out, suggest that the informational hazards tend to dominate the physical hazards.

The contract data all derive from the notarial series *Notai in Candia* maintained at the State Archives of Venice. The data set is comprised of 760 contracts sampled from the years 1303-1351. These years include various phases of the Venetian experience in trade in and around the Aegean. In 1347 The Black Death descended from Central Asia into the Aegean region. One might have expected that plague might have distracted the merchant community in Crete, but casual inspection of the notarial records suggests that trade activity remained unabated. Indeed, Western Europe yet remained untouched by plague, and the traders in Crete, seeing half of their competitors perish, may have been particularly keen to capitalize on the thinning of the ranks of merchant class. By the late 1320's the Venetian authorities in Crete had established formal trade settlements with the emerging Turkish beyliks, including the Ottoman beylik, on the Sea of Marmara on the Anatolian peninsula. Although the Pope had at times recruited the Venetians in various small-scale naval crusades against the Turks, trade with selected Turkish ports persisted through the 1330's and 1340's with some disruption. Trade with Turkish beyliks was severely complicated when, in the summer of 1339, a coalition of Turkish beyliks launched a massive sea-borne offensive all around the Aegean, threatening Rhodes and Crete themselves.

The data derive from the cartularies of 19 notaries, each of whom is indicated in Table 1. Table 1 indicates the distribution of contracts across notaries aggregated in intervals of 5 years. The data collection was concentrated in four intervals around 1305, 1328, 1339, and 1347. Forty-five percent of the data or 342 contracts fall in the nine-year interval 1343 – 1351.

II Testing the hypotheses

In the context examined here, the fundamental prediction about the selection of compensation schemes is that share contracts (*colleganze*) would be applied to ventures featuring transactions in commonly traded goods along commonly attended trade routes whereas the “sea loans” would be applied to ventures featuring idiosyncratic activities – that is, ventures featuring transactions in uncommonly traded goods along or transactions along uncommonly traveled routes. Part of the theory is that *colleganze* would be applied to trade in which principals would have access to ready sources of information against which agents’ reports could be compared. An agent reporting returns that were inferior to the returns reported by other agents would distinguish himself unfavorably and invite sanction. In contrast, the strategic viability of ventures involving idiosyncratic transactions would only be supported by modes of contracting that distribute payoffs to the principal that are independent of agents’ reports whereas other trade. In the context examined here, such contracts are the “sea loans.” Pooling contracts, on the other hand, are like *colleganze* in that they implicate multiple agents in the conduct of parallel transactions. Again, such contracts permit principals to exploit agents’ reports in ways that induce them to truthfully account for transactions.

Determining what contracts correspond to idiosyncratic ventures takes some detective work and some assumptions. For the purposes of this paper, ventures are distinguished by the destinations to which agents travel and by the commodities in which they trade. “Idiosyncratic ventures” are defined by those ventures that can be distinguished by space and/or commodity from all other ventures conducted simultaneously. The idea is to identify ventures for which no external accounts of an agent’s performance would be available. The trade between Crete and pre-Ottoman Turkey, for example, likely provides a good source of idiosyncratic ventures, because the trade experienced inordinate flux in the first half of the 14th century. Regular trade with the Turkish Beyliks had only been renewed in the 1320’s and 1330’s. The authorities in Crete negotiated commercial treaties with selected Turkish beyliks, and trade persisted through the 1330’s and the 1340’s even though Turkish pirates sometimes disrupted commercial traffic.

Four devices, labeled “Informed Principals,” “Plague,” “Turkish Trade,” and “Rhodian Trade” are constructed for distinguishing idiosyncratic trade from other trade. The device “informed principals” identifies principals who show up in the data as “informed” and were therefore more likely to have had access to idiosyncratic ventures. Contracts featuring informed principals are differentiated from those featuring uninformed principals.

Being “informed” is indicated as having superior information about flows of commodities through foreign ports. As interpreted here, being better informed entails having access to a wider set of trading opportunities. An alternative (and complementary) interpretation might be that being informed constituted being able to operate with less “noisy” probabilistic assessments. Being better informed would permit principals to identify trade ventures that would likely render

superior returns. For example, knowing that an irregular shipment of spices would likely to arrive in Trebizond on the Black Sea would permit informed traders to avoid competition for spices in the established markets for spices in Egypt, Armenia, or Cyprus.

