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# Working Paper The trade effects of the plague: The Saminiati and Guasconi Bank of Florence (1626-1634)

EHES Working Paper, No. 271

**Provided in Cooperation with:** European Historical Economics Society (EHES)

*Suggested Citation:* Elliott, Robert J. R.; Gatti, Fabio; Strobl, Eric (2024) : The trade effects of the plague: The Saminiati and Guasconi Bank of Florence (1626-1634), EHES Working Paper, No. 271, European Historical Economics Society (EHES), s.l.

This Version is available at: https://hdl.handle.net/10419/307424

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EHES Working Paper | No. 271 | November 2024

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# The Trade Effects of the Plague: The Saminiati and Guasconi Bank of Florence (1626-1634)\*

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# Abstract

This paper quantifies the impact of the 1630-1631 Italian plague on the business activities of the Florentine merchant-bank Saminiati & Guasconi. Employing AI for handwriting recognition on over 6,000 bank letters we show that letters and goods transactions decreased by two-thirds when a merchant lived in an infected town although this negative effect was halved when the correspondent also resided in an infected town. Mentions of precious coins however increased reflecting a flight to the safety of hard currency. The plague also shifted the bank's merchant network towards Southern and Eastern Europe and away from the Atlantic Coast.

JEL Codes: N00, N73,N83

Keywords: merchants, plague, trade

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\* Preliminary draft, please do not quote without permission of the authors. We are thankful to Tiziana Dassi and the staff of the Bocconi University Historical Archives for their indispensable support in re-searching and digitizing the historical materials employed in this article.

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### **1** Introduction

The plague which hit Italy in 1630-1631 is considered exceptional in its pervasiveness and high mortality compared to other infections that inflicted the European Continent in the early XVII<sup>th</sup> century (Alfani 2010). In fact, the Italian regions struck by the Peste Manzoniana had not been hit so harshly by an epidemic since the Black Death in the  $XIV^{th}$ century (Alfani 2013). It has even been argued that the outbreak caused an entire century of demographic and economic stagnation and may have been one of the drivers of the divergence between the Mediterranean and the Atlantic economies, the latter of which at the time started to benefit more and more from the new trade routes after the great geographical explorations (Alfani 2013). One important consequence of the plague was that "most trade and communication was forbidden" (Cipolla 1978, p.12) and Florence, as well as other Italian cities and regional States, put in place commercial blocks, lock downs and quarantines, which arguably impacted trade even more than the infection itself (Rondinelli 1634, Henderson 2019). In this paper we quantitatively assess this trade impact from the correspondence of the large Florentine merchant-bank Saminiati & Guasconi (Cipolla 1988, Saba 2019), whose merchant-network's trade activity was abruptly disrupted when the plague entered Italy towards the end of 1629 (Corradi 1870).

Existing research on plague epidemics has tended to focus on a range of different economic outcomes. For example, Stahl (2001) illustrated the disruption to coinage activity in Venice during the plague of 1348, as well as the rise in public salaries and the policies of debasement in the *Serenissima* Republic in the aftermath of the epidemic. Cohn (2007) also noted a general salary increase in the aftermath of the Black Death, and reported on a series of State initiatives aimed at limiting the increase in the cost of labour throughout Europe. The role played by the XIV<sup>th</sup>-century plague in the economic divergence between Western and Eastern Europe was studied by Bosshart & Dittmar (2021), while Alfani & Murphy (2017) report on the long-lasting negative impact of the Late Antique plagues of 160-180 (The Antonine plague), 249-270 (the Cyprian's plague) and 541 (the Justinian's Plague) on the economy, society and state-capacity of the Roman Empire. The Italian plague wave of 1630-1631 has already been analysed in terms of its economic impacts from a number of different perspectives. For example, Alfani & DiTullio (2020) consider this plague wave to have "slowed down" the monotonic increase in wealth inequalities in the Venetian Republic, while Masciandaro et al. (2022) described the expansionary monetary policy of the lagoon town which printed paper money to finance pandemic-related public expenditure. In other research, Alfani (2013) attributes the demographic decline of the Peninsula and its economic divergence from the Atlantic economies to the exceptional per-vasiveness of the plague in XVII<sup>th</sup>-century Italy, whereas in related work Cipolla (1988), Lombardi (1979) and Romano (1952) blame the economic crisis which inflicted Florence (and its textile sector) on the epidemic.

Remarkably, one economic aspect of plagues that has thus far been neglected is that of trade. This is despite the fact that the impediment of trade is widely acknowledged as one of the obvious consequences of the plague and policies implemented to deal with it (Biraben 1952, Boerner & Severgnigni 2012, Alfani & Murphy 2017, Jedwab et al. 2019, Belich 2022, Udale 2023, Madsen et al. 2024). For example, the impact of early-modern trade-bans and lock-downs have been meticulously described by Cipolla (1978), Palmer (1978), Slack (1988), Crawshaw (2013) and Henderson (2019). Arguably the most important reason for the lack of research examining trade as an economic outcome in detail is the paucity of relevant trade data for the time periods when there were significant outbreaks.<sup>2</sup> We overcome this obstacle by inferring trade activity from the postal correspondence of the merchant bank *Saminiati & Guasconi*.

Founded at the end of 1626, the Saminiati & Guasconi merchant bank took over the structures, contacts, and activities of the already well established Tornaquinci bank (Groppi 1990), and thus became immediately immersed in a commercial network of hundreds of Italian merchant-bankers scattered across the major trade and financial hubs of Europe (Bratchel 1990, Subrahamanyam 1996, Caracausi & Jeggle 2014). The main business of the Compagnia consisted of a wide range of activities, including the buying and shipping of fine Florentine draperies and cloths on behalf of foreign correspondents, as well as the importing of raw silk and wool from Sicily and South Italy destined for the

<sup>&</sup>lt;sup>2</sup>Most of the contemporary (and surviving) sources, such as chronicles, letters and registers, describe the public response of municipal or ecclesiastical authorities to the plague infection, while "direct evidence of the impact on trade and markets is limited" (Madsen et al. 2024, p.24). The paucity of trade data in this epoch is also reported by Boerner & Severgnigni (2012).

industrious manufacturing centres of Tuscany and Northern Italy (Morelli 1976, Malanima 1983, Goldthwaite 2009). The Saminati & Guasconi also ventured into the selling of exotic goods that landed in Europe via the Dutch ports and became involved in the purchase and resale of Spanish precious coins through their contact with Genoese merchants. To carry out trading activities on behalf of his bank, a Renaissance merchant-banker had to maintain an assiduous and punctual business correspondence with partners outside of Florence so that the bank could coordinate orders, production and shipment of goods (Galliano 2018, Bartolomei et al. 2018). Through repeated letter correspondence stable mercantile networks were formed, and the Italian-speaking network at this time was particularly important for Europe before the development of the colonial economies.

By studying the letters of the Saminiati & Guasconi merchant bank during the early  $17^{th}$  century Italian plague we are, as far as we aware, the first to provide quantitative insight into the impact of plagues on trade during a period when trade data are notably scarce. More specially, we demonstrate the usefulness of merchant letters as a rich source of information on trade networks within Europe and how these networks were weakened or strengthened as a result of a shock. To achieve this we employ the approach developed by Gatti (2024) using artificial intelligence for handwriting recognition and text analysis on over 6,000 of the bank's letters to their business partners covering the period 1626 to 1634. This allows us to extract in near real time information on the merchant recipients of the bank's letters (more than 400 different companies), the town of settlement (65 places in Europe) and 27 different traded goods (e.g. textiles, spices, precious, coins) before, during, and after the plague outbreak.

The results of our analysis show that the number of letters sent by the company, as well as the number of goods transacted, fell dramatically in 1630, and only started to recover in 1632, when the epidemic had passed and all trade restrictions had been dismantled. The number of business correspondents in the recipient towns hit by the plague also saw a substantial decrease during the years 1630-31, likely either as a result of merchants fleeing the towns or dying of the plague. We show that these missing merchants were replaced by others but only towards the end of the pandemic. In terms of the geographical impact on the merchant-network we find that the *Saminiati* bank's network contracted during the plague (mainly in the Western cities), but after the plague was rebuilt, but with a greater emphasis on peripheral European areas. This finding is consistent with the view that the Italian economy started to diverge from the new core of the European economy that was being formed along the North-West Atlantic coast as a consequence of the plague (Alfani 2013).

The remainder of the paper is organized as follows. In Section 2 we provide an historical overview of the merchant economics in early-modern Europe, with a focus on the structures and the activities of the *Saminiati & Guasconi* merchant-bank. In addition, we describe the plague of 1630-1631 with special attention to the Florentine case. In Section 3 we provide details on the data employed in this paper. We then outline the computer-based processes needed to build our dataset from the archival sources. In Section 4 we describe the patterns of what emerges from the letters in terms of most traded products, geographical extension of the merchant-network and means of transportation. We then perform regression analyses to quantify the losses and changes in trade suffered by the *Saminiati & Guasconi* from the plague and provide an interpretation of the results. Section 5 concludes.

## 2 Historical Context

#### 2.1 Merchant-Bankers Networks in Early-Modern Europe

Towards the end of the dark ages, Europe experienced a revival of international commerce, sustained by a generalized increase in the demand for goods, accompanied by the opening of new trade routes which crossed the European Continent longitudinally and latitudinally (Malanima 1983, Kellenbenz 1986). In an epoch of growing contact between people and cultures, merchants acted as privileged intermediaries, becoming the ultimate social group connecting societies and nations, and were the main actors involved in the transition from feudalism to capitalism on the Continent (Subrahamanyam 1996). More generally, while in the darkest centuries of the middle ages, commerce took place within communities of people who knew each other well (Kohn 2001). From the late medieval period trade among more distant communities led to the emergence of the early-modern merchant class who developed new methods for the organization of merchandise orders and transportation, and for the management of payments and credit collection. Alongside other financial innovations, such as the birth of the Deposit Bank and the Bill of Exchange (Kohn 2001), the positioning of correspondents in the main commercial hubs of Europe was the indispensable infrastructure supporting the international flow of information, goods and moneys.

The ability of Europe's city tradesmen to enter an international trade-network was particularly relevant for Renaissance Florence, whose economy largely depended upon the textile sector, relying on a stable import of raw silk and wool for the production of refined cloths and textiles to be sold in the urban markets of Europe. The Tuscan capital, still defined as "one of the greatest towns of trade in all the Mediterranean Seas" (Lewes 1638, p.203) in the XVII<sup>th</sup> century, relied on the international projection of its merchant class, which was essential for linking the city's economy to that of the Continent. The merchants interacted in a network composed of Italophone merchants who since the late Middle Ages had settled in all of the major commercial and financial hubs, such as Lyon, Antwerp, Amsterdam, and London (Mauro 1990, Matringe 2017). It has been said that the trade of textiles and fabrics was the first impulse for Florentine merchants to operate abroad and led to the development of processes that allowed them to deal with international credit and debits (Goldthwaite 2009). The necessity to move financial flows between the commercial hubs of Europe transformed cloth-merchants into a merchant-bankers (Goldthwaite 2009), a category to which the *Saminiati & Guasconi* proudly belonged.

