# The Disappearance of Deposit Banks: An Explanation*

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**Abstract**

This paper asks why deposit banks thrived in the late middle ages, but had virtually disappeared by 1600 and studies banking in Venice in order to answer the question. A model is developed that shows that a partial reserve banking system is an efficient means of allocating investment funds only if the returns from long-term investment are sufficient both to compensate the banker for the costs of running a bank and to offer depositors a return over what they can receive through market allocation. Thus the collapse of deposit banking in Venice can be explained by the fact that in the 16th c. the costs of operating deposit banks remained high, while the returns from long term investment declined.

The lack of continuity in European banking history is a puzzle that remains largely unexplained. Partial reserve banking systems developed in large, urban centers of trade like Barcelona, Bruges and Venice during the commercial revolution. They thrived for two centuries, but had disappeared almost entirely by 1600. Slowly, with the rise of the Dutch Republic and the British economy,

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banking systems were reestablished. And we find today that the founding dates of the major British banking houses often lie in the 18th century.

The standard explanation for the disappearance of private banks at the start of the modern era is that they were outlawed and actively repressed. This explanation leaves open, however, two important questions: Why were the deposit banks abolished after centuries of operation? Why didn't they reappear as soon as they were no longer the focus of the authorities' attention? Our failure to answer these questions is an indication that we fail to fully understand the role played by financial institutions in the late medieval period.

In order to shed some light on these issues this paper focuses on Venice, one of the most important banking centers in the late Middle Ages. The nature of Venetian banking and its role in the trading system of medieval Europe has been thoroughly explored by Reinhold Mueller (1997). Mueller, however, ends his study in 1500 and does not address the 16th century collapse of the system. The last century of Venetian private banking has been investigated recently by Tucci (1996) and Pezzolo (2003) and was discussed briefly in Luzzatto (1964). The primary explanations of the demise of the banking system fit into two broad categories, both of which were originally raised in a speech by Senator Tommaso Contarini in 1584, shortly after the failure of the last private bank.[1] The first explanation places the blame on the structural defects of a partial reserve banking system.

Contarini found partial reserve banking fundamentally unstable, because in the absence of 100% reserves bankers are liable to find themselves in a position where they cannot pay their debts. For this reason Contarini promoted the establishment of a state-run bank which is legally required to hold 100% reserves. The disorder caused in the marketplace by bank failures is generally

[1] Contarini's speech is published in Lattes, 1869.

There are two secondary explanations for the collapse of banking. Luzzatto explains that the banking system was weakened by lending excessively to the Republic. (1964, pp. 44-45) However, more recent research indicates that from the 1540s on the state was borrowing directly from the public and had stopped borrowing from banks. (Pezzolo, 2003, p. 120)

Pezzolo quotes a banker who argues that the reason his bank is in crisis is that the state is offering the public high interest loans and his clients are withdrawing money to purchase government debt. (Pezzolo, 2003, p. 122) Given that the banker acknowledges that the outbreak of war with the Turks is a additional cause of the run on his bank, that the Venetian economy had many alternative investment choices paying more than current accounts and that this statement is found in the banker's request for financial aid from the government, this argument does not appear to be particularly convincing. And in fact the bank was not bailed out by the government.

recognized as an important concern of the authorities who outlawed banks in Venice.[2] Tucci, however, attributes the problem not to the intrinsic instability of the banks, but to faulty regulation of the banking system: the credit operations of bankers were not explicitly legal and this made it easy for a bank to be closed by a run founded only on rumors.[3]

While structural defects were an ongoing problem for the Venetian banking system, the view that they are the cause of the collapse of the banking system is incomplete. Partial reserve banks were operating in Venice by 1300 and they continued to operate – with only minor changes in regulation – until 1569 when the founding of new banks was prohibited. If the banking system was structurally flawed, an explanation must be found as to why the authorities waited two and a half centuries to shut it down.

More convincing is the second explanation for the abolishment of Venetian deposit banking: the authorities believed that the hoarding of gold by banks was disrupting the money supply. Luzzatto's version of this argument takes into account the conjuncture of the European economy in the second half of the 16th century. During this period and well into the first half of the next century, the price of gold was rising relative to silver due to the inflow of American silver. This was a source of monetary instability for most European economies since they, like Venice, were on a bimetallic standard. With gold increasing in value, it is almost certainly true that bankers held on to gold and preferred to pay out silver. One interpretation of the end of the Venetian banking system is that the Venetian government in the 16th century saw an unprecedented shift in the bimetallic ratio, attributed the shift to the hoarding of gold by bankers and chose to shut them down.[4]

While there is likely to be a good measure of truth in this explanation, it too is incomplete. Speculating on the relative value of different coins was part of the business of banking in Medieval Europe. This is evidenced in Venice over the centuries by the periodic, and apparently unsuccessful, prohibition of such speculation.[5] A stronger case needs to be made for why it was only in the second half of the 16th century that speculation in coin led to the closure of the banking system. Furthermore, one may ask why private banks did not reappear in Venice sometime after they were outlawed – and after it had become clear that they were not the main force driving the change in

[2] Pezzolo, 2003, p. 127.

[3] Tucci, 1996, p. 792.

[4] Luzzatto, 1964, pp. 45-46. Pezzolo, 2003, pp. 126-7.

[5] Mueller, 1997, p. 127; Mueller, 1979, pp. 62-65.

the bimetallic ratio – as occurred in Amsterdam.