While the data do not permit an obvious means of identifying which principals were at any one time better informed, i.e. endowed with superior information, a device is employed here that does permit sharp distinctions in the data to be made. Specifically, “informed principals” are identified as those principals in a given contract who in an earlier contract emerged as a trading agent. The idea is that investing time as trading agents permitted “informed principals” to build up informational capital. They established commercial contacts overseas, and they acquired information about the local trade environment. Maintaining contacts would permit privileged access to, among other things, information about irregular flows of particular commodities. Although contracts often featured more than one principal, all contracts featuring at least one informed principal are identified as being financed by informed principals.

Second, 1347 is identified as “the plague year”. By early 1347, plague had reached Crete, and, undoubtedly, it had reached other parts of the Aegean before then. Plague is assumed to have constituted a negative shock to the informational capital of the economy, and the informational advantage enjoyed by informed principals is assumed to have degenerated in that year. One quarter to half the population in a locality would have perished in a short time. Informed Principals might lose their contacts, and upon receiving news that plague had emerged abroad, they might not be in a position to know the status of their contacts or of the conduct of markets.

The device “plague” is also intended to identify the particular role (if any) of pooling contracts. One advantage of pooling contracts was that they engaged the services of a group of agents thereby increasing the prospect that some number of agents would have survived the physical hazards encountered in the course of a venture. Securing the survival of agents would have secured the prospect of recovering proceeds from trade ventures. In the plague year, securing the survival of any number of agents would have been a greater concern – a concern addressed by substituting loan contracts and *colleganze* with pooling contracts.

An entire year, rather than some other interval, is distinguished as the interval capturing the effects of plague for a few reasons. First, plague itself had reached Crete by late winter in 1347, a time of the year when most of the maritime fleet would have been idle but just as investors and agents would have been organizing the financing of ventures to be launched in the spring. The emergence of plague in the Eastern Mediterranean, in the Black Sea, and on the Anatolian peninsula would have disrupted, to some extent, the flows of information about market prospects from these regions to Crete. In turn, at the time of contracting the informational advantage of “informed principals” would have been marginalized. Any informational advantage may not have been restored without taking time to ascertain the effects of plague on trading opportunities in afflicted regions, and taking time would have required at least another cycle of ventures through which investors may gain new information. Documents also suggest that outbreaks of plague persisted through the year in Crete and other regions beyond its initial emergence thereby complicating efforts to restore informational contacts. Indeed, plague typically presented itself as a hazard in the warmer months of the year before abating with the onset of winter.⁴

⁴ Notaries indicated calendar years beginning in March rather than January, but the data are coded to indicate calendar years beginning in January.

The third device for distinguishing types of trade to which loan contracting would have been more amenable involves distinguishing trade with particular regions. Specifically, the trade with Turkish territories (hereafter, the “Turkish trade”) is distinguished from all other trade. The trade with the Turkish beyliks was subject to greater physical and institutional hazards than trade with other regions. Various Turkish entities periodically and independently pirated commercial traffic. In the 1330’s naval “crusades” against “the perfidious Turks” (“*i turchi perfidi*”) were periodically organized.⁵ Moreover, political affiliations on the Anatolian peninsula were ever changing. In all of this the merchants operating out of Crete could more likely expect the prospect of gaining access to idiosyncratic trade.

The last device, the “Rhodian trade,” is used to distinguish trade in an established, secure market from trade in less secure markets. It is used in conjunction with “informed principals” to indicate salient patterns in the contract data pertaining to ventures terminating in and going through Rhodes. The idea explored here is that trade terminating in Rhodes constituted trade in a commonly attended market in commonly traded commodities. Trade going through Rhodes likely entailed more idiosyncratic types of trade in Turkish territories or other less well-attended and regulated markets. In the former case, *colleganze* should dominate, and in the latter debt contracts should dominate. Moreover, wherever “informed principals” are implicated, debt contracts should show up more prominently.

⁵ Zachariadou (1983) and the records collected in *Duca di Candia: Quaternus Consiliorum (1340-1350)*, Vidulich (1976), abundantly document the role of the authorities in Venetian Crete in mobilizing – and sometimes resisting – naval crusades.

The four devices provide a means of coding the data that will support statistical analysis of the selection of compensation schemes. The idea is that, other things equal, ventures featuring “informed principals” or trade with Turkish territories more likely involved idiosyncratic transactions and therefore more likely involved loan contracts rather than other modes of contracting. The proportion of contracting by loans is also predicted to increase with the discrete (and favorable) shift in 1328 in the range of available trading opportunities.

The first two devices are employed as explanatory variables in a logistic regression (or “logit”). The logit generates predictions of the probabilities with which each mode of contracting is selected. Three modes are distinguished: 1) “Debt” contracts; 2) “Pools” includes all pooling contracts; 3) “*Colleganza*” includes all contracts featuring non-degenerate linear sharing rules.