#### 2.2 The Saminiati & Guasconi's merchant bank of Florence

The Saminiati & Guasconi, also known as the Ascanio Saminiati, Giovacchino Guasconi e comp. di Banco, di Firenze, was founded in Florence in 1626, appropriating the structures and activities of its predecessor, the Tornaquinci's, in which Ascanio Saminiati and Giovacchino Guasconi were minority partners and employees at the order of the majority shareholders Luca and Matteo Tornaquinci and Andrea Bettini (Groppi 1990). Since its inauguration in December 1626, the bank was twinned with a Venetian branch (the Casa di Venezia) thanks to the co-participation in the corporate structure of prominent personalities from the lagoon, such as Alberto Gozzi and, since 1628, his uncle, Domenico Tironi Dalla Sedda (Groppi 1990).

The company was governed according to established structures and customs that were carefully written into the founding contract, and frequent changes in the composition of owners was by no means unusual for banking companies of the time. As such, younger employees would start as trainees and then become minority shareholders until they were ready to take the place of an elderly merchant (Groppi 1990). The trainees of the bank were usually linked to the main partners through family ties and were often employed in the humble and menial jobs, such as copying the letters that would later be sent by post (Groppi 1990). The profitability of the bank came from the commission it charged on its counterparts for the provision of various services. Examples include 0.33% commission for the *star del credere* over a bill of exchange, 0.4% commission for the trading of a bill of exchange, and 2% commission for the trade of commodities or valuable goods (Groppi 1990). The counterparts of the *Saminiati & Guasconi* bank were usually other merchants, i.e., members of a network of Italian and European businessmen who's role was to move raw and laboured silks and wools to and from the Peninsula, and provide banking and payment services to towns and cities across the Continent.

The Florence of the 1620s and 1630s was marked by a competitive merchant banking sector. During this time the *Saminiati & Guasconi* appears to have been particularly active since its inauguration. For example, using postal charges to proxy the number of different merchant bankers in Florence, the *Saminiati*'s was the fifth largest during the period July 1627 to June 1628, fourth between June 1628 and June 1631, and third from July 1631 to June 1632 (Cipolla 1988). The relevance of the company, as well as the status of its main owners, is evidenced, amongst other things, by the election of the Gozzi as Senator for the *Serenissima* Republic of Venice in 1646, while the two main partners, Ascanio Saminiati and Nicolo Guasconi, later became senators in Florence in 1653 and 1657, respectively (Groppi 1990).

# 2.3 Letters and Bills of Exchange: The foundation of Merchant-Banker activity

Good and punctual communication was the sine qua non for the success of a renaissance company, in that the epistolary activity was the main instrument through which an earlymodern merchant-banker ran his business (Doria 1986).<sup>3</sup> The writing of letters was an exercise for which junior merchants were carefully prepared by the senior merchants, since a clear, trust-inspiring and mutually supportive language was essential in fostering and maintaining the distant nodes of the trade network (Peri 1672, Galliano 2018). An illustration of the importance of letters can be found in the correspondence of the Renaissance businessman Tönnis Smith who complained about his poor writing, which forced him to have his letters re-written by an assistant (Jeannin 1972, p.92-93).<sup>4</sup> Similarly, the early modern economist Giovanni Domenico Peri insisted that writing and arithmetic skills were necessary preconditions for a merchant to ply his trade (Peri 1672, p.5).<sup>5</sup> The importance of the information exchanged epistolary, as a means of financial evaluation of the economic counterparts, is well described by a dialogue found in a letter of the Venetian branch of the Saminiati towards the Florentine parent company: "You should pay attention to negative news, and it's better to lose a friend than the money, but be careful, you should trust the one sharing this information with you, since it's easy to be cheated" (Groppi 1990, p.74).

The central role played by correspondence in the management of a Renaissance commercial enterprise means that the letters and the surviving contemporary *copialettere* (i.e., the books in which the merchant transcribed the letters before sending them by post) provide today's scholars with an overview of the contracts and agreements concluded by the merchant, and the evolution of his expectations in quasi 'real time' as they were formed and thus are the primary documentation of merchant interactions (Saba 2019, p.10). These documents provide a rich "heritage of knowledge" (Doria 1986, p.77) that can be used for analysing the commercial and financial relationships of the time. Mercantile letters were usually structured according to a customary format, consisting of date, place and

<sup>&</sup>lt;sup>3</sup>Such merchant letters were a mixture of business and political news, records of deals and numbers, but also included a record of historical events.

<sup>&</sup>lt;sup>4</sup> "I did not learn enough in my youth, and that vexes me".

<sup>&</sup>lt;sup>5</sup> "Among the qualities that a merchant should have, three are the most important: full knowledge of arithmetic, being a good writer, and knowing the Grammatical rules".

salutation of the correspondent, followed by an acknowledgement of the letters received from the addressee and the indication of which letter the current one was written as an answer to. These documents provide us with a detailed insight into the customs, mentality, and set of values held by merchants (Galliano 2018). In contrast, accounting books, such as the *libro mastro*, allow only a static and end-period summary view of the business activities of a Company (Galliano 2018).

#### 2.4 The Plague wave of 1630-1631

"When an epidemic broke out, most trade and communication were forbidden" (Cipolla 1988, p.12), and this was also the case when the Plague entered the Peninsula in October 1629. This wave of infection originated on the Baltic coast in 1628 (Eckert 1996) and by early 1629, France, Switzerland and Germany had already been affected by the epidemic (Corradi 1870), but north of the Alps the epidemic-related mortality declined and became residual by the year 1630 (Eckert 1996). Importantly, the plague did not have the same demographic catastrophic effect as in North Italy (Alfani 2010, 2013), with the exception of Germany where plague mortality was interwoven with that due to military operations of the bloody Thirty Year War, as also noted in some of the letters used in this paper.<sup>6</sup>

As a result of Spanish and French troops being involved in the War of Mantuan Succession, the epidemic started to spread rapidly in the north of Italy (Alfani 2013). At this point the activities of the merchant-networks connecting Florence and other main industrial centres of Italy, such as Venice, Milan, Verona, Bergamo, to Europe were abruptly disrupted. Indeed, it has been argued that the plague prevented Italy from profiting from the increase in world trade that followed the period of geographical explorations since it was not as destructive in those countries which were already beginning to benefit from the growth in Atlantic trade (Alfani 2013). It has also been proposed that the plague may have been the cause a whole century of economic decline in the *Belpaese* (Alfani 2013).

<sup>&</sup>lt;sup>6</sup>In the letters received by Saminiati & Guasconi's in the years 1628-1629 from John Henderick, a major correspondent in Nuremberg, the plague is never mentioned as a possible impediments to the trade between the Italian and German areas, while the Bavarian merchant did express concern about the warfare that affected the German territory in these years, as one can read in a letter dated 6/3/1628: "All the country is full of soldiers, a lot of murders and robberies take place on the streets, which means it is almost impossible to ship goods or even to walk", and again a letter dated 12/3/1629 he writes: "Here there is no relevant news, roads are not safe, and soldiers' murders are a daily business".

Recognised as contagious, the plague led most Central-North Italian towns to introduce legislation to restrict the freedom of movement in the two years 1630-1631.<sup>7</sup> However, as reported by Cipolla (1988), starvation and the large number of deaths prevented true observance of such laws in Turin and Padua. In reaction to restrictions on movement, Venice, seat of the second "house" of the *Saminiati*, put in place extraordinary fiscal and monetary measures to sustain the increase in public expenditure related to the containment of the contagion (Masciandaro et al. 2022).

Since Saminiati & Guasconi's was headquartered in Florence, it is of particular interest to understand the magnitude of the pandemic from a Tuscan perspective. The Florentine government first limited trade in the summer of 1629 when, facing a famine, it banned the export of cereals (Cantini 1800-1808), while on the  $8^{th}$  of November of 1629 the Grand-Duchy prohibited (at least in theory) any commercial exchange with some plagueinfected regions of Northern Italy, followed by a further geographical extension of the ban on the  $29^{th}$  of December (Cipolla 1988).<sup>8</sup>

When the plague was officially declared in Bologna in May 1629, the Florentine health board ruled that a health pass was required for people travelling within Tuscany and in June 1629 it established a *cordon sanitaire* and sent troops to patrol the Tuscan boarders (Cipolla 1988, Henderson 2019).<sup>9</sup> By the summer of 1929 the plague had entered the region and other decrees were issued to limit the economic activity of butchers, traders, and different types of employees in the textile sector, whose activities were considered aggravating factors (Henderson 2019). On the  $20^{th}$  of January 1631 in Florence, as well as communities around the capital, a general quarantine was introduced, prescribing that

<sup>&</sup>lt;sup>7</sup>For example, Parma introduced a quarantine in June 1630, Piacenza in the autumn, and Milan decreed a general quarantine in November 1630. Verona, Bergamo, Brescia, Vicenza, Bologna and Lucca also put in place measures to contain people's movements (Corradi 1870).

<sup>&</sup>lt;sup>8</sup>From the archival sources it is possible to appraise how the commercial relationships of Florentine companies toward extra-Ducky places never really ceased, and, as Corradi (1870) stated, most of the public prescriptions were not really (or fully) enforced.

<sup>&</sup>lt;sup>9</sup>After the plague pandemic of 1347-1351, public health offices were created in the major towns of the Italian Peninsula for the monitoring of the spread of diseases and epidemics. Passing through the minor epidemics of the  $XV^{th}$  and  $XVI^{th}$  centuries such offices became increasingly structured in their functions and in the recruitment of permanent staff. With the passing of decades of epidemics, smaller centres in north-central Italy developed similar structures resulting in a dense network for the communication and control of infectious diseases. Early-modern Italy was the most advanced European region in the field of plague control and its policies and structures were copied, from the XVII<sup>th</sup> century, by other countries such as Switzerland, the Low Countries and England.

most of the population could not leave their homes for 40 days, while food, drink and firewood was to be delivered daily to their houses, thanks to a complex bureaucratic machine employing 1,100 people that was created for the management of this extraordinary situation (Henderson 2019). Exceptions from the general 'stay-at-home' provisions were granted to people employed in the textile and food industries with the provision that no one could return home and they had to live in their workplace, while ad-hoc permissions to travel were granted to members of aristocratic families (Henderson 2019).

The total cost of the quarantine measures reached the exorbitant amount of 150,000 *scudi* and resulted in a 150% increase in unemployment (Cipolla 1988).<sup>10</sup> The quarantine restrictions were gradually removed from the spring of 1631 (Corradi 1870), and crowds of peasants from the countryside poured into the city searching for food and State-subsidies that had not been guaranteed in the marginal areas of the Grand-duchy (Lombardi 1979). By the summer there were no longer abnormal mortality rates in Tuscany and, although minor resurgences of the infection affected Florence for the following two years, the plague wave was considered to have ended in Italy by the end of year 1631.

