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Networks paving the way: Apprenticeship and occupational mobility in early modern Genoa

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NETWORKS PAVING THE WAY: APPRENTICESHIP AND
OCCUPATIONAL MOBILITY IN EARLY MODERN GENOA

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Working Paper 25-08

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Networks Paving the Way: Apprenticeship and Occupational Mobility in Early Modern Genoa*

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Abstract

This paper investigates how kinship and professional networks shaped labour market outcomes in early modern Genoa. Using a newly constructed dataset of over 8,000 apprenticeship contracts (1450–1530), I examine the extent to which kinship ties with masters or guild members influenced both entry into apprenticeship and the probability of attaining mastership. Using a probabilistic record linkage strategy to reconstruct career trajectories, I show that apprentices with kinship ties to insiders were significantly more likely to become masters, received shorter contracts and enjoyed better contractual and training conditions. These advantages persisted even during periods of economic contraction, suggesting that apprenticeship functioned not only as an open mechanism for human capital formation but also as a selective filter reinforcing occupational stratification. The findings contribute to debates on the role of guilds in pre-industrial labour markets, offering empirical support for the view that social networks limited access to skilled work and upward mobility.

Keywords: Apprenticeship; Labour Markets; Guilds; Mastership; Social Networks; Early Modern Italy.

JEL Codes: J62; J24; N33; N93.

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1 Introduction

In recent years, the connection between social structures and economic institutions has attracted growing scholarly interest. A central concern has been the persistence of inequalities and inefficiencies in labour markets, particularly in the earlier stages of professional careers, when disparities in access to opportunities often entrench social hierarchies and worsen the impact of inequalities (Chetty et al. 2014; Heckman et al. 2013; Kramarz and Skans 2014; Oreopoulos 2011). In his *Principles of Political Economy*, John Stuart Mill (1849) argued that before industrialization, occupational groups in Europe were “almost equivalent to a hereditary distinction of caste”, with the majority of new trainees in a specific trade being tied through family or community networks to those already active in it. More recent theoretical and empirical works in economics have explored the effects of social networks on the professional trajectories of individuals, whether in early modern economies or in contemporary developing contexts, where trade relations are often enforced more via social interactions rather than formal legal systems (Edwards and Ogilvie 2012; Jackson 2010; Munshi 2014). Even in the modern United States, the presence of networks of strong ties has been proven to be a determinant of better career opportunities among migrant communities (Munshi 2003).

Apprenticeship, one of the commonest forms of organized learning in early modern Europe and an essential ingredient for the acquisition of human and occupational rights, offers an important lens for examining these issues (De la Croix et al. 2018; Mokyr 2019). Human capital theory suggests that educational and training institutions are major determinants of lifetime outcomes on the microeconomic level and possible sources of opportunities for upward social mobility (Epstein 1998; Mokyr 2019; North 1990). For unskilled youths, direct training in a master’s workshop provided access to the fundamental knowledge of a specific trade and to urban labour markets, without being constrained by family resources or background (De la Croix et al. 2018; Mokyr 2019).

However, even though apprenticeship could solve imperfections in markets for skilled training and thus foster investment in human capital, in practice, access to these opportunities and the subsequent career prospects was deeply shaped by family ties and broader

economic circumstances (De Munck 2007; Farr 2000; Ogilvie 2019; Ogilvie 2020). Indeed, securing entry into prestigious trades and obtaining better training opportunities was often dependent on the presence of family connections within the same labour market or even within the same guilds (Ogilvie 2019, pp. 110–116). This network-based advantage extended beyond the training period. At the end of their training terms, most apprentices aspired to become masters themselves in their trade of choice and be able to open their workshops, but only a few of them completed this professional pathway (Barahona and Nieto Sánchez 2019; Schalk et al. 2017). The limited available evidence confirms that the process for attaining mastership, even with geographic and occupational differences, was strongly mediated by social networks and guild structures (Schalk et al. 2017; Wallis 2008).

In this paper, I explore the role of social and professional networks in shaping occupational trajectories in Genoa between the fifteenth and the sixteenth century. To do this, I use a hand-collected sample of more than 8,000 apprenticeship contracts, which recorded the names and family relations of every figure present at the moment of contract drafting (i.e., apprentices, masters, guarantors). The study focuses on a critical stage in the career of apprentices: becoming a master at the end of training. By analysing the interplay between social connections, labour market structures, and broader changes in economic trends, I test to what extent kinship and professional ties shaped the professional advancement of apprentices in early modern Genoa. To identify apprentices who advanced to mastership, I employ a probabilistic record-linkage algorithm that matches apprentices' names with those of masters in later contracts. I then test the effect of an apprentice's kinship and professional ties on his likelihood of becoming a master in his trade to identify the key factors that influenced the career progression from apprenticeship to mastership.

The results reveal a statistically significant effect of family ties with masters and guild members on the likelihood of achieving mastership at the end of training. These ties shaped multiple stages of an apprentice's career, from the choice of trades to the negotiation of contract terms, and their importance persisted even when controlling for geographic networks and family background. Furthermore, while the economic crisis of the late fifteenth century reduced career opportunities in the hardest-affected trades, I show that it did not alter the centrality of social networks, despite an increase in the reliance by masters on apprenticeship

as a cheap source of labour.