The Rhodian trade

Soon after the Hospitaller crusaders conquered Rhodes (1306), Rhodes became an important point for re-export trade and became important as a secure base from which to extend ventures to Turkish ports and other ports. Both the Turkish trade and the Rhodian trade remained vigorous until 1339. Trade terminating in Rhodes and going through Rhodes remained vigorous until 1339 when a broad coalition of Turks launched an offensive across the entire Aegean. (See Zachariadou 1983 on crusading and counter-crusading in the Aegean in the 1330’s and 1340’s.) Seasonal raiding along the Greek coasts and islands of the Aegean persisted over the next few years. Even so, some trade going to or through Rhodes shows up in the data after the early 1340’s.

Four salient patterns emerge in the Rhodian trade. First, of 22 ventures that terminated in Rhodes, none involved informed principals. Of these 22 contracts 12 were *colleganze*. Second, of the 37 ventures going through Rhodes, only 6 involve *colleganze*, and third, of these 37 ventures more than one third (14) implicate informed investors. Finally, all of the pooling contracts show up in 1339, the year the Turkish offensive commenced. Three of these patterns are indicated Tables 2A and 2B.

The strongest predictions would be that all of the trade terminating in Rhodes would be organized by means of *colleganza* contracts. Of the 22 contracts, 8 are loans and 2 are pooling contracts. Pooling contracts first start appearing in the data in 1339, the year during which the Turks organized a massive sea-borne offensive in the Aegean. The two pooling contracts might be explained away by reference to the increased physical hazards that renewed war with the Turks entailed. The remaining 8 loan contracts would be more difficult to explain, but the idea that *colleganza* contracts should dominate in the terminal Rhodian trade is, at least, suggestive.⁶

The 6 *colleganza* contracts that appear in the trade going through Rhodes are not explained here, but the predominance of loan contracts (73%) is also suggestive of the basic thesis that loan contracts should prevail, and is suggestive if not entirely dispositive, of the idea that informed investors would be more likely to organize their trading activities by means of debt contracts.

The Turkish Trade

⁶ The two tables constitute a three-dimensional contingency table in which the three dimensions are mode of contracting, type of investor (“informed” or other), and type of trade (terminal or through Rhodes). A simple test of the independence of the marginal distributions is a χ^2 test. In this case, the corresponding χ^2 statistic is 51.39, and the critical value with 7 degrees of freedom and 99% confidence is 14.07. The maintained hypothesis that the

The data indicate that “Turkish trade” did not uniformly constitute particularly idiosyncratic trade and did not invite uniform contractual remedies. The distinguishing features all pertain to the Mentеше trade. First, trade involving Mentеше accounts for 157 of all 210 ventures (75%) to “Turkish” ports. Second, informed investors account for nearly half of the Mentеше trade whereas they account for one-quarter of all other Turkish trade. Finally, and most to the point of this paper, the informed investors distinguish themselves by how they contract agency services in the Mentеше trade whereas they do not distinguish themselves in the other Turkish trade. Specifically, informed investors overwhelmingly participate in the Mentеше trade by means of debt contracts. All other investors who participate in the Mentеше trade also relied most heavily on debt contracts but not in the heavy proportion that distinguishes the informed investors. These results present themselves in the Tables 3A and 3B.⁷

In the Mentеше trade, 42 of 51 ventures (82%) featuring informed investors are debt contracts whereas all other investors participating in the Mentеше trade use debt contracts in 57 of 106 ventures (54%). In all other Turkish trade informed investors use debt contracts in 5 of 13 ventures (38%), and the other investors use debt contracts in 19 of 40 ventures (48%).

The Logit Model

To more generally characterize contract selection in the face of informational hazards and physical hazards, a model of discrete choice is enlisted. Discrete choice models, of which logits are one variety, generate estimates of the probabilities with which modes of contracting are

marginal distributions are independent would be rejected under this test suggesting that “informed principals” and other investors did, indeed, engage in the Rhodian trade in distinctive ways.

⁷ The corresponding χ^2 statistic is 318.61, and, again, the critical value with 7 degrees of freedom and 99% confidence is 14.07.

selected, but they generate parameter estimates that are not amenable to ready interpretation. The model estimates equations of log-odds ratios that are linear in the regressors. The parameter estimates do not correspond to the marginal effects of the explanatory variables on the probabilities, but such marginal effects and corresponding t-ratios can be extracted with some manipulation and computation.