# 3 Data

### 3.1 The Copialettere of the Saminiati & Guasconi Bank

The archival sources in this research are from the Saminiati-Pazzi archive of Bocconi University (https://asboc.unibocconi.it/oggetti/34-archivio-saminiati-pazzi/), which is a collection of documents that cover the economic life of two Tuscan families of early-modern merchants. The use of early-modern letters as a source of data is described by Camiciotti (2014) and differs from the analysis of static and end-period accounting documents, such as the *libro mastro*. The benefit of the letters is that they provide the researcher with almost day-by-day information about the business conduct of the mercantile organization.

In this paper we focus on six *Copialettere* books that contain the transcriptions of all the outgoing mercantile correspondence of the *Saminiati*  $\mathscr{C}$  *Guasconi's* in the years

 $<sup>^{10}</sup>$ As a comparison, Lombardi (1979) reported that an amount ranging from 20,000 to 25,000 scudi was deemed adequate to cover the wages of all wool workers in the city for a period of three months.

before, during and after the epidemic. The documents are paired temporally as follows: (1) Register 192 and Register 193 cover more or less the same time span from January 1627 (plus a small number of letters dated December 1626) to August 1628 and were held separately for practical reasons; (2) Copialettere 193 contains ad-hoc transcriptions of letters sent to the most popular destinations of Venice and Rome; (3) Register 194 is the temporal continuation of register 192, while (4) Register 195 is the continuation of register 193 (so contains the letters sent to Venetian and Roman partners). Both registers 194 and 195 roughly span from August 1628 to September 1632. The final two registers, Register 196 and Register 197 are, respectively, the temporal continuation registers 194 and 195 and cover the time span from September 1632 to April 1634.

Letters transcribed in the *Copialettere* follow the same format. Each communication starts with the mention of the delivery town, the name of the recipient merchant, and the date on which the letter was written. Then, after the salutation, the *Saminiati* updated their correspondent on the state of the art of their trade, informing them on the arrival of goods in Florence, or the shipment of the ordered merchandise to its final destination. Many letters also contain a confirmation of receipt of payment or instead an invitation to perform a financial operation with a third agent with the use of a bill of exchange.

# 3.2 An AI model for the *Saminiati's* orthography: The Transkribus Platform

After checking that all the pages of the six *Copialettere* were present and intact, and the handwritten text was distinguishable from the background, the registers were digitized to produce a series of pdf files in which each page contains the scans of the two adjacent pages.<sup>11</sup> The scans of these were then uploaded on Transkribus, the most popular user-based platform for producing transcripts of historical documents in order to produce a searchable text for computer-based analysis (Nockels et al. 2022). More specifically, we trained an AI-based HTR (handwritten text recognition) model by feeding the platform with transcriptions of the original documents, in order to allow the underlying neural

<sup>&</sup>lt;sup>11</sup>Ensuring the text is distinguishable from the background is a prerequisite for the text to successfully undergo an OCR (optical character recognition) process since machine-made decipherability is strongly dependent on the regularity, clearness, and sharpness of the text being scanned (Hamad & Kaya 2016).

network to learn which character each sign in the *Saminiati's* orthography corresponds. The actual engine we used to produce the transcriptions, was fed 63,014 words, i.e., 119 (mostly) double pages. The Character Error Rate (CER) was only 1.00% on the training set and 4.90% on the validation.<sup>12</sup> Note that an HTR which can produce automated transcripts of handwritten material with a CER of below 5 per cent (meaning that 95 per cent of the characters are correct) is generally considered good (Muehlberger et al. 2018, Burlacu & Rabus 2021). Reassuringly our model clearly passes this hurdle.

### 3.3 A code for text analysis: Searching for keywords in the letters

The first step was to enter the entire corpus of documents into Transkribus and apply the AI-HTR model. The result was an output of six .txt files (six different files for the six different *Copialettere*) which were then merged, formatted, and partially edited to produce a single file that includes all the letters sent between January 1627 to February 1634 contained in the *Copialettere*) and are suitable for automated-text analysis (Gatti 2024). As our focus is understanding trade and trade networks we extract information on the addressee, destination, goods traded, and means of transport. We document 446 different merchant companies across 65 towns, 27 goods, 7 different means of naval transport and 10 types of packaging, the latter helping us identify each letter as a goods transaction even when the traded product is not one of the 27 goods originally identified.<sup>13</sup>

The main traded goods identified in the letters were typical products from local Florentine industries, the most cited of which are different types of silk fabrics (Morelli 1976, Malanima 1983, Goldthwaite 2009) and woollen clothes (Edler 1934, Malanima 1983, Munro 2005, Spallantani & Bruscoli 2003, Ammannati 2020).<sup>14</sup> We also searched for mentions of raw silk, wool and cotton, as well edible goods and spices such as pepper,

<sup>&</sup>lt;sup>12</sup>Note that the precision of the model is measured in terms of the number of characters transcribed correctly. In our case, we trained the model to recognize 110 different characters, namely the 23 characters of the Latin alphabet (both in lower and in upper case), the 9 numerical digits, and some "special characters" (resembling some from the Coptic and Greek alphabets) other than commas, punctuation and algebraic operators, used by the *Saminiati & Guasconi* to denominate prices, quantities and currencies.

<sup>&</sup>lt;sup>13</sup>Seven different types of sea crafts were identified as *galere* (galleys), *feluche* (feluccas), *vascelli* (vessels), *navi* (ships), *fregate* (frigates), *barche* (boats) and *galeoni* (galleons), for more information on ships in early-modern Europe see Unger (1980) and Gardiner (1994). We also isolated ten possible ways that the *Saminiati* packaged the traded goods, namely, *casse* (crates), *balle* (bales), *fagotti* (bundles), *sacchetti* (bags), *barili* (barrels), *scatole* (boxes), *salme* (sacks), *fiaschi* (flasks), *vasetti* (jars), and *botti* (casks).

<sup>&</sup>lt;sup>14</sup>Silk products include Drappi, rasi, ermisini, chermisini, tele, taffette, velluti, dommaschi, and broccati while woollen products include rascie, saie, pannine, baiette, perpignani, and ciambellotti.

saffron, sugar and oil (Berglez 2021). Among the precious goods the most cited were diamonds (Lenzen 1970, Hofmeester 2019, Sabel 2019), necklaces, and silver, while the Spanish *Reales* and *Dobles* were the most frequently cited precious metal coins (Barrett 1990, Pezzolo & Tattara 2008, Chen et al. 2021).

In order to address concerns regarding imprecision of the AI-HTR tool we inspected the .txt file produced by the model and compared it with the digitised *Copialettere*. We took note of all the errors/variations in which the AI generated HTR model transcribed the above mentioned trade-related keywords from pdf into .txt.<sup>15</sup> Understanding the errors/variations in the keywords in the text was crucial when it came to writing R code to classify the contents of each letter (Gatti 2024). The results were then merged into an R data.frame and exported in a data sheet where each letter was assigned a number from 1 to 6,376 and was associated with the name of the addressee merchant, the destination town, and the count of the mentions in each letter of each of the 27 goods, the seven sea crafts and the ten packaging systems. The final data was then cleaned and validated following rules described in Gatti (2024). In order to prepare the dataset for a regression analysis, it was structured as a panel based on quarters (29) and towns (65).

### 3.4 Plague Indicator Variables

For our econometric analysis we created a number of plague indicator variables. The first is a Florence plague dummy  $(P_{FL})$  which is equal to 1 if the plague was present and zero otherwise. Second, a Corradi set of dummies  $(P_{DT}[C])$  which are equal to 1 when there is a plague presence in an Italian recipient town, as reported in Corradi (1870): Turin, Milan, Mantua, Cremona, Verona, Bergamo, Venice, Vicenza, Parma, Plaisence, Bologna, Modena, Florence and Lucca, who experienced the infection at some point during the period 1630-31. Since it was common practise for renaissance public bodies to at first deny the presence of an infection in their town, since it was seen as God's curse (Rondinelli 1634, p.40), in the regressions the plague-indicator variables are lagged by one time period.<sup>16</sup>

<sup>&</sup>lt;sup>15</sup>As an example, the model transcription for the words *Seta* - *Sete* (Silk - Silks) took 48 different forms such as *Seta*, *Site*, *Setas*, *Gete*, while the town of Venice was coded in 33 different ways such as *Venezia*, *Ven.a*, *Vinizia*, and *Vonezia*.

<sup>&</sup>lt;sup>16</sup>In his "relation" on the 1630-31 plague wave, Rondinelli explicated the common view of time, whereby "our sins have unleashed the righteous wrath of Go". A clear example of denial of the plague is Venice, where the Senate meticulously recorded, through an affidavit attested by a notary, the clear absence of

Note that by construction, each town has it's own dummy variable that is equal to 1 when the plague first appears and zero before and when the plague wave is no longer present.

Using similar rules, we also generated a North Italian set of dummies  $(P_{DT}[NI])$ which extended the Corradi set of dummies in the sense that it is based on the town and quarter considered infected according to Corradi (1870), but also assumes that the plague was likely present in towns close to ones that had been reported infected giving us a broader measure of infected partner towns. These towns were Mondovi, Sant Albano and Chieri in the case of Turin, Novi and Bisenzone for Plaisence, Reggio Emilia for Parma; Cesena, Ferrara, Ravenna, Rimini and Faenza for Bologna, Chiavenna for Milan, and Massa, Pisa and Leghorn for Florence. While both the Corradi and North Italian sets of dummies are only defined for Italian destination towns, the set of European plague dummies  $(P_{DT}[EU])$  captures the temporal presence of the plague in the non-Italian towns in our dataset relying in this case on Büntgen & Ginzler (2019), where over the period 1627 and 1634 plague outbreaks, and their timing, were noted in Augsburg, Basel, Hamburg, Lille, Lyon, Nuremberg, Paris and Vienna. While for Italian locations we are able to identify the quarter of the year when the infection started and ended, for the extra-Italian locations we could only determine the year.

## 4 Descriptive Statistics & Trends

#### 4.1 Descriptive Statistics

Of the 6,376 letters sent by the *Saminiati* from January 1627 to February 1634, around 90% were sent to Italian towns, while 10% were addressed to merchants outside of Italy.<sup>17</sup> Figure 1a presents the count of mentions of maritime transportation per each town, while Figure 1b presents the frequency of it as a ratio between the total mentioning and the number of letters per each destination.

Observe that commercial exchange happened mostly by sea for the Mediterranean

contagion, and of any suspicion of contagion, within the city, in September 1630 when the plague had already been claiming victims for months (Corradi 1870).

<sup>&</sup>lt;sup>17</sup>The main recipients in Italy were Venice (1,872), Naples (1,191) and Rome (901) while those outside of Italy were Lyon (137), Antwerp (127), Krakow (95), Nuremberg (77) and Amsterdam (59).