This paper proposes a very different explanation for the collapse of Venetian banking. The structural instability of banking in the middle ages which led to frequent bank failures could impose costs on both the banker and the depositor. I argue that the benefits of banking outweighed its costs only when the investments available to bankers who held partial reserves paid high returns. During the 16th century Venice lost its hegemony in the trade between East and West, and the returns from investment in the Venetian economy fell. It is this drop in investment returns that meant that the unstable form of banking practiced in Venice was no longer viable.

This explanation makes use of (i) the historic changes in the Venetian economic situation that took place in the 16th century and (ii) a theoretic model which establishes that, given an unstable partial reserve banking system, the benefits of the system will outweigh its costs only when long-term investment returns are sufficiently high. The next section of the paper discusses the position of Venice in the late Medieval European economy. Section two describes the Venetian banking system, detailing the penalties bankers who defaulted could face and the instability of the environment in which bankers operated. Sections three and four take an analytic approach, using a variant of Diamond and Dybvig's model of banking to make the theoretic point that a high-cost banking system is only viable in an environment with high investment returns. The fifth section concludes.

## 1 The Setting: 16th Century Venice

Recall for a moment the role that Venice played in the European economy of the 14th and 15th centuries. German and Hungarian silver was financing the purchase of "silks and spices" – which included a great deal of raw cotton and cotton textiles – from the East. Venice, just over the Alps from the silver mines, was a convenient outlet for the central Europeans and, as a maritime power, had easy access to the ports of the Black Sea, the Levant and Egypt. While in the 14th century Genoa challenged Venetian supremacy in the Eastern Mediterranean, through much of the 15th century Venice lacked maritime rivals on the Eastern trade routes. Venice was an exemplar of the medieval tradition of cities that act as a corporation of mercantile interests: she carefully negotiated in each Eastern port a monopoly on trade for her merchants. Access to the silver that was in such demand in these foreign ports was an important bargaining point in these negotiations, as was the strict regulation of Venetian merchant convoys that helped establish annual markets in

Eastern ports.[6]

It is no surprise then that Venetians were earning exceptionally high rates of return in this period. According to Peter Spufford, "the fifteenth century Venetians ... could commonly reckon on a profit of 40% merely on bringing spices half the length of the Mediterranean."[7] As a consequence of hegemony over the Eastern Mediterranean, through the 15th century Venice developed into a city-state of extraordinary wealth and power.[8]

Unfortunately Venetian success was viewed as threatening by the Ottoman empire, the Hapsburg empire and France. In 1509 the European powers formed a League and demonstrated definitively that even the wealthiest city-state could not compete with imperial resources. From 1529 until the fall of the Republic Venice would follow a policy of neutrality in Europe. Meanwhile in a series of wars that spread over two centuries the Turks were steadily conquering the Venetian trading colonies in the Eastern Mediterranean and putting in place discriminatory tariffs that reduced Venetian trade.[9]

For Venice the 16th c. was a century of transition. The economic core of the European economy was shifting away from the Mediterranean – and from Venice – to the Atlantic. Venice struggled to continue to be an important player in the East-West trade with success in certain decades, but by the first quarter of the next century Venice belonged to the periphery of the European economy – as symbolized by the fact that, based on their provenance, spices were now classified as "Western goods" by customs officials.[10] Through the century Venetian merchants continued the aggressive search for profitable investments, but often found that the best returns were not offered by commerce, but by industry and agriculture. Thus the 16th c. saw the decline of Venice as hegemon over the Eastern Mediterranean and the rise of Venice as "the first industrial center in Europe."[11]

This transition from earning monopoly profits on the trade between East and West to competing in the production of woolens, silks, glassware, etc. was accompanied by a reduction in returns. While in 1495 a chronicler found that those who accepted an annual return of 6.5% on government

[6] Lane, 1972, p. 287. On the convoys also see Lane, 1972, pp. 124-31.

[7] Spufford, 2002, p. 312.

[8] See Lane, 1972, chapter 16 and Aymard, 2006, p. 369.

[9] Lane, 1972, chapter 17 and p. 299.

[10] Panciera, 2006, p. 186.

[11] Aymard, 2006, p. 370, quoting Fernand Braudel. Lanaro, 2006, p. 40 seconds this view.

bonds (in a temporarily moribund trading environment) were letting their money lie idle,[12] in the 17th century the long-term return from trade in Venice was estimated to be 6.4% per annum.[13] Business correspondence during the 16th century reflects the difficulties merchants were having in making profits commensurate with the risks of trade.[14] As Pezzolo observes, it is hardly surprising that by the early 1600s many were content to invest in land and earn returns of 3-5% given the risks involved in commerce.[15] In fact the movement in the portfolios of wealthy Venetian families out of commerce and into agriculture is also strong evidence of the fall in long-term investment returns that took place over the 16th century.[16]

To draw the connection between the changing investment climate in Venice and the demise of private banking, this paper will argue that, because the system of partial reserve banking in Venice was extremely unstable, high returns on the funds invested by bankers were necessary to outweigh the costs of a fairly high probability of failure for the banker. Effectively it was the extraordinary profits available to Venetian merchants and bankers in the 14th and 15th centuries that made the risky transformation of deposit accounts into long-term investments an efficient choice for the economy. As the 16th century unfolded, the loss of Venetian trading colonies to the Ottoman empire and competition of other Western powers reduced profits to competitive levels. This fall in profitability caused the collapse of the banking system.