The marginal effects are functions of the predicted probabilities, and this leaves the prospect of reporting marginal effects for each of the 760 data points. While that would be easy to do, that is not done here. Rather, means of the marginal effects are reported, and corresponding asymptotic t-ratios have been calculated.⁸

Table 4A summarizes the predicted signs of the marginal effects of the variables “plague” and “informed principal.” The probability the parties to contracting engaged a debt contract is predicted to be increasing in “informed principal.” The probability with which parties select pooling contracts is predicted to increase with the emergence of “plague” as contracting parties substitute out of *colleganze*. The effects on the selection of *colleganze* contracts should, for the most part, run counter to the effects on the selection of loans. Principally, “informed principals” substitute out of *colleganze* into loans except possibly in the plague year when their informational advantage was marginalized.

The impact of “plague” on the selection of debt contracts presents a puzzle. On one hand, parties might respond to the physical hazards presented by plague by substituting out of debt contracts

⁸ See Greene (1993) pp. 108 and 645-646 for the corresponding linear approximation theorem and application to discrete choice models.

and into pooling contracts. On the other hand, the greater informational hazards that attend plague may motivate a wholesale substitution out of pooling contracts as well as out of *colleganze* contracts into debt contracts. While the data will speak to this puzzle, no *a priori* prediction can be stated without qualifications.

The probability of debt contracts, labeled $\text{Pr}(\text{Mode} = \text{Debt})$, emerging from the process of contract selection is predicted to be increasing in the factors “Informed Principal”. At the same time, $\text{Pr}(\text{Mode} = \text{Colleganza})$, the probability with which *Colleganza* contracts emerge, is predicted to be decreasing in both “Informed Principal” and “Plague”. $\text{Pr}(\text{Mode} = \text{Pool})$ is predicted to be increasing in the factor “Plague.”

Table 4B presents the results pertaining to the marginal effects, and Table 5 presents the results of the logit regression. Table 4B indicates the marginal effects of the regressors on the mean of estimated probabilities assigned to each of the three modes of contracting. It also indicates in parentheses the asymptotic t-statistics associated with each of the estimated marginal effects.

Table 4B indicates three things: 1) the signs of the four marginal effects for which predictions are furnished match the four predictions, 2) the marginal effect for which no prediction was furnished is not statistically significant, and 3) the marginal effect for which no unambiguous prediction could have been furnished turns out to be positive. Specifically, the probability assigned to pooling contracts is increasing in “plague” whereas the effect of “informed” on the same probability probability is effectively zero. The probability assigned to *colleganze* contracts is decreasing in both “plague” and “informed investor.” The probability assigned to debt

contracts is also increasing in “informed investor.” Each of these five effects line up with the simple qualitative predictions. Only the marginal effect of “plague” on the probability assigned to debt remains, and the data indicate that this effect is positive. An interpretation that proceeds from this empirical result is that the effect debt contracts have in neutralizing informational hazards dominates the substitution out of debt contracts motivated by the physical hazards attending plague. Taken all together the results indicate that informed investors tended to rely more heavily on debt contracts. Debt contracting proved to be a remedy to informational problems exacerbated by the Black Death, but at the same time plague motivated a shift into pooling contracts. In each of these instances the risk-sharing afforded by *colleganza* contracting was sacrificed.

III Conclusion

The paper goes some way toward characterizing contract selection in a context that involves the financing and conduct of risky commercial ventures. Ventures involved transactions that investors could neither observe nor verify, yet ventures could be distinguished between those in which transactions were transparent and those in which transactions were not transparent. Contracts featuring risk-sharing may obtain in the former case, whereas contracts featuring little or no risk-sharing obtain in the latter. Specifically, contracts featuring payoffs that are independent of agents’ reports should emerge in contexts in which principals have no cost-effective means of inducing truthful reporting. At the same time, contracts featuring risk-sharing (if any) should emerge only in trade along well-traveled routes involving commonly traded commodities. The data indicate that parties involved in *colleganza* contracts were more likely to participate in trade along established, well-traveled trade routes. On my interpretation, principals

could easily obtain independent reports on the performance of other trading agents operating along these routes thus permitting them to gauge the performance of their own agents. At the same time, contracts featuring payoffs to the principal that were independent of any stochastic factors (debt contracts) were found to be applied with greater regularity to ventures along less established routes. Presumably, trade along less well traveled routes generated more opportunities for idiosyncratic transactions – transactions for which principals could not extract independent reports and transactions that principals could neither observe nor verify *ex post*.

Finally, the data indicate some unanticipated results. Most notably, pooling contracts had not been anticipated, yet they seem to have been used to manage physical hazards encountered in the trading environment. At the same time these contracts can be partly understood by the way in which they relate to informational hazards. Sending a team of agents on a venture could complicate the prospect that any one agent could cheat the investors in the pool, and, indeed, the data suggest that the selection of these types of contracts were at least partly motivated as a response to informational problems.