Figure 1: Naval Transport in the Letters

hubs of Genoa, Messina, Palermo, Leghorn and Constantinople. In contrast, the *Saminiati* mainly relied on a system of *condotte* to move goods and letters, and land transport was the norm for trans-alpine journeys.<sup>18</sup> For high value shipments, couriers were often escorted by armed guards.<sup>19</sup> In addition, large cargoes were usually insured against transport risks by merchants specialised in risk evaluation and related financial operations, i.e., the

<sup>&</sup>lt;sup>18</sup>This was done by land couriers who organized periodic journeys that travelled from place to place. For example, two letters to John Henderick of Nuremberg from Register 192 stated "we'll send you such draperies with the usual condotta by land, at usual cost" and "we'll send you the coloured drapes with the usual condotta by land".

<sup>&</sup>lt;sup>19</sup>An example was the case of 10 boxes of Spanish *Reales* to be delivered to the merchant Martellini in Ferrara: "God willing we'll receive with the Rossi's condotta on Tuesday 10 boxes of Reales. You should pay, in addition, to Gio Francesco Miccieri, the expenses for the soldiers' accompaniment of such Reales to our guest house, where we'll send the usual honoured armed guards to pick them up" (Register 194).

assicuratori, where the premium price was a percentage of the value of the insured asset.<sup>20</sup>

Of the 6,376 letters in our sample, 2,415 mention some type of good.<sup>21</sup> The 18 textile product groups we identified in our analysis were referred to a total of 3,090 times (including multiple mentions of the same good in the same letter), consisting of 1,792 silk and 474 wool related transactions and is the sum of the count of ten different silk and seven different wool products. If the same silk product (i.e., *rasi*) was mentioned more than once in a letter, we only counted it once. However, if a letter contained a reference to more products (like one mention of *rasi* and one of *ermisini*) we counted each separately (in this case two) silks-related transactions in the letter. Figures 2a, 2b, 2c and 2d presents the main destinations for Silks, Wool, Precious coins and Diamonds, respectively.

The destination of letters that mention silk products (Figure 2a) tell a somewhat different story to that of woollen goods. More precisely, Venice was still the most important market (also because the *Saminiati* had a foothold there), while the letters to Nuremberg, Vienna, Krakow, and Amsterdam testify to the European demand for Tuscan-made silk products.<sup>22</sup> The relatively large number of letters to Sicily (Messina and Palermo) can be interpreted as an operation to purchase raw silk from the island, confirming the view that Sicilian ports were the main suppliers to the Florentine silk industry in the XVII<sup>th</sup> century (Morelli 1976). Sicilian silks were mostly loaded onto ships arriving at the Tuscan port of Leghorn<sup>23</sup>, while Naples, and some North Italian cities acted as both a market for sales and for the supply of silks (for example, Morelli (1976) talks about Lombard silks).

<sup>&</sup>lt;sup>20</sup>As can be read in a letter to Fornari of Venice, dated 22 October 1633, from Register 197 "... magnificent Sir Fornari, we received your letter dated 15 December in which you asked us to find you an insurance for a shipment from Ragusa to Messina, worth 4,000 Ducats of Bologna, and willing to implement it, we discovered that the few insurers here (in Florence) refuse to do it for less than 4%'.

<sup>&</sup>lt;sup>21</sup>Whenever a letter contains a mention of a good, we consider the letter as a transaction related to that good. Indeed, from reading the correspondence it is possible to assess whether the good was related to the good's shipment, arrival or payment.

 $<sup>^{22}</sup>$ In a letter dated 27 November 1627 addressed to John Kenderick of Nuremberg one finds further details of the silk trade between Florence and Central-Western European Countries: "We promise you to buy (here in Florence) the best qualities of draperies, given our expertise and daily practice, indeed everyday we buy drapes on commission of our correspondents located in Germany, Poland, Holland and France, and particularly we buy black or coloured rasi about which you also showed us some interest. In this purpose, you have to know that there are two main categories of rasi: normal ones, woven in the "Florentine manner", or richest and more decorated ones, woven at the "Bologna's manner", which are nicer and as a consequence cost more" (Register 192).

 $<sup>^{23}</sup>$ As can be read in a letter addressed to Jacomo Batta of Messina, dated  $26^{th}$  August 1627, "We hear that arrived in Leghorn the 6 balloons of silks you shipped for us, as soon as they arrive to us (in Florence), without loss of time we will ship them to their final destination and notify you" (Register 192).



(c) I recious coms (d) Diamonds

Figure 2: Destination Towns of Letters mentioning different Products

Letters mentioning woollen products (Figure 2b) are mostly addressed to Venice and its *Terraferma* (the mainland domains of the Venetian Republic (Alfani & DiTullio 2020)), Lombard and Piedmont towns, and the Central Apennines area. Although we do not specifically analyze whether the letters constitute purchase or sale transactions, we can interpret the mention of wools in the letters to the Abruzzi areas as operations to purchase raw material (Malanima 1983, Spallantani & Bruscoli 2003), as backed up by some of the letters themselves. For example, a letter in Register 192 states that *"we decided to order from you a commission, to buy a hundred of balloons of white wool, provided you do not exceed the price of 20 shields"*. The letters to Venetian and Lombard towns mainly concerned the resale of raw wool, or the selling of semi-finished or finished Florentine wool products (Sella 1968*b,a*, Malanima 1983). In terms of trade in precious coins, shown in Figure 2c, they are mentioned 704 times in the letters. Genoa appears as a central point of transit for the precious metals and coins from the Spanish Empire. Indeed, in the the period of interest Genoese merchant-bankers replaced the German dynasty of the Fueggers as the main financiers of the Spanish Crown, supplying the Habsburgs with liquidity and being paid back in gold and silver pieces (Barrett 1990, Pezzolo & Tattara 2008, Chen et al. 2021). Trade in precious gems is shown in Figure 2d, where our letters confirm the view that Venice, Amsterdam and Antwerp were the main markets for diamonds in the XVII<sup>th</sup> century, where the gems arrived in the low countries on Dutch and Portuguese ships, while some of the best jewellers and polishers were located in Venice (Lenzen 1970, Hofmeester 2019, Sabel 2019).

### 4.2 Temporal Trends

Figure 3a shows the number of letters sent per quarter between 1627 and the start of 1634. The lowest number of letters sent was in the final quarter of 1630, which was also the period with the lowest amount of goods transactions. Looking at individual months, October and December 1630 recorded only three transactions, while April 1631 saw only 24 letters in total being sent. These dates coincide with information surviving from the chronicles that suggest that the peak of the infection occurred between late 1630 and early 1631 (Rondinelli 1634, Corradi 1870). Within our dataset, the average monthly count of letters sent by the company, as well as the number of monthly goods transactions, only returned to pre-epidemic levels in 1632, settling around 90 and 35, respectively. A similar trend is followed by the quarterly number of business correspondents, shown in Figure 3b, where we can observe a recovery when new correspondents started to emerge and liaise with the *Saminiati*, substituting for those that exited the market because of the pandemic.

Figures 4 and 5 present maps of Europe and show the number of letters sent to European commercial hubs from 1627 to 1633. The maps suggest that the spread of the plague in Northern Italy, and the subsequent trade bans and quarantines, even if rarely fully enforced, had a strong impact on the trade activities of the *Saminiati & Guasconi*.<sup>24</sup>

<sup>&</sup>lt;sup>24</sup>According to Biraben (1952) merchants were often allowed to circulate and to continue to move their goods. A complete halt of commerce would have meant indeed also the interruption of supply for food and medicines, other than a drastic drop in all the town's economic activities.



(a) Number of Letters Mailed per Quarters





Moreover, there appears to be a shift in the geographical reach of the trade network in the post-plague period (1632-1633), characterised by a consistent decline in the number of letters sent to towns on the Atlantic and by an increase in letters to the more peripheral European areas. This finding supports the aforementioned hypothesis that the severity of the plague that hit Italy in the XVII-century contributed to the divergence of the Italian economy away from Atlantic countries. Figure 6 allows us to see how the number of letters changed across our time period and clearly shows how the weakening of correspondence with partners in the Atlantic area, *Saminiati & Guasconi* was compensated for by a conspicuous increased in correspondence with Krakow-based merchants, as well as with



Figure 4: Geographical Spread of the *Saminiati*'s Network (Number of Letters per Town per Year) - Part 1



**Legend:** In the figure, the size of the dots is proportional to the number of letters per town per year. The colors represent the infection presence according to our *North Italian Plague* indicator  $(P_{DT}[NI])$ . Black indicates the towns infected according to Corradi (1870), Dark Grey represents the extension to North Italian towns, and Light Grey marks towns that were not infected

Figure 5: Geographical Spread of the *Saminiati*'s Network (Number of Letters per Town per Year) - Part 2

Figure 7a illustrates how the epidemic coincided with an increased demand for precious coins within the Saminiati's network. Given that the Genoese were the primary suppliers of Spanish precious coins, this would also explain the rise in correspondence with Ligurian merchants after the onset of the plague. Specifically, the average monthly mentions of precious coins and silver were around four in the first three years of our analysis, but surged to 14 during the epidemic years of 1630-1631, before stabilizing around 13 in the two years following the plague. The peak in mentions occurred in June 1631, with 102 references to *Dobles*, *Reales* and silver in the outgoing correspondence. The increase in mentions of such goods towards the end of the plague, along with their continued occurrence in the correspondence even after the epidemic, indicates a sustained preference shift among merchants towards more secure payment systems even in post-crisis times. The role of the Tuscan merchant-bankers as buyers and re-sellers of large quantities of precious coins has already been claimed (DaSilva 1969) and the increase of this phenomenon during the period under consideration is likely driven by a significant deterioration in the financial positions (including creditworthiness) of both private counterparts and the public bodies responsible for guaranteeing the value of paper currency (Soresina 1889, Luzzatto 1964, Masciandaro et al. 2022).

As textiles were the most traded items by *Saminiati & Guasconi*, and represented the main industry for Renaissance Florence, we are particularly interested in the mentions of these in the letters. The quarterly mentions of ten different silk and seven wool-made products are shown in Panels (b) and (c) of Figure 7. Both graphs exhibit a U-shaped pattern, again indicating a temporary impact of the pandemic induced recession on Florence and on the international trade network centred on the Tuscan capital. The most severe period of the crisis occurred from mid-1630 to mid-1631, a period in which the mention of textiles in the letters, typically occurring between 40 and 50 times per month both before and after the plague, abruptly ceased. From Figure 7 it is also worth pointing out that the spikes in mentions of wools during the autumn of 1631, which occurred when some trade restrictions were finally lifted, showed how *Saminiati* cleverly capitalised on this opportunity by disposing of their remaining stock.<sup>25</sup>

 $<sup>^{25}</sup>$ There was mention of a shipment of silks in Leghorn that was ready to be shipped as "soon transit will be free" in a letter to the Venetian branch of the *compgania*, dated  $11^{th}$  October 1631 (Register 195). In



(a) Number of Letters Mailed to North-West Europe



(b) Number of Letters Mailed to South and East Europe

Figure 6: Letters Outside Italy

With the arrival of the contagion some merchants and artisans left their stores and businesses to take refuge in the countryside (Biraben 1952), while others remained in the cities trying to profit from the lower competition by setting higher prices for their services (Biraben 1952). In the letters one finds examples of both cases.<sup>26</sup> Figures 8 and 9 are

the same letter we read of the "rush" of the Azzolini (clients of the Saminiati) to ship their goods to Ferrara since the "passage [of goods] was made possible". In a Letter dated  $25^{th}$  October the Florentine house of the Saminiati updates the Venetian branch of having released 18 boxes of silks from the quarantine house (i.e. the "Lazzaretto") where they had been confined (Register 195).