My work provides three main contributions to the literature. First, by tracing apprentices' career trajectories in this historical context, this paper contributes to debates on the functioning of pre-industrial labour markets showing how networks of strong ties altered the markets for skill formation and labour mobility. Building on previous contributions on the subject, I show that southern European markets for apprenticeships were not fluid, accessible and merit-based as other markets for skills in early modern Europe (Leunig et al. 2011; Zeev et al. 2017). Instead, I argue that networks of strong ties played a key role in facilitating access to economic opportunities, thereby reinforcing social and economic inequalities.

Second, this paper contributes to the studies seeking to explore the role of guilds in apprenticeship training and their responses to socio-economic transformations. Differently from some other cases in pre-industrial Europe, in early modern Genoa, apprenticeship was entirely run by guilds (Schalk 2019; Wallis 2019). Therefore, as argued by various scholars, guilds were in a position to extract benefits for their members, rationing access to human capital investment and redistributing resources to their members at the expense of the wider economy, especially during periods of economic instability (Acemoglu et al. 2011; Caracausi 2017; Ogilvie 2019; Ogilvie 2020). This study, to the best of my knowledge, provides the first micro-level empirical evidence for Italy on how guilds restricted access to professional opportunities to those not linked with existing members.

Finally, this paper speaks to the wider interest in understanding the institution of apprenticeship. Most of the works done on this topic have sought to study who was able to access apprenticeship, how effective the training was, whether innovation was encouraged and the flexibility of this system in case of premature terminations (De Munck 2007; Schalk et al. 2017; Schalk 2019; Wallis 2019). This paper builds on the aforementioned works but tries to explore the link between apprenticeship and occupational mobility. My results challenge the notion of apprenticeship as a straightforward mechanism of upward mobility in pre-industrial societies and suggest instead that in Italian labour markets, in absence of social connections, it often functioned as a mechanism for controlling entry into urban labour markets and securing low-cost labour.

The structure of this paper is as follows. Section 2 presents an overall picture of ap-

apprenticeship in Genoa across the fifteenth and sixteenth centuries and highlights the main differences in rules and terms compared to other training systems across Europe. Section 3 introduces the dataset of apprenticeship contracts and the methodology used to reconstruct professional careers. Section 4 assesses the possible drivers of professional outcomes in Genoa by looking at the determinants of apprentices' promotion to mastership. Section 5 discusses the results given the recent literature on the topic. Section 6 provides brief conclusions.

2 Apprenticeship in Early Modern Genoa

Apprenticeship in Genoa grew alongside the rise of urbanisation in the fifteenth century. Despite being on a declining economic trajectory at the start of the century, Genoa remained, together with Venice, a major commercial and naval power in the Mediterranean. To mitigate the economic consequences of the eastern trade decline following to the loss of their colonies in the Mediterranean and Black Sea, the Genoese redirected their commercial routes towards north-western Europe and Genoa was progressively converted into a proto-industrial centre, especially in the textile sector (Casarino 2018; Lopez 1964). The growth of local trades drove urbanisation, attracting hundreds of workers from the countryside. As a result, from the second half of the fifteenth century, Genoa experienced a 19 per cent growth in the urban population from 43,000 inhabitants in 1450 to 51,000 in 1525, largely driven by the influx of migrants into the urban environment.¹

Guilds in Genoa responded to the growth of new trades and labour supply by regulating apprenticeship at the urban level and setting as standard a formal contract registration with a master (Epstein 1996; Itzcovich 1979). Apprenticeship contracts were broadly uniform across trades and required the master to host his apprentices and to teach them a given occupation for the whole length of the contract. In principle, the formal drafting of contracts benefited both parties. On one side, for apprentices and their families, it offered legal protection with a ratified start and an agreed end of training. For guilds, it provided a mechanism to monitor the number of apprentices hired by each master and to enforce statutory limits on recruitment.²

¹According to Oddo and Zanini (2022), from 1450 to 1525, the city of Genoa constituted between 16% and 18% of the Republic's total population.

²Genoese guilds had provisions that either constrained the recruitment of apprentices to one for each

Sending a child for a training period in a workshop was a form of investment (Wallis 2008; Wallis 2019). For the apprentice, the advantages of undertaking this form of training were multiple: careful and complete on-the-job training, longer learning time, and the inclusion into a network of practitioners, all skills that could become profitable throughout a professional career (Casarino 1982; Ogilvie 2019). For a master too, training an apprentice was a form of investment (Gatti 1979). While some guilds in other European cities charged formal apprenticeship fees, evidence for Genoa suggests fees were minimal or absent in many trades. Masters' incentives to train apprentices therefore depended primarily on the expected return from apprentices' labour: once the initial learning phase was complete, each skilled apprentice worked at a below-market wage, long enough to cover the master's expenses in training (opportunity cost of time, materials, accommodation, and food).³ In addition, apprenticeships allowed masters to cultivate skilled workers for the long term, maintain control over trade knowledge, and secure labour for their workshops.

Guild statutes in Genoa typically set the length of training between four and eight years but allowed some flexibility for guilds and masters (Gatti 1979). The duration depended not only on the apprentice's age and the nature of the profession he was going to learn, but also on his family background. In this regard, Casarino (1982) notes that contract length was often the outcome of negotiation processes, with those possessing stronger ties with the master or the guild better placed to secure favourable terms.