The contract data suggest that informational problems go some way toward characterizing the selection of sharing rules. This conclusion contrasts markedly with the conclusion established in the historical literature. The literature asserts that contracts featuring risk-sharing tended to be applied to the most uncertain, idiosyncratic ventures. The conclusions of the literature, it turns out, derive from anecdotal evidence, whereas the evidence presented here derives from a broad dataset of contracts. Both types of evidence need to be folded into a larger theory of contract selection. Insofar as the larger theory implicates issues encountered in other contexts such as

venture capital contracting and agricultural contracting, the study of the Medieval contracts should prove broadly illuminating.

Table 1**The Distribution of Contracts Across Notaries and Time**

Notary	1303-07	1308-12	1313-17	1318-22	1323-27	1328-32	1333-37	1338-42	1343-47	1348-51	Totals
Andrea de Bellamore						12					12
Angelo Bocontolo									157	65	222
Angelo Cariola		5									5
Angelo de Cartura	92										92
Angelo Donno			6								6
Antonio Brixiano										4	4
Bartholomeo Francisci								120			120
Donato Fontanella				3							3
Filippo Malpes										1	1
Francisco de Cruce								14			14
Giorgio da Milano I									6	4	10
Giorgio di Ligardo								1			1
Giovanni Gerardo						40		4	39	20	103
Giovanni Similiante					23	14					37
Iacobus de Firmo								2			2
Leonardo de Vegla									8	30	38
Marco da Piacenza								6	8		14
Nicolo Brixiano							2				2
Stefano Bono	58	7	9								74
	150	12	15	3	23	66	2	147	218	124	760

Table 2A

Trade Terminating in Rhodes, 1303 – 1351

	Pool	Loan	<i>Colleganza</i>	
Informed Investors	0	0	0	0
All Other Investors	2	8	12	22
	2	8	12	22

Table 2B

Trade Going through Rhodes, 1303 – 1351

	Pool	Loan	<i>Colleganza</i>	
Informed Investors	1	13	0	14
All Other Investors	3	14	6	23
	4	27	6	37

Table 3A

Turkish Trade less Menteshé, 1303-1351

	Pool	Loan	<i>Colleganza</i>	
Informed Investors	2	5	6	13
All Other Investors	4	19	17	40
	6	24	23	53

Table 3B

Menteshe Trade, 1303-1351

	Pool	Loan	<i>Colleganza</i>	
Informed Investors	4	42	5	51
All Other Investors	17	57	32	106
	21	99	37	157

Table 4A

**Predicted Signs of the Marginal Effects
of the Regressor on the Mean Probabilities**

	Prob(Debt)	Prob(Pool)	Prob(<i>Colleganza</i>)
Plague	Ambiguous	+	-
Informed	+	No Prediction	-

Table 4B

**Marginal Effects of the Regressors
on the Mean Probabilities**

	Prob(Debt)	Prob(Pool)	Prob(<i>Colleganza</i>)
Plague	15.87% (3.70)	13.75% (7.23)	-29.62% (-4.95)
Informed	13.25% (2.86)	3.16% (1.61)	-16.41% (-2.57)

Table 5
Results of the Logit Estimation

Equation 1:

$$\log\left(\frac{\Pr(y_i = \text{Debt})}{\Pr(y_i = \text{Colleganza})}\right) = \beta_{\text{Debt,Intercept}} + \beta_{\text{Debt,Plague}}\text{Plague}_i + \beta_{\text{Debt,Informed}}\text{Informed}_i$$

Regressor	Coefficient Estimate	Standard Error	t-statistic
<i>Intercept</i>	-0.44920	0.09321	-4.81913
<i>Plague</i>	1.10113	0.21574	5.10400
<i>Informed</i>	0.70756	0.21842	3.23945

Equation 2:

$$\log\left(\frac{\Pr(y_i = \text{Pool})}{\Pr(y_i = \text{Colleganza})}\right) = \beta_{\text{Pool,Intercept}} + \beta_{\text{Pool,Plague}}\text{Plague}_i + \beta_{\text{Pool,Informed}}\text{Informed}_i$$

Regressor	Coefficient Estimate	Standard Error	t-statistic
<i>Intercept</i>	-2.16644	0.17647	-12.27678
<i>Plague</i>	2.10842	0.28071	7.51114
<i>Informed</i>	0.72899	0.33146	2.19930

Likelihood ratio test of the significance of the regression:

Likelihood ratio statistic = $-2(-728.10 + 690.29) = 75.62$.

The corresponding critical value with 5 d.f. is $\chi^2 = 11.07$.

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