<sup>&</sup>lt;sup>26</sup>For example, in a letter to a correspondent in Venice it was stated: "We are telling you that we heard that the merchant Selomo Touro will escape outside of the town because of the contagion" (Register 195). Also, in a letter sent in the post-pandemic period towards an Italian correspondent based in Krakow one can see how the silk-makers in Florence worked "demanding a price increase" (Register 196), while in another letter toward Augsburg it is stated that "because the contagion caused most of the craftsmen to



(c) Mentioning of Wool Products per Quarter

Figure 7: Mentioning of Textile Products in the letters

die, now we are reduced in a way in which those who want to make drapery must pay some part of the price in advance" (Register 196).

analogous to Figures 4 and 5 but plot the number of business partners per year and town. Again, one can see a substantial decrease in the number of business partners based in North-Western Europe after the Italian plague, and a simultaneous increase in trading partners settled in more peripheral areas, confirming the view of start of the detachment



Figure 8: Geographical Spread of the *Saminiati's* Network (Number of Letters per Town per Year) - Part 1

# 5 Econometric Analysis

# 5.1 Econometric Specification

We want to verify and quantify the impact of the plague, both in terms of the presence in Florence and in destination towns, on various aspects of the trading operations of the



**Legend:** In the figure, the size of the dots is proportional to the number of correspondents per town per year. The colors represent the infection presence according to our *North Italian Plague* indicator ( $P_{DT}[NI]$ ). Black indicates the towns infected according to Corradi (1870), Dark Grey represents the extension to North Italian towns, and Light Grey marks towns that were not infected

Figure 9: Geographical Spread of the *Saminiati's* Network (Number of Correspondents per Town per Year)

Saminiati. As our explanatory variables are counts, we employ a Poisson Conditional Fixed Effects Maximum Likelihood Estimator (PCFE) for all specifications (Wooldridge 1999). The use of the PCFE in our context has a number of advantages. First, it is robust even when the count of interest has a large number of zeros, as is the case where towns receive no letters in a given quarter. In addition, it is suitable for contexts of both underand overdispersion of the dependent variable (Cameron & Trivedi 2013). Finally, it allows us to take into account unobserved time invariant destination town level fixed effects that could undermine causal interpretation. More specifically, under the PCFE we assume that the dependent variable(s) Y of our count(s) follows a Poisson distribution with mean:

$$Y_{it} = \exp\left\{\beta_{P_{FL}}P_{FL,it} + \beta_{P_{DT}}P_{DT,it} + \beta_{P_{DT}\times P_{FL}}P_{DT,it} \times P_{FL} + \lambda_q + \gamma_s + \mu_i\right\}$$
(1)

where subscripts *i* and *t* denote destination town and time (quarterly), respectively.  $P_{FL}$  is a dummy variable indicating the occurrence of the plague in Florence.  $P_DT$  is a dummy for plague presence in the destination town, where we experiment with different definitions and samples. In terms of the other controls,  $\lambda_q, q = 1, ..., 4$ , and  $\gamma_s, s = 1627, ..., 1634$ , constitute a set of quarter and year specific indicator variables, while  $\mu_i$  is a vector of destination town fixed effects. As shown by Hausman et al. (1984), the coefficient estimates in Equation (1) are consistent as long as the conditional mean is:

$$E[Y_{it}|P_{FL,it}, P_{DT,it}, \mu_i, \lambda_q, \gamma_s] = \mu_i \exp\left\{\beta_{P_{FL}} P_{FL,it} + \beta_{P_{DT}} P_{DT,it} + \beta_{P_{DT} \times P_{FL}} P_{DT,it} \times P_{FL,it} + \lambda_q + \gamma_s\right\}$$
(2)

In terms of estimating the standard errors in equation 1 we follow (Wooldridge 1999) and cluster these at the level of the destination town (i).<sup>27</sup> However, one possible threat to the estimation of the correct asymptotic variance of the PCFE model is time varying spatial dependence. To verify this is not the case with our data we calculate the test statistic T developed by Bertanha & Moser (2016) to evaluate the null hypothesis of only time invariant spatial dependence in the data.

In terms of the causal interpretation of  $\beta_{P_{FL}}$  and  $\beta_{P_{DT}}$ , the identifying assumption is that after we account for common yearly, seasonal, and destination town fixed effects, the onset and duration of the plague in both Florence and in the destination towns can be considered exogenous shocks. This would, for instance, assume that anticipation effects are

<sup>&</sup>lt;sup>27</sup>One should note that for all our estimations we also experimented with a dynamic PCFE where we included a lagged value of the dependent variable. This made almost no qualitative or quantitative difference, and we thus do not report these results in the paper but they are available from the authors upon request.

negligible. In this regard one should note that during the Renaissance the health bodies of Italian city-states were diligent in exchanging information to monitor disease presence across the peninsula in real time (Cipolla 1978). However, when a plague outbreak occurred, authorities at first even prohibited the use of the term *peste* (i.e., plague) to identify the epidemic, wary of its potential economic impact, and initially downplayed the rising death toll (Corradi 1870). Moreover, the actual enforcement of precautionary measures was uncommon especially in the early stage of the epidemic (Biraben 1952). Rather, severe economic restrictions were typically imposed several months after the plague's onset in a town and often persisted until the end of the plague wave (Corradi 1870), when infection was no longer seen as a localised curse but as a wide-spread and common problem.

Another violation of the identifying assumption could occur if there were other destination town specific trading activity determinants that were correlated with the onset and duration of the plague, or if trade with some destination towns was more likely to induce a plague outbreak. We assume that such factors would be captured by the destination town fixed effects. This seems reasonable given the short time period (7 years) that we are covering, so that it is unlikely that there would have been any independent and consequential structural changes in trading activity that would be correlated with the plague. One should additionally note that the causal effects, conditional on the identifying assumption holding, will capture both the effects of the plague, as for instance through deaths or reduced production of goods, as well implemented policies to deal with the disease that affected trade. In other words, our estimates capture the total net effects of the plague.

Finally, one should note that for Poisson models the fixed effects are multiplicative and not additive like in a linear model, but can still be interpreted as a shift in the intercept (Cameron & Trivedi 2013). To quantify the marginal impact of the plague on our dependent variables, we assume the town specific fixed effects, which are not explicitly identified,  $\mu$  to be 0. Moreover, since in a non-linear model marginal effects depend on the assumed value of the other control variables, we set as well the years and quarter time dummies to 0. The interpretation of the marginal effect of a single regression coefficient  $\beta$  from the PCFE is given by  $exp(\beta)$ , while for interpreting more coefficients, the effect is multiplicative, so that for three independent variables like the plague in Florence, in the recipient town, and their interaction term), the overall effect is given by  $exp(\beta_{P_{FL}} + \beta_{P_{DT}} + \beta_{P_{FL} \times P_{DT}})$ .

### 5.2 Summary Statistics of the Regression Variables

Our compiled dataset covers 65 towns (the letter destinations), observed for 29 quarters. Summary statistics of the six dependent variables selected for the econometric analysis are presented in Table 1, along with the sources of the data. On average, *Saminiati & Guasconi* dispatched approximately 3.43 letters to each destination per each quarter, but with a notable degree of variability with a standard deviation of 11.35. This variance can be attributed both to fluctuations in the volume of letters sent to specific destinations over time and to the inherent discrepancy in the importance of different towns (consider, as an example, Turin compared to the smaller village of Chieri, both in Piedmont). Moreover, it is worth noting that around one-third of such letters were associated with transactions involving goods. Although exhibiting a standard deviation of 6.22, which is considerable, the variance of the quarterly number of goods transactions is notably lower compared to the overall variability in letters sent. This discrepancy probably underlines Saminiati's policy regarding the exchange of goods, which was mostly carried out with partners characterised by more stable relationships than those for financial transactions alone.

Variable	Obs	Mean	Std. Dev.	Min	Max
Letters	$1,\!885$	3.43	11.35	0	116
Goods transactions	$1,\!885$	1.30	5.11	0	70
Mention of silks	$1,\!885$	1.33	6.22	0	74
Mention of wools	$1,\!885$	0.32	1.58	0	29
Mention of precious coins	$1,\!885$	0.38	3.49	0	100
Correspondents	$1,\!885$	1.15	3.22	0	29

Table 1: Summary Statistics of Variables

Among the various goods mentioned in the letters, silk products emerge as the most frequently referenced, averaging 1.33 occurrences per town per quarter, followed by woollen products and precious coins at 0.32 and 0.38, respectively, and is indicative of the diverse array of commodities involved in the merchant-bank's operations. Furthermore, it is worth highlighting that the merchant-bank's number of business correspondents averaged 1.15 per town per quarter, showing a significant degree of variability across different destinations. The explanation is that this is because certain places experienced periods without any active partners for consecutive quarters, while others, such as the hubs of Venice and Naples, were characterised by the abundance of business counterparts.

We use a number of sources to identify the presence and duration of plague outbreaks in the destination towns and these are provided in Table 2. For all destination towns that were not mentioned in these sources we assumed that the plague was not present to a meaningful extent during our sample period. Table 3 includes descriptive statistics for our plague proxy indicators from this information, namely,  $P_{FL}$   $P_{DT}[C]$ ,  $P_{DT}[NI]$ , and  $P_{DT}[EU]$ . As can be seen,  $P_{DT}[NI]$  suggests more plague presence than the indicator based on Corradi (1870). The much higher mean for  $P_{FL}$  compared to the other plague related variables shows how badly hit Florence was compared to other towns and cities in Italy and in other towns in Europe.

#### 5.3 Econometric Results

The regression results for the estimation of the PCFE models on the Italian and full sample are shown in Tables 4 to 9. One should note that no matter what specification or dependent variable, the p-value related the test statistic T of (Bertanha & Moser 2016) was higher than 0.95, which excludes therefore any time-varying spatial correlation.