Apprentices faced four main outcomes: (i) early departure during the apprenticeship period; (ii) death before completing the term⁴; (iii) employment as a salaried journeyman, either in Genoa or elsewhere; or (iv) achievement of mastership. The most recent contributions on the topic show that the distribution across these outcomes, despite the presence of some similarities, was substantially influenced by the economic and institutional framework of the urban labour market in which apprentices had to operate. Schalk et al. (2017) show that the percentage of apprentices who ultimately became masters was low across

master or at least specified a maximum limit on the numbers that could work simultaneously for one master.

³Master's obligations, apart from teaching the craft (*docere artem bene et legaliter*), implied providing the apprentice a remuneration in kind, commonly clothing and footwear. For a more detailed discussion of master's obligations, see Itzcovich (1979).

⁴Ogilvie (2019, p. 407) highlighted that mortality among apprentices was not negligible. Estimates for early modern London show that around 10 per cent of apprentices died during training and outcomes elsewhere in Europe were similarly constrained.

Europe. This tendency seems to be confirmed also in the case of early modern Genoa. In Genoa, apprentices could attain mastership after completing the statutory training period and successfully passing a guild examination, which tested both technical competence and knowledge of the trade (Casarino 1982). These requirements, combined with potential guild-imposed limits on the number of masters, meant that only a small share of apprentices ultimately achieved mastership, even in trades with high apprenticeship fees as an entry barrier.⁵

Apprentices in Genoa, as in many urban centres of early modern Italy, had strong incentives to achieve mastership due to the economic and social advantages it offered over lower positions such as those of salaried journeyman. For journeymen, wages were relatively stable but modest, as they were typically set by guild regulations or negotiated individually with masters (Epstein 1991). Masters, by contrast, earned directly from their production, supervised apprentices and journeymen, sold finished goods, and controlled workshop output. Wage records from Italian cities suggest that journeymen in textiles and construction earned 20-30 per cent less than their masters (Buscemi 2024; Caracausi 2010; Pullan 1964). This substantial wage gap, along with the higher social standing associated with mastership, made the achievement of mastership a critical step toward economic security.

The role of family connections on career advancement remains a subject of debate in the literature, especially in cities like Genoa, where guilds exercised a strong control over the urban labour market. Epstein and Prak (2008) emphasize the centrality of guilds in human capital formation and downplay the role of families in shaping access to apprenticeship or mastership. Similarly, De la Croix et al. (2018) argue that guilds offered an institutional alternative to family-based training, encouraging skill transmission through formal structures rather than through kinship ties. By contrast, Ogilvie (2019) highlights that kinship networks often reinforced guild monopolies, limiting labour market access for outsiders and ultimately shaping training outcomes. Likewise, Farr (2000) notes that although masters' sons did not always remain in the same trade, many new masters were still recruited from established guild families, sometimes shifting between guilds within the same city.⁶

⁵Gatti (1986) shows that only 5% of apprentices active in the craft of furrier in Genoa eventually became masters at the completion of the apprenticeship.

⁶Evidence from cities such as Milan, Antwerp, and Württemberg points to similar exclusive practices

The available evidence for Genoa, though scarce, supports the latter view, revealing a segmented market for skilled labour (Casarino et al. 1979; Massa 1970; Massa 1998). Only a few trades, though, explicitly facilitated entry for masters' sons,⁷ for example through statutory exemptions from formal contract drafting.⁸ More generally, families played a prominent role in guiding the choice of trade. Apprenticeship placement was strategic: individuals with relatives already active in a trade benefited from asymmetric information and established networks, which increased the likelihood of completing training and, ultimately, accessing mastership (Mokyr 2019; Wallis 2025).

Building on the importance of social networks in the apprenticeship system, as apprentices often originated from distant rural areas and sought work in urban centres, there was a significant cultural and geographic divide between labour supply and demand (Ghiara 1991). To bridge this gap, guarantors served as intermediaries, offering security to both contracting parties. For masters, guarantors reduced the risk of misconduct or early abandonment. For apprentices, they ensured protection in an unfamiliar urban environment and facilitated integration into the trade (Casarino 1982; Ghiara 1991). Guarantors in Genoa were either individuals connected to the apprentice - through family ties or by virtue of shared geographic origins - or were guild members familiar with both the rural and urban settings and operating as recruiting agents (Casarino 1982). Guild-affiliated guarantors likely enhanced the apprentice's credibility in the urban labour market, while kin-based guarantors not member of the same guild primarily signalled trustworthiness but carried less professional leverage.

The selection of the supervising master was another critical decision. Families in Genoa, exploiting informal connections and intermediaries, could secure supervision by experienced masters, especially when opportunities were limited or guild rules tightened.⁹ Such arrangements to seek the supervision of experienced masters sometimes required accepting less

among early modern guilds across continental Europe (D'Amico 2000; De Munck 2007; Ogilvie 1997).

⁷Barbers (according to their 1438 statute), caulkers (1438), and shoemakers (1424 and 1426).

⁸Gatti (1979) and Casarino (2018) also highlight for the end of the 15th century the existence of intra-trades agreements to prevent binding members' relatives as apprentices and to reserve to master's sons the profession of the father. These agreements anyway did not rule out the necessity of completing a training period as an apprentice with a colleague of the father or with the father himself.

⁹Casarino (2018) highlights that there is limited evidence for Genoa that might confirm whether apprentices could select from a wide array of masters or whether the choice was constrained by the guilds and/or the availability of masters.

individual attention during the training, as masters balanced multiple apprentices.