## 2 The Institution: Banking in Renaissance Venice

Like other major centers of trade during the commercial revolution, Venice developed a partial reserve deposit banking system that offered transferable current accounts to its customers. The banking system in Venice operated in the Piazza di Rialto.[17] The Piazza di Rialto was the city's wholesale marketplace and the banks existed primarily to facilitate wholesale trade. While there

[12] Domenico Malipiero quoted in Pezzolo, 2003, p. 36.

[13] Pezzolo, 2003, p. 209.

[14] Tucci, 1973, pp. 352-3.

[15] Pezzolo, 2003, p. 209.

[16] Before the 1500's the bulk of a typical wealthy Venetian family's portfolio was invested in trade, but during the 16th century real estate with its relatively modest returns absorbed a much greater fraction of Venetian capital at the expense of commerce. (Lane, 1972, p. 306-7. Pullan, 1973, p. 380. Tucci, 1973, p. 350. Pezzolo, 2003, pp. 206.)

[17] Mueller, 1997, pp. 27 - 31 discusses the differences between the deposit banks that functioned on the Rialto and the moneychangers who were active at San Marco. For the most part the latter did not maintain current accounts.

was an evolution over these centuries in the goods traded on the Rialto, the most important markets were in spices, gold and silver bullion, cotton, silk, wool, grain, salt, wine, etc. Deposit banks were in operation from some time before 1300 through 1584. In the last two centuries up to three or four banks were active at any given time.[18]

Banks offered current accounts to their customers and kept the balances on the banker's books. Transfers from one account to another were made orally, which was not inconvenient because of the location of the banks. Under Venetian law bank transfers were a legal means of paying off debt, so a banker's account books had the status of notarial contracts, and they were stored long after a bank had closed.[19] Remarkably in a careful study of more than two centuries of legal records during which well over 100 banks were known to have been in operation, Mueller found only two examples of fraudulent banker's books – and in one of these the banker was finally exonerated.[20]

Before opening, a banker had to post bond and obtain a license from the State. The bond, however, covered just a fraction of a banker's deposits. More effective protection for depositors is found in the fact that bankers faced unlimited liability for their debts, and in the penalty received by a banker who failed to honor his debts: bankers, like all merchants trading on the Rialto, faced a court order barring them from the Piazza in case of default. Because the Rialto was a center of information as well as trade, this punishment meant that a merchant could not participate in the wholesale or financial activities of the city and had to close his business.[21]

Banks were never explicitly permitted to hold only partial reserves, and, if a bank was unable to pay its depositors, the bank was closed, and its assets placed in receivership. However, 14th century laws that authorized bankers to invest in the principal trades of the city implicitly recognized that bankers were investing the funds deposited with them.[22] And in the 15th century illiquid bankers could easily obtain a "safe-conduct" granting immunity from imprisonment and a moratorium on debts for a specified period of time.[23] Contemporaries sometimes commented about a bank failure that there would only be a "loss of time," indicating acceptance of a banking system in which

[18] Mueller, 1997, p. 37.

[19] Mueller, 1997, pp. 44-45. Tucci, 1996, p. 775.

[20] The banker, Petrus de Mortisse, had been a victim of fraud himself, and as it was the time of the Black Death it was deemed acceptable that he had fled the city in order to avoid a few days imprisonment before getting the chance to defend himself. Mueller, 1997, pp. 45-6.

[21] Lane, 1972, p. 143. Mueller, 1997, pp. 124-5.

[22] Tucci, 1996, p. 787.

[23] Mueller, 1997, p. 124.

assets could be temporarily frozen while the banker waited for his investments to mature.[24] This acceptance was undoubtedly due in part to the fact that the banking system was essential to clearing bills of exchange that were drawn on Venice and that this system of bills of exchange made it possible for sedentary long-distance merchants based in Venice to both pay and receive funds in distant cities and have access to a money-market in which to place idle funds.[25]

Because the Venetian authorities never explicitly recognized that a partial reserve bank could not be expected to meet depositors' demands in the case of a run, banks that faced runs were liquidated. However, given the lack of resale markets for many of a banker's assets – e.g. a partnership in a merchant voyage – the liquidation process allowed assets to mature and final settlement of bank liabilities to take place over a period of a year or more. The frequent liquidation of banks meant that the ratio of "failed" banks was extremely high – in 1584 Senator Tommaso Contarini claimed that 96 of 103 private banks failed and Mueller confirms the approximate accuracy of this statistic.[26] On the other hand, many of the so-called failed banks actually paid deposit balances in full – although not in a timely manner. Of the liquidated banks for which which payment ratios are known well over 50% paid in full. Many of the others closed in the midst of full-blown financial crises and paid about 60%. Only two banks paid less than 50%: in one case the banker and his sons were exiled for fraud, and the other took place shortly after the Venetian government outlawed the formation of new banks in 1569.[27]

General liquidity crises were an occupational hazard faced by bankers. They occurred only three or four times a century, but when they did happen the reduction in bank money was severe

[24] Mueller, 1997, p. 59.

[25] See Mueller, 1997, Chapter 8.

[26] Mueller, 1997, p. 122.