#### 5.3.1 Number of Letters

Examining the impact of the plague on the number of letters in Table 4, regardless of the destination town plague proxy used, the impact of the Florence plague  $(P_{FL})$  is significant and negative and the size of this effect does not vary much. Focusing only on the Italian destination town sample in the first two columns, both destination town plague indicators  $(P_{DT}[C] \text{ and } P_{DT}[NI])$  indicate that the presence of the disease in the destination town also reduced the number of letters sent from the Florence merchant bank, with little difference between these alternative proxies.<sup>28</sup>. Similarly, within these two equations, we could not reject the null hypothesis that the coefficients for the plague in the destination

 $<sup>^{28}\</sup>mathrm{A}$  z-test failed to reject the null hypothesis that such 2 coefficients are equal, with a z-test value of 0.032 and a p-value of 0.9741

Town	$P_{DT}[C]$	$P_{DT}[NI]$	$P_{DT}[EU]$	Source
Hamburg	—	—	q1 28- q4 28	(Büntgen & Ginzler 2019)
			q1 27- q4 28,	
Augsburg	—	—	q1 32 - q4 32,	(Büntgen & Ginzler 2019)
			q1 34	
Basel	—	—	q1 28 -q4 29, q1 34	(Büntgen & Ginzler 2019)
Bergamo	q2 30- q4 30	q2 30- q4 30	q2 30- q4 30	(Corradi 1870)
Bisenzone	0	q2 30- q4 30	q2 30- q4 30	
Bologna	q2 30- q4 30	q2 30- q4 30	q2 30- q4 30	(Corradi 1870)
Cesena	0	q2 30- q4 30	q2 30- q4 30	
Chiavenna	0	q4 29 - q1 31	q4 29 - q1 31	
Chieri	0	q1 30 - q1 31	q1 30 - q1 31	
Cremona	q1 1630 -q4 1630	q1 1630 -q4 1630	q1 1630 -q4 1630	(Corradi 1870)
Faenza	0	q2 30- q4 30	q2 30- q4 30	
Ferrara	0	q2 30- q4 30	q2 30- q4 30	
Lille	—		q1 29 -q4 29, q1 34	(Büntgen & Ginzler 2019)
Lyon	—	—	q1 27 -q4 31	(Büntgen & Ginzler 2019)
Livorno	0	q2 30 -q3 31	q2 30 -q3 31	
Lucca	q3 30 -q4 31	q3 30 -q4 31	q3 30 -q4 31	(Corradi 1870)
Mantua	q4 29 -q4 30	q4 29 -q4 30	q4 29 -q4 30	(Corradi 1870)
Massa	0	q2 30 -q3 31	q2 30 -q3 31	
Milan	q4 29 -q1 31	q4 29 -q1 31	q4 29 -q1 31	(Corradi 1870)
Modena	q2 30- q4 30	q2 30- q4 30	q2 30- q4 30	(Corradi 1870)
Mondovì	0	q1 30 -q1 31	q1 30 -q1 31	
Nuremberg	—	—	q1 32 -q4 33	(Büntgen & Ginzler 2019)
Novi	0	q2 30- q4 30	q2 30- q4 30	
Paris	—	—	q1 27 -q4 31	(Büntgen & Ginzler 2019)
Parma	q1 30- q3 30	q1 30- q3 30	q1 30- q3 30	(Corradi 1870)
Piacenza	q2 30- q4 30	q2 30- q4 30	q2 30- q4 30	(Corradi 1870)
Pisa	0	q2 30 -q3 31	q2 30 -q3 31	
Ravenna	0	q2 30- q4 30	q2 30- q4 30	
Reggio	0	q1 30- q3 30	q1 30- q3 30	
Rimini	0	q2 30- q4 30	q2 30- q4 30	
Sant'Albano	0	q1 30 -q1 31	q1 30 -q1 31	
Turin	q1 30 -q1 31	q1 30 -q1 31	q1 30 -q1 31	(Corradi 1870)
Venice	q3 30-q4 31	q3 30-q4 31	q3 30-q4 31	(Corradi 1870)
Verona	q1 30 -q4 30	q1 30 -q4 30	q1 30 -q4 30	(Corradi 1870)
Vicenza	q3 30 -q1 31	q3 30 -q1 31	q3 30 -q1 31	(Corradi 1870)
Vienna	—	—	q1 33 -q1 34	(Büntgen & Ginzler 2019)

Table 2: Plague Indicator Variables for destination towns

*Note: a)* The Table does not include Italian or extra-Italian towns that did not experience any plague infection during this period, namely: Ala, Amsterdam, Ancona, Antwerp, Aquila, Bari, Colmar, Costantinople (Istanbul), Krakow, Fabriano, Foligno, Frankfurt, Genoa, Graz, The Hague, Lecce, Lixa, Metz, Madrid, Messina, Naples, Palermo, Perugia, Pesaro, Cuenca, Rieti, Roma, Toscanella and Viterbo. *a)* Where the Source is missing, we assume the plague to be present as described in Chapter 3.

Variable	Obs	Mean	Std. Dev.	Min	Max
$P_{FL}$	$1,\!885$	0.207	0.405	0	1
$P_{DT}[C]$	$1,\!305$	0.041	0.199	0	1
$P_{DT}[NI]$	$1,\!305$	0.089	0.286	0	1
$P_{DT}[EU]$	$1,\!885$	0.107	0.309	0	1

Table 3: Summary Statistics of Plague Indicators

town and the plague in Florence are equal.<sup>29</sup>

Variable	(1)	(2)	(3)	(4)	(5)	(6)
$P_{FL}$	-0.391***	-0.376***	-0.446***	-0.438***	-0.417***	-0.502***
	(0.104)	(0.103)	(0.120)	(0.121)	(0.129)	(0.140)
$P_{DT}[C]$	-0.293*		-0.877***			
	(0.157)		(0.152)			
$P_{DT}[NI]$		-0.300**		-0.888***		
		(0.153)		(0.150)		
$P_{DT}[EU]$					-0.256	$-0.565^{*}$
					(0.177)	(0.311)
$P_{FL} \times P_{DT}$			$0.765^{***}$	$0.762^{***}$		0.548
			(0.240)	(0.232)		(0.337)
Observations	1,260	1,260	1,260	1,260	1,820	1,820
T	4.93	4.93	4.94	4.94	10.91	10.91

Table 4: Regression results for Number of Letters

*Note:* Robust standard errors in parentheses. \*Significant at the 10% level. \*\*Significant at the 5% level. \*\*\*Significant at the 1% level. In all the specifications, we controlled for Town, Year and Season Fixed Effects.

The estimated coefficients for equations (1) and (2) suggest that the total net impact on letters of the plague when it was present in both Florence and the recipient town was around -50%.<sup>30</sup> Therefore, the presence of the plague in Florence and in the recipient town (in the case of the Italian dummies) each has a marginal effect of approximately -25% on the number of letters sent. This result is in line with the general view that the presence of the plague significantly decreased the trade between towns (Biraben 1952, Corradi 1870, Rondinelli 1634).

In the next two columns of Table 4 we interacted the Florence and respective destination town dummies in order to ascertain whether the presence of the plague in both determined the number of letters sent. As can be seen, the coefficient of the interaction term is significant and positive, with a similar size for the Corradi (1870) identification of plague and the more expanded definition. It is also noteworthy that while the coefficient on the Florence plague dummy is rather unresponsive to allowing for the effects to be dependent on each other, this is not the case for the destination town plague indicator. Quantitatively, when the epidemic periods do not coincide, the effect of the destination

 $<sup>^{29}</sup>$ With p-values for the t-test of 0.5662 for equation (1) and 0.6685 for equation (2).

<sup>&</sup>lt;sup>30</sup>This was calculated using the exponential of the sum of the coefficients of both the plague in Florence and in the (Italian) destination towns.

town plague on number of letters dispatched is approximately -70%, but decreases to around -40% when the two locations experience the infection simultaneously.<sup>31</sup> One possible explanation is that when both places were affected by the same infection, the stigma related to this "God's curse" was no longer important enough to restrict correspondence and trade (Biraben 1952). This would have then led to an increased desire by both correspondents to be updated (the case of number of letters mailed) about the epidemiological situation in the partner's town. Such behaviour was, for instance, also displayed by the Italian Renaissance Health Offices of towns, where in times of calm the correspondence was around one letter each two weeks, while during health emergencies several messages per week were sent (Cipolla 1978).

Column (5) of 4 consists of "only" Italian towns. When we enlarge the number of destinations to include towns outside of Italy and construct the destination town plague dummies accordingly, there is no longer a negative and significant coefficient associated with the plague present in where the letters were sent. Allowing for plague dependency in the final column indicates that there is only an effect of the destination town epidemic if this did not coincide with the disease in Florence. However, reducing the sample to only the non-Italian recipients shows that these results are due to a lack of any plague impact, whether in Florence or abroad, in the non-Italian town sample (Table A1 in the Appendix). This supports the view that the plague wave of 1630-31, although exceptionally aggressive in Italy, did not have a comparable impact on the population in destination towns (and hence the demand) outside of the Italian Peninsula (Eckert 1996, Alfani 2010, 2013, Alfani & Percoco 2023). However, when the plague was present in both Florence and non-Italian destinations, the plague in the non-Italian destination town, while not having an independent effect, acts to reduce the negative impact of plague in Florence on the number of letters (Table A2 in the Appendix). This confirm our interpretation of a "fall in the taboo" regarding the exchange of letters and information when the plague became a common problem for both parties in a business relationship.

<sup>&</sup>lt;sup>31</sup>Note that the overall net effect of the plague allowing for the interaction effect is still statistically significant across both specifications.

#### 5.3.2 Number of Letters Mentioning Transaction Goods

Our letters include those that specifically mention goods, and thus are more likely to be goods trade related, but also all other correspondence. To see whether considering just the former affects the results, in Table 5 we consider only counts of letters that explicitly mention any transaction goods. As can be seen, ignoring any possible plague dependency in the first two columns for the Italian sample qualitatively replicates what we found for the total number of letters in that both plague presence in Florence as well as the destination location of the letter recipient reduced the number of goods transactions, whereas with the total count of letters, the latter impact is greater than the former.

Variable	(1)	(2)	(3)	(4)	(5)	(6)
$P_{FL}$	-1.072***	-1.025***	-1.090***	-1.038***	-1.169***	-1.178***
	(0.186)	(0.196)	(0.182)	(0.194)	(0.225)	(0.219)
$P_{DT}[C]$	-0.473*		-0.611*			
	(0.263)		(0.363)			
$P_{DT}[NI]$		-0.551*		-0.640*		
		(0.293)		(0.374)		
$P_{DT}[EU]$					-0.299	-0.329
					(0.304)	(0.506)
$P_{FL} \times P_{DT}$			0.184	0.119		0.0541
			(0.306)	(0.309)		(0.532)
Observations	1,260	1,260	1,260	1,260	1,820	1,820
T	5	5	5	5	9.45	9.46

Table 5: Regression results for Number of Goods Transactions

*Note:* Robust standard errors in parentheses. \*Significant at the 10% level. \*\*Significant at the 5% level. \*\*\*Significant at the 1% level. In all the specifications, we controlled for Town, Year and Season Fixed Effects.