In this respect, from the 1470s onwards, Genoa entered a period of economic crisis, which caused a setback for some of the major guilds in the city (Casarino 2018; Heers 1961). Highly reliant on imported cereals and goods from its physically limited hinterland, the city started to experience food shortages following the loss of its overseas colonies.¹⁰ Casarino (2018) suggests that the effects of this economic crisis on Genoese trades mainly depended on their degree of labour intensity and their dependency on Eastern Mediterranean markets. In response to these economic pressures, Genoese guilds increasingly relied on apprenticeship as a cheap source of labour,¹¹ introducing longer minimum training periods and reinforcing masters' authority, especially over apprentices from outside the city. Especially in sectors with a more complex work organization, new intermediate roles ("*laboratores*") emerged, reflecting a reduction in available opportunities for young apprentices at the end of training.

The Genoese apprenticeship system thus imposed uneven constraints. For guilds, apprenticeships ensured a supply of relatively cheap labour, a desirable outcome, especially for a city with limited local labour resources (Epstein 1991). For apprentices, however, opportunities at the end of training were highly heterogeneous. Well-connected individuals, especially sons of masters or those with strong guild or kin ties, could leverage networks to secure entry into mastership or favourable positions. By contrast, outsiders and those lacking family support often faced barriers to advancement, with apprenticeship functioning less as a vehicle for technical skill transmission and more as a mechanism for regulating access to skilled trades (Buscemi 2024; Ogilvie 2019). In this sense, what has sometimes been described as a "bottleneck" in Genoa did not affect all apprentices equally: it restricted upward mobility for weaker families and outsiders, while serving the interests of guilds and established masters.

In sum, apprenticeship in early modern Genoa operated at the intersection of family networks, guild authority and broader economic conditions. The prominent role of kinship and professional ties underscores the importance of empirically testing their effects on career trajectories. Considering both external economic factors and the specific structures of Ge-

¹⁰ASCG, Fondo Brignole-Sale, 108-D-3

¹¹Bellavitis et al. (2019) suggest that in early modern Venice it is also possible that masters were using apprenticeship as a form of cheap labour contract.

noese guilds is therefore essential to understanding apprenticeship outcomes and, ultimately, how these factors influenced occupational mobility in early modern Genoa.

3 Data

3.1 Data sources

In this article, I use a dataset of 8,543 apprenticeship contracts (*acordaciones famuli*), which record the names and relationships of individuals active in Genoa between 1451 and 1530. The sample provides a broad view of recruitment patterns in one of early modern Italy's largest urban centres and allows the examination of training processes across several decades and trades.¹² To reconstruct professional careers, I link individuals across contracts using a probabilistic record linkage procedure based on the Fellegi-Sunter model (Enamorado et al. 2019; Fellegi and Sunter 1969). The linkage method matches individuals over time by names (and their Jaro-Winkler distances), patronymics and year of appearance, with several adjustments to improve matching accuracy.¹³

For the purposes of this study, I define becoming a master as the appearance of a former apprentice as a supervising master in a subsequent contract. This definition captures the moment at which an individual assumed responsibility for workshop training and provides a consistent criterion for professional advancement.¹⁴

The matching procedure identifies 12,582 distinct individuals, 10,272 with a single appearance and 2,310 with at least two appearances. In demographic terms, the dataset is sizeable: between 1468 and 1475, 2,325 apprentices were registered in Genoa, suggesting that roughly 5 per cent of the city's population of 45,000¹⁵ were engaged in apprenticeship.¹⁶ The near absence of female apprentices confirms the overwhelmingly male character of guild training in early modern Italy, in contrast to the more inclusive patterns sometimes

¹²See Appendix A.1 for further details on sources and database construction.

¹³See Appendix A.4 for details of the matching technique employed.

¹⁴This measure therefore might be interpreted as a lower bound, since some individuals may have attained mastership without subsequently appearing in the records as supervising masters.

¹⁵Oddo and Zanini (2022) estimates that in 1475, the city of Genoa had an urban population of about 45,000 inhabitants.

¹⁶This share is higher than the 4% estimated for Utrecht in 1670 (Schalk 2019) but below the 6-8% estimated for London in 1600 (Wallis 2019).

observed in private apprenticeship.¹⁷ At the same time, it also implies that the incidence of apprentices is even higher when measured against the male segment of the Genoese population. Demographically, this strengthens the representativeness of the dataset: the estimates suggest that it captures a substantial share of the city’s male labour force and, by extension, a significant portion of the urban labour market.

Despite its extensive coverage, the dataset has some clear limitations. First, it only enables us to trace the professional trajectories for individuals who remained within Genoa’s urban boundaries. For instance, it is not possible to observe whether an apprentice whose contract is included in the dataset, after completing training in Genoa, continued his career elsewhere. It would be incorrect to consider the Genoese professional system as a closed system with no emigration to other areas of Northern Italy (Bezzina 2015; Casarino 1982). However, Bezzina (2015) argues that starting from the fifteenth century, Genoese guilds were worried about the weakening of the control exercised on their members and the diffusion of specific knowledge and techniques and endeavoured to eliminate the possibility of moving away from Genoa at the end of training. This consideration partially mitigates the fact that, in the absence of evidence on emigrant apprentices, my dataset can only give a partial perspective of the professional trajectories of apprentices trained in Genoa.

Second, apprenticeship contracts do not record the status of journeymen or other intermediate positions, even though a large share of apprentices never reached mastership (Casarino 2018; Schalk et al. 2017). The analysis therefore captures an important but partial set of professional trajectories within the broader spectrum of paths available to apprentices in Genoa. Nevertheless, the evidence remains valuable for understanding the conditions under which some apprentices achieved mastership, and by extension, the factors shaping entry into journeymanship.