[27] From Mueller, 1997: 1355, Marino Baffo e Marco Trevisan pay 76%, p. 141; 1405 Benedetto Estate Bank pays 100%, p. 174; 1424, Nicolo Cocco e Antonio Miorati pay 100%, p. 177; 1425, A. Priuli Estate Bank pays 85%+ (last 15% litigated over 50 years), p. 181; 1429, Jacomo Priuli e Giovanni Orsini pay 50%+, p. 187; 1429 A. Priuli Estate e Bartolomeo Priuli pay 65%, p. 187; 1445, Francesco Balbi e frat. pay 100%, p. 200; 1445, Benetto Soranzo pays 45%, p. 209; 1473, Piero Guerrucci pays 100%, p. 228; 1491, Piero e Vettor Soranzo pay 100%, p. 230; 1499, Gerolamo Lippomano pays 65%, p. 251; 1500, Alvise Pisani pays 100%, p. 250. From Lane, 1966: 1528, Alvise Pisani pays 100%, p. 71; 1524, Matteo Bernardo pays 100%, p. 71; and 1513, Girolamo di Priuli pays 100%, p. 80. From Pezzolo, 2003: 1568, Giacomo Foscarini pays 100%, p. 122, and 1568, the Fratelli Correr pay 100%, p. 122. Tucci, 1981, p. 233: 1570 Sanudo bank pays 25%. Notice that Lane and Pezzolo do not appear to have payment ratios for banks that paid less than 100%. For this reason, I use the 50% figure for paying in full that is correct for Mueller's more exhaustive study.

and resulted in an aggregate crisis marked by a shortage of cash and the disruption of trade.[28] The liquidity shortage drove the value of cash up and the cash value of claims on the bank down. Furthermore the crisis caused other members of the economy to have difficulty meeting their debts, and invariably some of these bankrupts were debtors of the failed bank. As a bank's bad debts rose, the bank's ability to pay in full became more remote, driving the value of the bank's assets down further. It was under these circumstances that bankers found they could only pay 60% on deposits. It is remarkable that certain perspicacious bankers, seeing indications of difficult economic times ahead, chose to close their banks and pay in full a few years before the onset of a crisis.[29]

An indication that Venetian banking was generally successful despite aggregate crises is the complete lack of structural reform to the banking system for more than two centuries. In each of the crisis periods, 1340-46 and 1374-75, half of the dozen or so banks on the Rialto failed. During the 14th century it is precisely when bank crises resulted in the sudden and severe shortage of means of exchange in Venice that reforms to the banking system were discussed and undertaken. In the mid-14th century the opening of a public bank was proposed to "guarantee continuity in the clearing of payments even when private banks were insecure."[30] While a proposal for a public bank was never enacted during the period of private banking in Venice, it would be reconsidered three more times over the next century. On the other hand large scale banking crises only took place three or four times a century and the Venetian deposit banking system generally weathered the years of liquidity crisis and disrupted trade and then returned to normal. Those reforms to the system that were enacted emphasized the regulation of bank guarantors and did not result in structural change to the banking system until the latter half of the sixteenth century.

## 3 Analysis: Why did Venetian Banking Fail?

The Venetian deposit banking system combined longevity with instability: while the system lasted for more than three centuries, many banks were closed after five years or less of operation.[31] We know that the bank failures that took place during periodic crises could be costly – some depositors lost 40% of the value of their current accounts, and the bankers involved had to sell off personal

[28] Mueller, 1997, p. 111 ff.

[29] Mueller, 1997, p. 230 discusses the case of Pietro and Vettor Soranzo and Pezzolo, 2003, p. 122 the examples of Giacomo Foscarini and the Fratelli Correr.

[30] Mueller, 1997, p. 112.

[31] Mueller, 1997, App. A.

property to meet their debts and could be banned from participation in the merchant activity of the Rialto for life. The fact that private banks in Venice continued to be opened and continued to receive deposits despite the seriousness of these recurring costs is an indication that for centuries these costs were outweighed by the benefits of banking. In this section, I use a model to analyze the costs and benefits of Venetian banking.

Let's start, however, with Raymond de Roover's now traditional explanation for the evolution from moneychanger into deposit banker. In the medieval world, every time a merchant made a purchase using coin, the coin needed to be counted by a professional. The circulating coinage consisted of coins from a multitude of principalities. Because the coins were issued by different states, even when new the coins were of different quality. Furthermore use and clipping of the coins made careful assessment of each individual coin's value essential. Moneychangers were specialists in the counting of coin. To conserve on the costs of counting coin they began to act as deposit bankers – they offered to accept deposits of coin and to keep on their books a record of their clients' balances. These balances could be withdrawn in coin or transferred upon request. In the former case, bags of coin that had been counted at the time of deposit could be given out without recounting, and the latter case required no counting at all. If money-changers are assumed to hold 100% reserves and therefore always to stand ready to pay out deposits, an account with a moneychanger is an asset that clearly dominates the imperfect coin that circulated in the middle ages.

It was these money-changers, now deposit bankers, who were well-placed to observe that a 100% reserve position was inefficient. Deposit bankers saw that only a small fraction of their deposits was withdrawn at any one time and that therefore a large portion of those deposits could be profitably invested by the banker while at the same time honoring the deposit contract.

To make the theoretic point that partial reserve deposit banks create gains for an economy by enabling the economy to achieve an efficient level of investment through the transformation of demand deposits into long-term investments, I use Diamond and Dybvig's model of banking – with some simplifications from Allen and Gale.[32] In order to extend the model to take into account the high costs of an unstable banking system such as the Venetian one, I add the assumption that bankers must be compensated for the risks they face and that this payment to the bankers reduces

[32]Note that Diamond and Dybvig framework is very effective in representing the challenges of managing and regulating banks, but only gives an impressionistic view of the services provided by banks to consumers.

the funds available for depositors.