Importantly, however, mutual plague presence no longer plays a role in the number of letters. Nevertheless, the effects are noticeably larger for good transaction letters, particularly in terms of plague presence in Florence. Quantitatively, the effect on goods transactions is between -60% and -65% for the plague indicator in the Tuscan capital. Table 6 presents the Z-tests and confirms the significant difference between the estimated coefficients of total correspondence and only good letters.

The effect associated with the coefficient of the destination town varies from around -45% for the Italian destination indicators but disappears once non-Italian towns are in-

Variable	(1)	(2)	(3)	(4)	(5)	(6)
$\overline{P_{FL}}$	3.195***	2.931***	2.945***	2.621***	2.9***	2.596***
$P_{DT}[C]$	0.591		-0.677			
$P_{DT}[NI]$		0.758		-0.616		
$P_{DT}[EU]$					0.122	-0.398
$P_{FL} \times P_{DT}$			1.494	$1.666^{*}$		0.784

Table 6: Z-Test on Coefficients : Number of Letters vs Goods Transactions

*Note:* Difference in the coefficients is: \*Significant at the 10% level. \*\*Significant at the 5% level. \*\*\*Significant at the 1% level

cluded, entirely due to these other destinations.<sup>32</sup> Overall, the effect ranged between -70% and -80% when considering all significant coefficients in the equations in Table 5.

In Tables 7 and 8 we further break down the trade of different goods by counting in the letters the mentions of silk and woollen products, respectively. In this regard, note that the plague effect is qualitatively the same for both types of merchandise. More specifically, while there is a reducing effect of a plague in the destination town, plague presence in Florence has no impact of its own on the mentions of these good, no matter what the sample or specification, or when we allow for plague dependency. However, if there was also a plague in the destination town then having the epidemic in Florence tended to reduce the large independent effect. This moderating impact of the plague in Florence on the mentions of wool and silk can be partly explained by special permissions granted to workers in the textile sector in Florence in an attempt to protect the city's leading economic sector even during the General Quarantine period (Rondinelli 1634, Henderson 2019). Moreover, there were also attempts to disinfect the merchandise (Biraben 1952), such as leaving goods for several days in ad-hoc places called *Lazzaretti.*<sup>33</sup>

One additional aspect that stands out in comparing the effect between silk and wool products is that the latter is much more sensitive to plague presence, where the significant coefficients are multiple times higher.<sup>34</sup> Specifically, when considering only the Italian

 $<sup>^{32}</sup>$ See Tables A1 and A2 in the Appendix for regressions on the restricted, non Italian, sample. The plague in the destination town is never associated with a significative coefficient for the number of goods transactions.

<sup>&</sup>lt;sup>33</sup>These facilities are discussed in the letters as to a correspondent in Neaples: "..we're waiting for notices from you, to know if the boxes of spun gold are now outside the Lazzaretto..." (Register 194) or to the Venetian branch of the bank: "..the silks you ordered arrived in Leghorn, we'll let you know if they are free to be re-shiped or should stay in a Lazzaretto..." (Register 195)

<sup>&</sup>lt;sup>34</sup>A Z-test confirmed the statistical significance of this difference.

Variable	(1)	(2)	(3)	(4)	(5)	(6)
$P_{FL}$	-0.867	-0.839	-1.026	-0.998	-0.951	-1.255
	(0.727)	(0.738)	(0.813)	(0.828)	(0.759)	(0.871)
$P_{DT}[C]$	-0.319*	· · · ·	-0.927***	× ,	· · ·	. ,
	(0.184)		(0.214)			
$P_{DT}[NI]$	. ,	-0.364*		-0.940***		
		(0.202)		(0.218)		
$P_{DT}[EU]$		· /			-0.349	-0.645
					(0.667)	(0.936)
$P_{FL} \times P_{DT}$			$0.996^{***}$	$0.937^{***}$		1.159
			(0.258)	(0.281)		(0.988)
Observations	1,260	1,260	1,260	1,260	1,820	1,820
T	3.79	3.79	3.79	3.79	8.76	8.76

Table 7: Regression results for mentions of Silk Products

*Note:* Robust standard errors in parentheses. \*Significant at the 10% level. \*\*Significant at the 5% level. \*\*\*Significant at the 1% level. In all the specifications, we controlled for Town, Year and Season Fixed Effects.

Variable	(1)	(2)	(3)	(4)	(5)	(6)
$P_{FL}$	-1.037	-0.967	-1.131	-1.062	-1.219	-0.793
	(0.917)	(0.901)	(0.928)	(0.911)	(1.003)	(0.705)
$P_{DT}[C]$	-1.291***		-13.84***			
	(0.464)		(0.862)			
$P_{DT}[NI]$		-1.339***		-13.84***		
		(0.468)		(0.855)		
$P_{DT}[EU]$		. ,			-0.0526	0.629
					(0.88)	(1.204)
$P_{FL} \times P_{DT}$			$12.68^{***}$	$12.63^{***}$	. ,	-1.517
			(1.12)	(1.131)		(1.432)
Observations	1,260	1,260	1,260	1,260	1,820	1,820
T	3.67	3.63	3.67	3.63	6.64	7.33

Table 8: Regression results for mentions of Wool Products

*Note:* Robust standard errors in parentheses. \*Significant at the 10% level. \*\*Significant at the 5% level. \*\*\*Significant at the 1% level. In all the specifications, we controlled for Town, Year and Season Fixed Effects.

sample, the effect of plague in the destination town ranges from almost -100% to -70%for wool, and from -60% to -30% for silk, while the effects are not statistically significant when enlarging the sample to all destination, confirming a "mitigating" effect of the plague when considering the towns abroad that were only mildly hit by the infection. Examining the restricted, non-Italian sample, this interpretation is partly confirmed and from Table A1 in the Appendix we can see how mentions of both silks and wools are not sensitive to the plague presence in the extra-Italian towns confirming the limited relevance of the epidemic abroad. In contrast, silks are mentioned less in the correspondence when the plague is in Florence. The effect increases when the destination plague coincides withe the Tuscan epidemic while mentions of wool in the letters abroad seems to be insensitive to the plague presence in Florence.<sup>35</sup> The disparity in the impact of the plague on silk and wool products may be attributed to the shorter "supply chain" for silk compared to wool.<sup>36</sup> That is, while Florentine industries completely relied upon foreign imports for raw wool, the introduction of sericulture in Tuscany during the late Middle Ages alleviated this dependency on foreign markets for silk supply, making the production of silk textiles less sensitive to the interruption of international supply chains as a result of the epidemic (Malanima 1983).

#### 5.3.3 Counting of Coins' mentions per Quarter

Table 9 shows the regression results using as the dependent variable the mention of precious coins in letters that did not mention any other goods. Defining it as such arguably allows us to isolate the role of precious coins as an anti-inflationary and anti-recessionary investment/store of value and not as a means of payment, this last function being highly correlated with the trade of the products mentioned above. While there appears to be no significant effect of the plague on the the number of mentions of such goods, referring back to Figure 7a suggests that there may be a non-linear relationship that depends on the duration of the plague. Hence, our approach was to decompose  $P_{FL}$  into six individual quarterly indicator variables, where each takes on a value of one for the corresponding

<sup>&</sup>lt;sup>35</sup>Table A2 in the Appendix was not able to include the results for wool and coins as the regressions failed to converge.

 $<sup>^{36}</sup>$ Except for the very restricted non-italian case (less than 10% of the letters were sent abroad), it seems the wools were more affected by the plague than silks.

quarter when there was the presence of the plague in Florence and zero otherwise, denoted as  $P_{FL_1}, P_{FL_2}, \dots P_{FL_6}$ . We then include these as well as their interactions with the proxies of  $P_{DT}$ .

Variable	(1)	(2)	(3)	(4)	(5)	(6)
$\overline{P_{FL}}$	-0.955	-0.915	-0.954	-0.89	-0.909	-0.889
	(0.631)	(0.712)	(0.702)	(0.787)	(0.703)	(0.78)
$P_{DT}[C]$	0.359		0.364			
	(0.558)		(0.461)			
$P_{DT}[NI]$		0.161		0.318		
		(0.617)		(0.45)		
$P_{DT}[EU]$		· · · ·		· · ·	0.17	0.297
					(0.612)	(0.459)
$P_{FL} \times P_{DT}$			-0.0061	-0.171	· /	-0.138
			(0.752)	(0.777)		(0.777)
Observations	1,260	1,260	1,260	1,260	1,820	1,820
T	3.09	3.1	3.09	3.1	3.09	3.09

Table 9: Regression results for mentioning of Precious Coins (in letters not mentioning other goods)

The regression results for the decomposition of  $P_{FL}$  by plague duration for letters mentioning precious coins are shown in Table 10. Looking at the Italian sample (Columns 1 and 2), during the initial phase of the epidemic in the Tuscan capital (in 1630), there was a decrease in the mention of coins. However, in the latter phase of the epidemic (in 1631), there was a notable surge. The marginal impact in the second quarter was between -70 and -75%, and in the third quarter around -90%, whereas the positive impact of the final two quarters of the epidemic induced substantially increases of +1,800% and +800%<sup>37</sup>, respectively. The most plausible interpretation of this non-linear relationship is that merchants and traders, after living with the epidemic for several months, adapted their strategies, becoming more adept at navigating the challenges posed by the plague and the regulations imposed to curb its spread. The rise in demand for gold and silver pieces during periods of uncertainty was previously illustrated in the case of the Renaissance Financial Fairs (DaSilva 1969). In our context, precious coins appeared to similarly emerge as safe

*Note:* Robust standard errors in parentheses. \*Significant at the 10% level. \*\*Significant at the 5% level. \*\*\*Significant at the 1% level. In all the specifications, we controlled for Town, Year and Season Fixed Effects.

<sup>&</sup>lt;sup>37</sup>Calculated as the exponential of the coefficients, where  $e^{2.9} \approx 18$  and  $e^{2.1} \approx 8$ .

assets and prized for their inherent stability and reliability as stores of value.<sup>38</sup>

One may also note that the interaction terms between the Florentine plague dummies and indicators of epidemics in recipient towns exhibit positive and significant coefficients (shown in Columns 3 and 4). As stated before, this can be interpreted as part of overcoming the stigma of being the only party affected by the curse of the plague. Finally, in terms of the destination town epidemic presence, one only finds an independent effect once one allows for it to depend on the presence of the plague in Florence, confirming the centrality of Tuscan-based merchant-bankers in the international market of precious coins at the time (DaSilva 1969).