3.2 Temporal and occupational representativeness

The number of new apprentices hired each year in Genoa varied with the economic conditions of the Republic (Figure 1). For example, the extensive hiring of new apprentices between 1469 and 1474 aligns with the economic development of the Republic in the 1460s,

¹⁷See Ogilvie (2019, pp. 232–306).

particularly in textile trades. Likewise, the economic contraction starting in the mid-1470s, coupled with the loss of overseas colonies, may help explain the decline in the number of apprentices in the final decades of the fifteenth century.

Figure 1 shows that the period 1465-1480 accounts for 41.4 per cent of all recorded contracts, indicating a potential temporal bias.¹⁸ Nevertheless, selection into the sample of contracts depends primarily on the survival and legibility of archival records. The limited number of contracts in the first and last ten years of the study period probably reflects an incomplete preservation of notarial registers rather than actual labour market trends.

[INSERT FIGURE 1 HERE]

To estimate the proportion of missing records, in the absence of reliable totals for registered apprentices, I follow Casarino et al. (1979) by comparing the number of distinct notaries drafting apprenticeship contracts with those whose records have survived in the State Archive of Genoa. A 1462 reform fixed the maximum number of notaries at 150, although the available evidence suggests the actual number was lower.¹⁹ Approximately 75 per cent of notaries with surviving records for 1480-1500 are represented in the dataset. This figure is conservative since not all Genoese notaries engaged in drafting apprenticeship contracts, as they were working as public notaries or judicial clerks. Thus, despite archival losses, the sample represents a substantial share of active notaries, reinforcing the robustness of the dataset.

The sample of professions aligns closely with the secondary literature on the Genoese labour market (Gatti 1980; Gatti 1986; Ghiara 1983). Table 1 shows that most apprentices were active in textile production (silk and wool above all), reflecting the centrality of these sectors in Genoese industry in the late fifteenth century. The distribution of silk workers also aligns closely with the 1531 Genoese Census of Occupations.²⁰ Comparative evidence from Florence, Venice, and Bologna (Molà 2000) suggests that silk production dominated

¹⁸Ghiara (1979) notes that the sharp decline in contracts in the second half of the 1470s may partly reflect a problem of erroneous dating of the archival sources.

¹⁹Costamagna, *Il notaio genovese tra prestigio e potere*, 1995; Puncuh, *Gli statuti del collegio dei notai genovesi nel XV secolo*, 2006.

²⁰ASG, Senato, Senarega, *Diversorum*, 1073

urban economies across Italy, confirming that the Genoese labour market followed broader patterns of economic restructuring in the fifteenth-sixteenth centuries

Fewer apprentices in Genoa were active in the leather, food, and construction industries than in textiles. Within construction trades, shipbuilding apprentices are under-represented, likely due to the relocation of these activities to the sub-urban area of Sampierdarena (Gatti 1980).

[INSERT TABLE 1 HERE]

The length of apprenticeship contracts in Genoa in my dataset reflects changes in economic conditions and labour demand, rather than adherence to fixed terms as prescribed by guild statutes. Table 1 shows a modest increase in average contract duration in the second half of the fifteenth century, particularly after the 1470 crisis, possibly allowing employers to benefit from having below-market remunerated workers and relying on workers' reduced contractual power. While some contracts may have fallen slightly below the guild-mandated minimum, evidence from the few surviving statutes is too limited to test this systematically. This variability in contract length is not a unique phenomenon as various scholars have highlighted that apprenticeship contracts were often adapted to local economic circumstances (Hamilton 1996; Wallis 2008).

Looking at the evidence for the largest guilds in Genoa, it is clear that changes in contract duration were heterogeneous and influenced by labour market conditions (Table 1). Among the silk and wool trades, differences in training length may have affected the likelihood of attaining mastership. Although shorter contracts could suggest that guilds tolerated a larger share of inexperienced workers, the evidence does not support the idea that guild statutes were formally altered. Rather, observed changes appear to have reflected flexible practice in response to economic pressures and political circumstances.

3.3 Kinship, guild and geography in Genoese apprenticeship

The characteristics of apprenticeship in Genoa confirm the central role of kinship and professional networks in shaping apprentices' career trajectories. As noted in Section 2, access to established relationships facilitated the entrance into the labour market and influenced

the opportunities available at the end of training. Having a father in Genoa, especially if a member of the same guild, as well as pre-existing ties with masters or guarantors, were all factors that could significantly improve an apprentice's prospects.

Table 2 reports the characteristics of apprentices, with a breakdown of family and social ties at the time of contracting. About 40 per cent of apprentices had a father mentioned in the contract,²¹ while only 5 per cent had a father active in the same guild and a similar share had a kinship tie with their master.²² Ties with guarantors were more frequent: over 50 per cent of apprentices were related to their guarantors, usually as sons, brothers, or nephews. This confirms that guarantors often acted as protective intermediaries, at least at the time of contracting. Moreover, 19 per cent of apprentices had guarantors from the same guild, indicating that direct recruitment by guild insiders was a relatively common practice.

[INSERT TABLE 2 HERE]

The geographic origins of apprentices provide a complementary perspective on recruitment patterns (Table 2). Around 13 per cent came from Genoa itself, a further 56 per cent from Genoese territories, and 14 per cent from outside the Republic, with the remainder unspecified. The fact that nearly one-fifth of apprentices originated beyond the Republic's borders suggests that large-scale recruitment required a degree of openness to outsiders, even as kinship and guild connections continued to play a protective role for local families.