The model has three time periods, dates $0, 1, 2$, a single consumption good and two assets. One asset is liquid, and each unit of the asset can be exchanged for one unit of the consumption good (or vice versa) at any point in time – the liquid asset can be thought of as coin. The other asset is illiquid: it can be purchased at date 0, pays nothing at date 1, but pays $R > 1$ units of the consumption good at date 2. The illiquid asset can be considered a diversified portfolio of investments in merchant voyages. $R$ then represents the gross rate of return on the portfolio.[33]

The economy starts at date 0 with a large number (technically a continuum) of identical consumers. Each consumer has an endowment of one unit of the consumption good at date 0. A consumer does not value consumption at date 0 and will not find out until date 1 whether he is an early consumer, who values consumption only at date 1, or a late consumer, who values consumption only at date 2. All the consumer knows at date 0 is that he has equal probability of valuing consumption at date 1 and at date 2.

By assuming that individuals consume *either* at date 1 *or* at date 2, the model assumes that the long-term investment opportunity has probability $\frac{1}{2}$ of being without value to an agent. Because an individual has a high probability of finding date 2 consumption useless, this should be viewed as a model of the choices an individual makes over the portion of his portfolio that he may wish to have access to at any moment. A merchant who is not sure when he will have a good investment opportunity or a consumer who wishes to have liquid funds available in case of disability or unemployment will face such a choice. We will find that a deposit bank can ease the tension between the uncertain need for liquidity at date one and the value of high-return illiquid investment.

The consumer's problem is to decide how to invest his endowment at date 0 given that he has a 50% chance of being an early consumer and a 50% chance of being a late consumer. I assume that the period utility function is the square root function: $u(c) = \sqrt{c}$.[34] Thus, each consumer

[33] Note that we are assuming that the return, $R$, is a guaranteed return – or that diversification of the portfolio of investments in merchant voyages is sufficient to provide a riskless return. This is a simplification made for expositional purposes. Extending the model to a stochastic environment would not change the basic character of the results.

Note also that by assuming that consumers have the ability to invest directly in a diversified portfolio of merchant voyages, we abstract from the role that banks can play in facilitating the diversification of investment for small investors. We choose to focus here on the economics of current accounts, not of time deposits.

[34] This assumption is for purposes of exposition only and does not have a substantive effect on the results.

has the following expected utility function at date 0:

$$EU(c_1, c_2) = \frac{1}{2}\sqrt{c_1} + \frac{1}{2}\sqrt{c_2}$$

where $c_1$ is consumption at date 1 and $c_2$ is consumption at date 2.

Diamond and Dybvig (with some help from Allan and Gale) have given us an extraordinarily simple liquidity problem. Consumers must decide how to divide their endowment between coin and the merchant voyages. If consumers knew at date 0 whether or not they need liquidity at date 1, the early consumer would invest only in the liquid asset and would consume one unit of the good, and the late consumer would invest only in the illiquid asset and would consume $R$ units of the good. This describes the *ex post* optimal allocation – that is, the best possible allocation when investment decisions are made after the uncertainty is revealed.

When there is a market in the illiquid asset at date 1 – in other words, when shares in long-distance voyages can be traded before they mature – we find that the best the economy can do is to reach the *ex post* optimum. Effectively the market clears only at the price that gives one unit of the good to early consumers and $R$ units to late consumers.[35] Observe that, to bias our results against banking, we assume that the operation of a market, unlike the operation of a banking system, is costless.

The *ex post* optimum does not, however, maximize the consumers' expected utility at date 0. They can do better by choosing to share risk. Given the square root utility function, the agents in the economy prefer at date 0 to make greater use of the high return asset than is possible in the market – the optimum at date 0 is for late consumers to consume more than $R$ and for early consumers to consume less than 1.

In order for our economy to share risk optimally, resources will have to be pooled. A banking system can play this role by making deposit contracts – bank money in Mueller's terminology – available to consumers. Consider a bank that offers a contract which promises to pay either $c_1$ at date 1 or $c_2$ at date 2 in exchange for a deposit at date 0 of one unit of the good. At date 0 every consumer will prefer the bank contract to what can be achieved in the market if the expected utility of the bank contract is greater than the expected utility of the market allocation, or if

$$\frac{1}{2}\sqrt{c_1} + \frac{1}{2}\sqrt{c_2} \geq \frac{1}{2}\sqrt{1} + \frac{1}{2}\sqrt{R}$$

[35] See appendix for details.

The bank contract must be feasible: the amount to be paid out to early consumers, $c_1$, must be invested in coin and the amount to be paid out to late consumers, $c_2$, must be equal to the amount invested in the voyage multiplied by the rate of return, $R$.[36] Since all consumers have the same preferences, when the bank receives deposits, it receives deposits from all consumers and invests the whole endowment of the economy – which I normalize to two. Because bankers in Venice faced high costs due to unlimited liability and the possibility of being barred from the Rialto, I assume that a fraction of deposits, $k$, must be paid to the bankers in compensation for the risks they face. From the depositor's point of view this fraction $k$ is lost, and we have the following feasibility constraint for bank money:

$$c_1 + \frac{c_2}{R} \leq 2(1-k)$$

If there are two or more banks and the banks offer contracts simultaneously at date 0, then they will offer the contract that maximizes the expected utility of the consumers subject to the feasibility constraint. Denote this optimal contract by the pair $(c_1^*, c_2^*)$. Any bank that offered a contract with a combination of payoffs worse than $(c_1^*, c_2^*)$ would find that all deposits went to banks that offered the better contract, and any bank that offered a contract with a combination of payoffs preferred by consumers to $(c_1^*, c_2^*)$ would be violating the feasibility constraint and would therefore lose money.