Including the non-Italian destinations in our sample provides qualitatively and quantitatively similar results as shown in columns (5) and (6) of Table 10. Also for the restricted, non-Italian destination sample, we performed the regression both decomposing the Florence plague indicators (Column (7) in Table 10) and (Table A1 in the Appendix). One should note, however, that in both cases we were not able to include the interaction variables because of collinearity. In addition, the Bertanha & Moser (2016) test indicated that we could to exclude time-varying spatial correlation. The results show a lack of a direct effect of the plague in destination the destination (non Italian) towns, in line with our interpretation thus far. Moreover from the "aggregated" version shown in Table A1 in the Appendix, it clearly emerges that the plague in Florence was a source of the increase in the mention of coins in the letters sent abroad, while in the decomposed trimester we see how the effect depends on the duration of the infection.

#### 5.3.4 Number of Business Partners

The presence of the plague in Florence generally had no effect on the number of business correspondents as shown in Table 11. This is consistent with the fact that the number of correspondents (all situated outside of the Tuscan capital) is more influenced by the epidemiological situation in their own locations. While the count of letters measures the extent to which these correspondents interact economically with *Saminiati*, the count of

<sup>&</sup>lt;sup>38</sup> "Coins made of precious metals were more widely accepted than banknotes or bills of exchange"... "In terms of their functionality, liquidity, and acceptance as a means of payment, precious metal coins are comparable to narrow money aggregates today" (Chen et al. 2021, p.2).

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$\overline{P_{FL_1}}$	-0.207	-0.312	-0.28	-0.116	-0.313	-0.116	-0.693
1	(0.491)	(0.484)	(0.398)	(0.475)	(0.471)	(0.46)	(1.225)
$P_{FL_2}$	-1.319*	-1.322**	-15.62***	-14.61***	-1.283**	-14.55***	17.465***
-	(0.684)	(0.637)	(0.954)	(1.15)	(0.635)	(1.143)	(1)
$P_{FL_3}$	-2.461***	-2.465***	-16.58***	-15.57***	-2.426***	-15.51***	17.465***
0	(0.686)	(0.759)	(0.828)	(1.174)	(0.743)	(1.152)	(0.978)
$P_{FL_4}$	-0.109	-0.0958	-0.924	-0.888	-0.144	-0.938	-17.465***
	(0.921)	(0.913)	(1.148)	(1.153)	(0.912)	(1.147)	(1.031)
$P_{FL_5}$	$2.943^{***}$	$2.939^{***}$	1.491	1.506	$2.894^{***}$	1.461	-18.158 ***
	(0.736)	(0.739)	(1.093)	(1.096)	(0.748)	(1.085)	(0.647)
$P_{FL_6}$	$2.076^{***}$	$2.071^{***}$	$1.572^{*}$	$1.586^{*}$	$2.071^{***}$	$1.586^{*}$	0
	(0.519)	(0.522)	(0.858)	(0.859)	(0.522)	(0.859)	0.249
$P_{DT}[C]$	0.674		$-17.17^{***}$				
	(0.551)		(1.022)				
$P_{DT}[NI]$		0.487		$-16.10^{***}$			
		(0.595)		(1.002)			
$P_{DT}[EU]$					0.502	$-16.02^{***}$	0
					(0.587)	(0.991)	(1.224)
$P_{FL_1} \times P_{DT}$			$16.77^{***}$	$15.22^{***}$		$15.15^{***}$	
			(0.785)	(1.028)		(1.018)	
$P_{FL_3} \times P_{DT}$			$32.31^{***}$	$29.87^{***}$		$29.78^{***}$	
			(1.477)	(1.873)		(1.854)	
$P_{FL_3} \times P_{DT}$			$32.13^{***}$	$29.69^{***}$		$29.60^{***}$	
			(1.472)	(1.874)		(1.854)	
$P_{FL_4} \times P_{DT}$			$17.78^{***}$	$16.59^{***}$		$16.53^{***}$	
			(1.767)	(1.782)		(1.774)	
$P_{FL_5} \times P_{DT}$			$18.72^{***}$	$17.56^{***}$		$17.50^{***}$	
			(1.502)	(1.516)		(1.508)	
$P_{FL_6} \times P_{DT}$			17.12***	$15.96^{***}$		15.89***	
			(1.271)	(1.286)		(1.28)	
Observations	1,260	1,260	1,260	1,260	1,820	1,820	560
Т	3.09	3.09	3.1	3.11	3.14	3.16	

Table 10: Regression results for Mentioning of Precious Coins (in letters not mentioning other goods), decomposed by quarters

*Note:* Robust standard errors in parentheses. \*Significant at the 10% level. \*\*Significant at the 5% level. \*\*\*Significant at the 1% level. In all the specifications, we controlled for Town, Year and Season Fixed Effects.

Additional Note: Values in column (7) for  $P_{FL_6}$  and  $P_{DT}[EU]$  are near zero:  $5.39 \times 10^{-9}$  and  $-1.07 \times 10^{-12}$ , respectively. The plague reached Florence in the summer of 1630 (Corradi 1870). The indicators  $P\_FL\_1$  to  $P\_FL\_6$  correspond to the period from the second quarter of 1630 to the third quarter of 1631, capturing the temporal impact of the outbreak.

correspondents per town and quarter qualitatively indicates whether they are active in the market or not, being a measure that may signal the "physical" health status of outside merchants. The only exception is when one expands the sample to non-Italian towns and allows for its dependency on the presence of the epidemic in the recipient location (Column 6). In contrast, when there was a plague in the destination town it reduced the number of letter recipients regardless of the sample or allowing for plague dependency. Quantitatively the number of business partners decreases by between 15% and 30%. As with the overall letter count, if the destination town is infected with the plague at the same time as Florence, the net negative effect of its plague is much reduced, even for the expanded sample, reflecting the "fall of the plague taboo" when the infection become a common problem. Restricting the sample to the non-Italian towns does not give a significant result as shown in Column 3 of Table A1 in the Appendix, while, allowing for plague dependency, in column 3 of Table A2 in the Appendix we see a positive impact when the plague is present on both side of a business relationship, confirming our interpretation for the Italian and the pan-European case above.

Variable (2)(4)(6)(1)(3)(5) $P_{FL}$ -0.302\* -0.186-0.145-0.245-0.217-0.205(0.148)(0.158)(0.17)(0.183)(0.151)(0.179)-1.145\*\*\* -0.350\*\*  $P_{DT}[C]$ (0.161)(0.212)-1.174\*\*\* -0.379\*\*  $P_{DT}[NI]$ (0.16)(0.206) $P_{DT}[EU]$  $-0.371^{**}$  $-0.698^{**}$ (0.179)(0.278)0.963\*\*\*  $P_{FL} \times P_{DT}$  $0.980^{**}$  $0.558^{*}$ (0.385)(0.366)(0.33)Observations 1,2601,2601,260 1,2601,8201,820T4.804.794.854.8211.11 11.12

Table 11: Regression results for Number of Business Correspondents

*Note:* Robust standard errors in parentheses. \*Significant at the 10% level. \*\*Significant at the 5% level. \*\*\*Significant at the 1% level. In all the specifications, we controlled for Town, Year and Season Fixed Effects.

# 6 Conclusion

The plague wave of 1630-1631 hit Italy with a pervasiveness unprecedented since the Black death of the  $14^{th}$  century. High-mortality, together with the city-State's efforts to contain the spread of the contagion through commercial bans and quarantine, dramatically lowered the trading activities of the *Saminiati & Guasconi*'s bank. Both the number of letters sent and the number of merchandise transactions subsequently fell in 1630 and recovered only after the epidemic dissipated and the restrictive public measures were dismantled. In contrast to the trade in silk and woollen fabrics, the trade in precious gold and silver coins was not impacted in the same way, likely because of an increased demand by business operators for a secure means of payments in times of uncertainty. The number of merchants participating in the commercial-network fell in the pandemic years, while the geographical reach of the network appears to have shrunk. However, this fall was due to a decrease of trading parters in the countries on the Atlantic coast while the number of trade linkages with the Southern and Eastern countries of Europe increased. This provides support of the view that the Italian plague wave of 1630-31 significantly distanced Italian trading activity away from the emerging Atlantic coast economies.

Finally, one should note that even towns which were not directly affected by the epidemic put in place commercial bans in order to prevent the contagion.<sup>39</sup> In addition, places which had overcome the infection wanted to prevent its recurrence by banning goods from entering their borders, thus extending temporally and geographically the economic impact of the epidemic in Italy.<sup>40</sup> Hence our results capture the effect on trade on those directly touched by the plague relative to those that reacted to it out of precaution.

<sup>&</sup>lt;sup>39</sup>For example, a letter sent to a Neapolitan correspondent of the *Saminiati* about the inability to send silk cloth by land reads "in Rome they don't allow any merchandise from any place enter the town" (Register 194).

<sup>&</sup>lt;sup>40</sup>For instance, we read in a letter to an Italian merchant based in Poland, "We would have sent you a box of draperies if we would not have heard that in Bologna and Verona they don't let transit any merchandise from here (Florence) because of some new suspicious of contagion" (Register 196).

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# Appendix

### Tables

Variable	Letters (1)	Transactions (2)	Partners (3)	Silks (4)	$\begin{array}{c} \textbf{Wools} \\ (5) \end{array}$	<b>Coins</b> (6)
$P_{FL}$	-0.957	-14.89***	-0.86	-14.91***	0.597	18.05***
	(0.758)	(0.544)	(0.654)	(0.914)	(0.408)	(0.707)
$P_{DT}[EU]$	-0.416	-0.569	-0.52	-1.025	0.739	0.000
	(0.518)	(0.902)	(0.506)	(1.259)	(1.388)	(1.414)
Observations	560	560	560	560	560	560
T	5.016	5.28	5.579	5.099	2.879	

Table A1: Regressions on Restricted Not Italian Sample

*Note:* Robust standard errors in parentheses. \*Significant at the 10% level. \*\*Significant at the 5% level. \*\*\*Significant at the 1% level. In all the specifications, we controlled for Town, Year and Season Fixed Effects. We couldn't compute the Bertanha (2016) Test for Coins because of lack of observations *Additional Note:* The value of  $P_{DT}[EU]$  in the "Coins" column is near zero:  $1.19 \times 10^{-12}$ .

Table A2: Regressions on Restricted Not Italian Sample, with Plague Interactions

Variable	Letters	Transactions	Partners	Silks
	(1)	(2)	(3)	(4)
$\overline{P_{FL}}$	-1.470*	-14.87***	-1.198	-14.91***
	(0.854)	(0.544)	(0.81)	(0.913)
$P_{DT}[EU]$	-0.532	-0.565	-0.639	-1.025
	(0.554)	(0.901)	(0.519)	(1.259)
$P_{FL} \times P_{DT}[EU]$	$1.599^{***}$	-13.43***	$1.005^{**}$	-13.49***
	(0.374)	(1.187)	(0.417)	(1.414)
Observations	560	560	560	560
T	5.43	5.52	5.86	5.10

*Note:* Robust standard errors in parentheses. \*Significant at the 10% level. \*\*Significant at the 5% level. \*\*Significant at the 1% level. In all the specifications, we controlled for Town, Year and Season Fixed Effects. Interaction terms for Wools and Coins were dropped because of collineartity

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