Table 2 also distinguishes apprentices starting before and after the economic contraction of the 1470s. At first glance, reliance on kinship and professional ties changed only modestly. The proportion with fathers mentioned declined from 42.3 to 38.8 per cent (significant at the 5 per cent level), while the share with a father in the same guild or a kinship tie to the master rose slightly, from 4.6 to 5.1 per cent and from 5.0 to 6.3 per cent, respectively. The most marked shifts are in the relationships with guarantors: kinship ties declined from 62.8 to 52.9 per cent, while the proportion of guarantors in the same guild rose from 15.6 to 20.0 per cent (both significant at the 1 per cent level). Geographic origins show a similar

²¹When reported, the presence of the father in the contract indicates his role (e.g. master, guarantor, witness) but not necessarily his occupation.

²²These shares are likely underestimates, since fathers' professions and statuses are not observable when they were not working in Genoa.

pattern of adjustment: the share from the dominion declined by 11.3 percentage points, while apprentices from outside the Republic rose by 5.4 points, suggesting that post-crisis recruitment relied more heavily on non-local entrants.

Taken together, these patterns suggest that apprentices' reliance on protective networks became less pronounced after the crisis, particularly in the role of guarantors, while geographic openness expanded. Families and guilds increasingly relied on social ties to secure apprenticeships for insiders, yet large-scale recruitment led to a greater reliance on apprentices from outside the dominion. This dual-protective mechanisms for insiders alongside openness to outsiders captures the tension between kinship-based access and labour-market demand in late fifteenth-century Genoa.

Unavoidably, the estimates in Table 2 provide only a minimum measure of family connections, since mothers and many other relatives (e.g., brothers and uncles) were not systematically recorded unless serving as masters or guarantors, and last names were not always stable. These omissions almost certainly underestimate the true prevalence of kinship ties. Nevertheless, with the available information, it is still possible to test the effect of strong ties with locally active relatives on the probability of reaching mastership. The absence of additional family evidence should therefore be seen as a limitation that biases the estimates downward, rather than as evidence against the importance of kinship networks.

[INSERT TABLE 3 HERE]

Table 3 shows that around 5 per cent of apprentices had more than one training period, with a small number changing paths three or more times. The reasons why apprentices might leave training were multiple, including death, migration, or voluntary transfer through the contractual arrangement known as “*avalacio famuli*” (transfer of the apprentice), through which an apprentice or guarantor compensated the old master to release the rights he held over the apprentice. Although on one side this system created some flexibility, it is also true that it was mediated by family resources (Casarino 1982). Sons of masters or of fathers in the same guild were two times more likely to start multiple apprenticeships than those without, suggesting that family status reduced the opportunity and other costs of quitting and starting a new training period.

Having more than one apprenticeship did not necessarily signal failure. On the contrary, it could represent an investment in skill accumulation and in gaining knowledge of alternative opportunities within the labour market. It might also reflect the ability to switch away from a master or trade that proved unsuitable, whether due to poor conditions or a mismatch of expectations. In this sense, multiple apprenticeships could have potentially enhanced, rather than hindered, the chances of eventually attaining mastership.

4 Empirical analysis

4.1 Econometric framework and determinants of mastership

Section 3 showed that apprentices in early modern Genoa differed across multiple dimensions: time, origin, trade, and family background. In this section, I extend the analysis a step further by estimating multivariate regressions explaining the probability of achieving mastership in Genoa as a function of these and other characteristics (see Table 4 for summary statistics).

[INSERT TABLE 4 HERE]

I estimate the relationship between the dependent variable and its possible drivers through the following regression:

$$P_{it} = \beta_0 + \beta_1 \cdot R_i + \beta_2 \cdot M_i + \beta_3 \cdot X_i + \beta_4 \cdot g_i + \beta_5 \cdot \pi_t + \epsilon_{it} \quad (1)$$

where the dependent variable, P_{it} , is a binary variable equal to one if an apprentice later appears in the dataset as a master in Genoa and zero otherwise. Given the binary nature of the outcome, I employ a probit model. To account for the temporal imbalances highlighted in Section 3, and considering the time needed to complete training before taking apprentices of one's own, the analysis is restricted to contracts signed between 1460 and 1510.

Figure 2 shows that the proportion of apprentices who eventually appear as masters fell sharply in the late 1460s and then stabilised at around 5% for the following four decades. This figure is consistent with the limited evidence available for late medieval and early modern Italy (Bellavitis and Sapienza 2022; Casarino 2018; Franceschi 1993). More broadly,

Carocci (2011) argued that from the beginning of the fourteenth century, apprenticeship in Italy increasingly resembled a form of wage employment rather than a pathway to master-ship, unlike the thirteenth century when it still offered real chances of social and occupational mobility.

[INSERT FIGURE 2 HERE]

As discussed in Section 2, kinship ties strongly influenced an apprentice’s career, both in the choice of trade and in access to networks of support. The main explanatory variable, R_i , tests the effect of such ties on the probability for a given apprentice of later being observed as a master.

Firstly, I test the potential effect of having a father already active in the same guild. As noted in Section 3, close family ties reduced the risks of investment in training. Sons of guild members were less likely to make poor matches and could draw on their fathers’ connections for their professional advancement. In line with Ogilvie (2019), I conjecture a positive bias towards insiders, as guild membership by a parent implied preferential access and an insider advantage that improved both persistence in training and, ultimately, later promotion prospects.