Observe the nature of the deposit contract offered by a bank: even though every depositor has the right to withdraw the amount $c_1^*$ from the bank at date 1, to honor the contact at date 2 the bank must invest a portion of its deposits in a the long-term asset, and this means that it is impossible for the bank to honor the contract at date 1 if there is a run (i.e. if late consumers choose to withdraw early). It is in this sense that the banks in the model are partial reserve banks – and it is precisely because the banking system only stands ready to meet the *expected* liquidity needs of the economy that the bank can offer a deposit contract that improves over the market.[37]

[36] Actually late consumers could also be paid from coin that was held for two periods. But in this environment holding coin for two periods is clearly inefficient.

[37] This paper does not focus on the "bank run" aspect of Diamond and Dybvig's model, but on the equilibrium without bank runs. This can be justified by the fact that bank liquidators effectively issued claims on the current and future value of the bank and paid the claims proportionately as assets matured. Since there is no uncertainty in our environment and there is evidence that it was possible to sell claims on a liquidating bank (Mueller, 1997 p. 171), this policy ensures that an efficient allocation of resources is achieved. (For the details of this argument, see the working paper, Sissoko, 2003.)

For the time being let us assume that consumers can costlessly choose to open a market in voyages. Thus, only when the expected utility of the deposit contract is greater than that of the market, will consumers be willing to deposit their endowments at the bank. After solving for $c_1^*$ and $c_2^*$ as functions of $k$ and $R$, we find that consumers will only be willing to open accounts if:[38]

$$\frac{1}{2} - \frac{\sqrt{R}}{1+R} \geq k$$

When we invert this equation, we find that for each level of costs $k$ there is a lower bound, $R(k)$, such that consumers are willing to place deposits with the banks only if $R \geq R(k)$. In other words, the banking system is preferred to a market based system, only if the returns on merchant voyages are sufficiently high to both cover the costs of banking and provide a benefit over the market allocation for consumers as well. Thus, if the costs of instability in a banking system stay constant, while the returns available from long-term investment fall, the banking system may become too costly for the economy to support. I argue that this is the transition that took place in Venice in the 16th century.

# 4 Analysis: The Political Economy of the Banking Collapse

The analysis in the previous section presents two alternatives for long-term finance – a stock market and a banking system. Late medieval Italy provides us with examples of both of these alternatives. While Venice relied mostly on its banking system to allocate resources between short and long-term investments, the most important competing city-state in this period, Florence, generally relied more heavily on market-based allocation. In Venice, the partnerships and investment contracts that were used to invest in long-distance trade were common elements of a banker's portfolio, but were rarely resold.[39] By contrast, early in the 14th century Florence developed a form of partnership that allowed for over 50 owners of a firm (many of them passive investors) and for the transfer of shares.[40] The local Florentine banking system, however, never developed into a source of investment funds for the economy and Goldthwaite questions whether it even deserves to be called a banking "system."[41]

[38] See appendix for details.

[39] Chapters 4 and 5 of Mueller 1997 discuss in detail the liquidation of failed banks. It was common for liquidation to take well over a year, as the liquidators waited for assets to mature. This process made it possible for the majority of liquidated banks to pay in full, if not on time. There is no evidence that liquidation involved the sale of shares in trade contracts.

[40] Spufford, 1988, p. 253.

[41] Goldthwaite, 1985, p 46-50.

We see in medieval Italy both of the solutions proposed by the model, and we see that the city-state that chose to develop a banking system which used depositors' funds to invest in long-distance trade failed to develop a market for shares in such trading enterprises, whereas the city-state that had an active market in shares in long-distance ventures failed to develop a banking system which facilitated investment in trade. Given the extraordinarily high returns earned in trade by the Venetians alone amongst the Italian city-states during the 15th century, our model indicates that it is no surprise that Venice is also the city that chose banking over a market system of allocating investment funds.[42]

While our model allows us to make comparisons between different economies, we must be careful in using it to analyze changes within an economy. The model presents a simple choice: an economy can allocate long-term investment funds using a market or using a banking system. If returns are not sufficiently high to compensate depositors and bankers for the costs of allocating investment using a banking system, the economy is better off using a market to allocate funds. Of course, in practice if an economy has invested in developing a banking system, determines that the banking system is no longer effective and decides to switch to a market system, it is likely to face transition costs. When looking at the political economy of the banking collapse in Venice, it is instructive to distinguish between the long-run view represented by the model and a short-run view that incorporates transition costs.

Because of the development in Venice of legal institutions and social habits that supported the banking system instead of a market in shares in long-distance ventures, in practice the immediate effect of the collapse of the banking system was a collapse of trade. After the last bank had closed in 1584 a contemporary chronicler reported: "The bank failed causing grave losses to innumerable persons and incredible damage to this city – which was left for four years without a bank, so that business contracted to an unbelievable extent."[43] In terms of our model, the immediate alternative to the banking system can best be represented by autarky, where each member of the economy chooses to store coin or to invest on his own account in an environment where he will have no opportunity to resell his shares. Our model indicates that a banking system with costs that

[42] Goldthwaite, 1985, in fact ends his article noting that: "Something was still missing ... that prevented the Florentines, for all their precociousness in business matters, from turning technical progress into a fully developed capitalist banking system." Our model indicates that a possible explanation is that the returns available to deposit bankers through Florentine commercial investment were generally not high enough to support a banking system.