A direct kinship tie with the supervising master constituted another potential advantage. Apprentices having strong ties with their masters benefited not only from closer skill transmission but also from privileged access to market knowledge and workshop resources (Prak and Wallis 2019; Wallis 2008). As Carocci (2011) observed, the increasingly rigid Italian apprenticeship regimes encouraged masters to treat workshops, clients, and know-how as family assets to be transmitted to descendants. Yet, these attempts to manage and transmit the competences of a specific trade and any connected privilege were limited by institutional and guild constraints. This might explain why only 6 per cent of apprentices included in my dataset has a family tie with the master (Table 4). By testing how family ties with masters impacted the probability of becoming a master in turn, I aim to understand both the importance of direct skill transmission and the openness of early modern Genoese guilds to the transmission of technical know-how.

Guarantors also played an important role but their effect likely depended on guild affiliation. As guilds imposed significant institutional barriers to admission, being backed by a guild member reduced the perceived risks for masters and guilds, thereby facilitating entry and, eventually, the achievement of mastership. This effect reflects the dual role of guarantors described in Section 2: protecting apprentices and simultaneously reassuring guilds. By contrast, kinship with a guarantor outside the guild was less advantageous, since it lacked the institutional weight to offset entry barriers in contract negotiations. To capture these differences, I therefore include two distinct variables in the regression: the first captures the effect for an apprentice of being related to his guarantor while the second accounts for being backed by a guarantor in the same guild.

To separate the effect of family status from that of network ties, I also include a binary variable equal to one when the father was explicitly mentioned in the apprenticeship contract, indicating his presence during the contract's stipulation. Recent research on Italian apprenticeship practices suggests that fathers were usually cited in contracts when they acted as guarantors or when their involvement could reduce the risks of hiring their sons (Morello 2016). This variable therefore proxies for family background without conflating it with direct kinship ties.

The existing literature on pre-modern apprenticeship has highlighted the importance of masters' supervision as a potential explanation for the professional take-off of their apprentices (De la Croix et al. 2018). At the time of sending their children for an apprenticeship period in a workshop families faced a trade-off. On the one hand, they could place children with less experienced masters, who offered closer supervision and fewer competing apprentices. On the other hand, they could have preferred opting for established masters, whose wider networks might facilitate long-term advancement but entailed higher short-term costs. If this was the case, I conjecture a positive relationship between a master's experience and the probability of becoming a master afterward for a given apprentice. To test which of these two effects prevailed, I match every apprentice to his supervising master and add the categorical variable M_i , equal to one if the master had previously supervised apprentices, as a proxy for his experience.

In Section 3 I shed light on the large number of migrant apprentices active in the urban

labour market of Genoa. Therefore, in one of my specifications, I introduce the variable X_i to account for the geographic origin of apprentices. Origin was not only an indicator of birthplace but also a proxy for access to networks, being strongly correlated with having kin or a father in the guild. Local apprentices likely enjoyed an easier entry into workshops and greater early opportunities, while foreigners often faced higher barriers to entry and promotion unless they could secure support from guild members through kinship or guarantor ties. Moreover, as shown in other European contexts, guilds frequently imposed higher entry fees or stricter requirements on outsiders (Ogilvie 2019). Testing the role of geographic origin therefore disentangles the double channel of informal network access and formal institutional barriers.

Time fixed effects for decades (π_t) account for wider shocks - such as the contraction of the 1470s and changes in trade patterns following the loss of overseas colonies - that could have reshaped opportunities for professional advancement. Compared with apprentices bound in the 1460s, those starting after 1480 were only half as likely to become masters (Figure 2), consistent with the closure strategies described in Section 2 and the protective behaviour of guilds during crisis (Bezzina 2015; Ogilvie 2019).

To account for differences across guilds, regressions also include guild fixed effects (g_i). Casarino (1982) and Epstein (1996) highlighted that Genoese guilds varied not only in training norms, such as the minimum mandatory contract length, but also in economic performance and political weight. Apprentices in stronger guilds plausibly enjoyed better prospects regardless of individual characteristics, especially in the aftermath of the 1470s crisis.

Finally, unobserved factors are captured by the error term ϵ_{it} . Standard errors are clustered at the guild level to account for intra-guild correlation.²³

4.2 Results

Table 5 reports the results of six estimated models. Column (1) presents a baseline model, excluding contractual variables and fixed effects. Column (2) shows the full model without

²³As a robustness check, Table B2 reports estimates with robust standard errors instead of clustering. Results are very similar, though clustering is preferred in the main specification as it better accounts for potential within-guild correlation in unobserved factors.

fixed effects. In Column (3), time fixed effects are added, while Column (4) includes both time and guild fixed effects. Column (5) restricts the sample to apprentices whose fathers were present at the contract drafting, a proxy for higher-status families. Finally, Column (6) tests for a potential geographic effect of the place of origin by including a dummy for Genoese origin.

The estimates in Table 5 show that a kinship tie with the master had a strong positive effect on the likelihood of becoming masters among apprentices in early modern Genoa. Across all specifications, this variable is positive and highly significant, resulting in a 60 per cent increase in the probability of achieving mastership relative to other apprentices.