[43] Quoted in Pullan, 1973, p. 384.

consume less than one-third of the economy's resources is preferred to autarky for all but the lowest values of $R$.[44]

Recognizing that the simple trade-off described in the analysis of section 3 is valid only in the long-run can explain the late 16th century behavior of both the government, which was determined to shut the banking system down, and the merchant community, a portion of which actively sought the establishment of yet another private bank. In Venice the authorities outlawed banks in 1569, allowed the last bank to close its doors in 1584, and even when a consortium of merchants supported a petition to establish a new private bank, rejected the request.[45] In view of the immediate problems caused by the absence of banks, the merchants wanted a bank even if it had no guarantors.[46] The State, on the other hand, had concluded that the banking system was no longer viable and was willing to accept the short-term economic dislocation in order to set in place a long-term solution. The merchants were appeased in 1587 when the Senate finally approved the establishment of a public bank that would take deposits and hold 100% reserves.

Since a cynic might argue that perhaps the State shut down the private banking system in order to draw revenue from a state-run public bank, one should observe that in the 1580's the Venetian government was in an extraordinarily liquid position and was in the process of retiring debt. By the first decade of the seventeenth century the Venetian state had paid off the whole of its public debt. Furthermore lending by the public bank was forbidden – even lending to the state – and in the decree founding the bank, public funds were set aside for operating expenses.[47] It appears that the direct effect of the bank on state revenues was, if anything, slightly negative. On the other hand, the public bank almost certainly increased trade relative to the three years in which no bank was in operation, and thus the indirect effects of the bank on trade and tax revenues were almost certainly positive.

## 5 Conclusion

This paper provides a new answer to the question of why the Venetian banking system collapsed. Venetian banking was notoriously unstable: many banks had lifespans of less than five years and even a bank that was solvent in the long-run and owned by a man of extraordinary wealth, could be

[44] See appendix for details.

[45] Tucci, 1981, p. 236.

[46] Tucci, 1997, p. 574.

[47] Luzzatto, 1964, p. 47.

closed down by a run.[48] The costs of such a banking system were high and our model indicates that in order for the benefits of a banking system to outweigh such high costs, the returns to long-term investment opportunities available to the bankers had to be high too. In the 16th century with the loss of its 15th century monopoly on the trade between East and West the returns to investment in Venice fell. This fall in returns is the underlying explanation for the collapse of private banking in Venice.

Two issues remain to be addressed: First, can the experience of other deposit banking centers such as Barcelona and Bruges also be explained by arguing that late medieval banking systems were built on above-normal returns and collapsed with a fall in returns? A brief review of their history indicates that this is a possible explanation. When deposit banking began in Barcelona, the Catalans were "serious competitors of the Italians in the Levant," and for a time they had a monopoly on the north west African trade.[49] In the 15th century the economic position of the city weakened and this phenomenon was accompanied by costly bank failures and a decline of the banking system. In Bruges banking also developed alongside a monopoly – the monopoly of the Hanse over the trade between the Baltic and Western Europe. In the 15th century Hanseatic hegemony was undercut by the Dutch and the south Germans, and by the end of the century Bruges had ceased to be an important center of trade and its banking system had collapsed.[50]

Second, if partial reserve banking in Venice was truly no longer viable after the sixteenth century, why is it that modern banking systems do not have the same tendency to collapse when the economic conjuncture takes an unfavorable turn? A complete answer to such a question is impossible in this paper, but there is room to raise the possibility that institutional change made it possible for banking systems to operate in the absence of supernormal profits. In the late medieval period, banks that were illiquid, but not insolvent, had to close their doors. When discount banking developed in the 17th century, it became possible for an illiquid banker to continue his operations. The key to this change was the evolution of the bill of exchange. Over the course of the 17th century it became the norm for bills of exchange to be used as a means of payment by endorsing

[48] See for example Tucci's comment on the closure of the Pisani-Tiepolo bank in 1584 (Tucci, 1996, p. 801). Or Mueller's account of the failure of Balbi's bank in 1445 (Mueller, 1997, pp. 196 - 200).

[49] Lopez, 1952, p. 347.

[50] See Postan, 1952, pp. 224 - 227 and 254 - 256 for the economic position of Bruges and van der Wee, 1977, p. 323 for banking in Bruges. Van der Wee, 1994, p. 89 argues that an important cause of the banking collapse was the disasterous effect on investment opportunities of warfare and finance via debasement of the currency.

them from one merchant to the next and for banks to cash these bills at a discount. This system had a certain flexibility built into it: a reputable merchant or banker who was temporarily illiquid could simply write up a "fictitious" bill – that is a bill that was not based on an actual transaction of goods – to draw cash from some other banker or merchant. Needless-to-say anyone who was suspected of abusing this privilege was not reputable. While few in the business world would admit publicly to the use of such methods, the importance of this safety valve to a banker is demonstated in the private correspondence of the Rothschilds.

At crucial points in the finance of the Napoleonic Wars when the Rothschilds' first extraordinary fortune was made, several different branches of the bank found themselves short of cash and were obliged to issue fictitious paper reaching a total of £2 million – an amount more than double their combined capital at the time. The tone of their correspondence makes it clear that certain of the brothers are aghast to find themselves in such a situation. And, in fact, when the British government asks for a full accounting of their financial activity, they are obliged to hide their behavior behind fictitious numbers.[51] Clearly there is reason to believe that discount bankers, who were illiquid, but not fundamentally insolvent, often had at hand the means to get through the difficult period without closing their doors. Because discount banks could continue to operate when they were illiquid, they were more stable and faced lower costs than deposit banks.

Of course, in the twentieth century we have deposit insurance and central banks that recognize that partial reserve banks will require the services of a lender-of-last-resort when they are illiquid. The early banking systems that developed during the commercial revolution were unstable because they operated in an institutional environment that lacked the financial know-how that would develop only over centuries of experimentation. The high level of instability in late medieval banking meant that the costs of banking were high and that deposit banking systems could be supported only in environments like 14th and 15th c. Venice where the investment returns available to bankers were commensurate with the costs of banking.

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# Appendices

## A The Market Solution

If there is a market at $t = 1$ in claims on the good at date 2 the *ex post* optimum is achieved. To see this let us use $X$ to denote the quantity invested in the illiquid asset and $p$ to denote the price at date 1 for a claim on a good at $t = 2$. Since coin can be used to convert a good at date 1 into a good at date 2, the claim to a date 2 good must sell for $p \leq 1$. In a market an early consumer gets $c_1^m = 1 - X + pRX$, because he can sell his claims to $RX$ units of the good at $t = 2$ at the price $p$. A late consumer gets $c_2^m = \frac{1-X}{p} + RX$ because he can sell the date 1 good at a price $\frac{1}{p} \geq 1$. A consumer solves the following problem:

$$\max_X \frac{1}{2}\sqrt{1 - X + pRX} + \frac{1}{2}\sqrt{\frac{1}{p}(1 - X + pRX)}$$

The only possible market clearing price is $p = \frac{1}{R}$. If $p < \frac{1}{R}$, optimization will imply $X = 0$ and there will be an excess demand for claims on date 2 goods. If $p > \frac{1}{R}$, optimization will imply $X = 1$ and there will be an excess supply of date 2 goods. When $p = \frac{1}{R}$ an individual consumer is indifferent over all possible choices of $X$, because all values of $X$ will mean that as an early consumer he gets $c_1^m = 1$ and as a late consumer he gets $c_2^m = R$. In order for this allocation to be feasible for every agent in the economy, it must be the case that half of the economy's endowment is invested in the illiquid asset. Thus one market equilibrium of this economy is for every agent to invest $X = \frac{1}{2}$ in the illiquid asset at $t = 0$.

## B Condition for preferring bank to market

Consumers prefer the bank contract to the market allocation on if $\frac{1}{2} - \frac{\sqrt{R}}{1+R} \geq k$ : We solve first for the optimal bank allocation as a function of $k$ and $R$ and then compare the optimal bank allocation to the market allocation.

Each bank maximizes the expected utility of a representative agent at $t = 0$:

$$\max_{c_1, c_2} \frac{1}{2}\sqrt{c_1} + \frac{1}{2}\sqrt{c_2}$$

subject to the resource constraint

$$c_1 + \frac{c_2}{R} \leq 2(1-k)$$

Then $c_1^* = \frac{2(1-k)}{1+R}$ and $c_2^* = \frac{2R^2(1-k)}{1+R}$.

A consumer will deposit his endowment in a bank only if the expected utility of the bank contract is greater than that of the market. In other words, if:

$$\frac{1}{2}\sqrt{\frac{2(1-k)}{1+R}} + \frac{1}{2}\sqrt{\frac{2R^2(1-k)}{1+R}} = \frac{1}{2}\sqrt{1+R}\sqrt{2(1-k)} \geq \frac{1}{2}\sqrt{1} + \frac{1}{2}\sqrt{R}$$

After some algebra we find that this condition reduces to:

$$\frac{1}{2} - \frac{\sqrt{R}}{1+R} \geq k$$

## C Comparison of banking and autarky

A banking system with costs that consume less than one-third of the economy's resources is preferred to autarky for all but the lowest values of $R$: First we solve for the optimal allocation of resources under autarky and then we compare the optimal bank allocation to the autarkic allocation.

Let $X^a$ be the quantity of the endowment good that is invested. Under autarky an early consumer loses his long-term investment and consumes $c_1^a = 1 - X^a$. A late consumer gets utility from both the liquid and the illiquid investment $c_2^a = 1 - X^a + RX^a$. Then, an autarkic consumer solves the following problem:

$$\max_{X^a} \frac{1}{2}\sqrt{1-X^a} + \frac{1}{2}\sqrt{1-X^a+RX^a}$$

We find that for $R > 2$, $c_1^a = \frac{1}{R-1}$ and $c_2^a = R - 1$. And for $R \leq 2$, $c_1^a = c_2^a = 1$.

First consider $R > 2$. The banking system is preferred to autarky when the expected utility of the bank contract is greater than that of autarky, or when:

$$\frac{1}{2}\sqrt{\frac{2(1-k)}{1+R}} + \frac{1}{2}\sqrt{\frac{2R^2(1-k)}{1+R}} \geq \frac{1}{2}\sqrt{\frac{1}{R-1}} + \frac{1}{2}\sqrt{R-1}$$

When $k < \frac{1}{2}$ this condition reduces to $R^2 - 1 \geq \frac{1}{1-2k}$. Since we started with the assumption that $R > 2$, we find that this condition always holds when $k \leq \frac{1}{3}$.

Now consider $R \leq 2$. The banking system is preferred to autarky when the expected utility of the bank contract is greater than that of autarky, or when:

$$\frac{1}{2}\sqrt{\frac{2(1-k)}{1+R}} + \frac{1}{2}\sqrt{\frac{2R^2(1-k)}{1+R}} \geq 1$$

After some algebra, we find that the banking system will be preferred when $2 \geq R \geq \frac{1+k}{1-k}$.