A possible explanation for this result is that apprentices having a tie with their masters were more often from wealthier, Genoese families, unveiling a potential advantage of insiders over foreigners. However, results in Columns (5) and (6) confirm that this result is not driven by the social status of apprentices' families or by their geographical origin. At the same time, even accounting for these factors, the coefficients associated with the presence of kinship ties with the master remain positive and statistically significant. This result reflects the master's active role in training and transmitting skills, as well as the intergenerational transfer of workshop resources and social connections.

A second strong predictor was having a father active in the same guild in which apprenticeship would have taken place. Sons of guild members not only benefited from trust and reputation effects, but also from the patronage and lobbying power of their families within the guild structure. This confirms that guild membership eased privileged access to scarce opportunities for professional advancement, consequently limiting the career prospects for outsiders.

[INSERT TABLE 5 HERE]

By contrast, kinship ties with the guarantor alone had little effect on the likelihood of achieving mastership. However, being in the same guild of the guarantor has a positive and statistically significant effect in three out of the six models, resulting in a 24 per cent increase in the probability of achieving mastership. Overall, this suggests that the backing of an insider at the moment of contract was a valuable signal of reliability to other guild

members. These results underscore that professional advancement depended less on generic family ties than on connections embedded directly in the institutional structure of the guild.

Other variables show weaker associations. The father’s formal presence at the contract did not increase promotion chances, once ties to masters and guild members are accounted for. Genoese fathers with higher social status might still have tried to use their influence to secure better career prospects for their sons. However, my results suggest that this positive effect is channelled through the presence of ties with key actors in the labour market (masters and guild members), independently from family status.

Similarly, results in Table 5 provides limited support for the idea that a master’s experience had an effect on career outcomes, which may reflect data limitations in identifying the master’s first contracts.²⁴

Overall, Table 5 highlights the central role of kinship and guild-based connections in securing professional advancement. But it leaves open the question of how these ties exerted their influence. One possible mechanism, discussed in Sections 2 and 3, was through more favourable contract terms - specifically, shorter durations - and the possibility to undertake multiple apprenticeships. To investigate these channels, Table 6 re-estimates the models shown in Table 5 but now using contract length and the fact of having started multiple training periods as the outcomes.

[INSERT TABLE 6 HERE]

The results in Table 6 indicate that family and guild ties influenced contract design in ways consistent with their role in securing career prospects. Apprentices with kinship ties to their masters were more likely to undertake multiple apprenticeships, suggesting lower switching costs and greater flexibility in pursuing alternative career paths. Sons of guild members negotiated significantly shorter contracts and were also more likely to undertake multiple apprenticeships, highlighting the higher bargaining power and reputation effects coming from family connections within the guild. Finally, apprentices backed by guarantors from the same guild obtained shorter contracts, though the effect on multiple apprenticeships

²⁴In the absence of some portion of apprenticeship contracts drafted in Genoa, it is impossible to precisely match masters with their first appearance in this role, especially in the first decades considered when the number of contracts is lower.

was weaker. These findings support the interpretation that ties worked partly by shaping the contractual framework of training, easing both the cost of exit and the speed of progression.

The final step is to test whether these relationships shifted during the crisis of the 1470s, when opportunities for advancement contracted and guilds had to face a higher economic pressure. Table 7 explores these dynamics by interacting social ties and guild affiliation with a crisis dummy.

[INSERT TABLE 7 HERE]

The first panel of Table 7 shows that the crisis did not fundamentally alter the advantage conferred by kinship with the master for later promotion. However, in line with the hypothesis presented in Section 2, it did affect contract terms: apprentices having kinship with their supervising masters had to accept longer apprenticeships than before, consistent with a greater competition for scarce opportunities in the urban labour market.

Rather than changes in the importance of social networks for professional advancement, Table 7 confirms that the crisis brought differences in internal organization and economic performances between Genoese guilds, which influenced the career prospects of their apprentices. In the second panel of Table 7, I display the marginal effects associated with three of the major Genoese guilds, all operating in different segments of the urban economy (silk, wool and shoemaking). Apprentices in silk, a sector hit hard by the economic contraction, faced significantly worse long-term outcomes after 1470, while those in wool and shoemaking were comparatively less affected. These contrasting trajectories confirm that the interplay between networks and guild-specific dynamics²⁵ was central to shaping opportunities for professional advancement in Genoa (Gatti 1980; Ghiara 1991).

5 Discussion

The results of the econometric analyses have shown that social networks affected, or at least were correlated with, professional advancement in early modern Genoa, particularly

²⁵This interpretation is consistent with the evidence presented in Appendix B.1, which shows that intra-guild dispersion in contract length widened after the 1470s crisis, suggesting that several guilds relaxed institutional constraints and allowed greater contractual heterogeneity.

regarding the transition from apprenticeship to mastership. While the findings are consistent across specifications, they also reveal complexities in the mechanisms at work.

The empirical analysis confirms that family ties with guild members played the most important role in an apprentice’s likelihood of becoming a master. Apprentices related to their supervising masters experienced the largest advantage, while sons of guild members also benefited substantially, though to a slightly lower degree. These advantages operated not only at the crucial moment of mastership’s admission but also throughout the training process.²⁶ Guild members’ sons typically enjoyed shorter contracts, more favourable terms and faced lower opportunity costs when deciding to terminate a contract and pursue alternative career paths (Table 6).

More importantly, kinship ties with guild members led to the inclusion in a common network of professional connections rooted in families and guilds that extended beyond the workshop itself. My dataset of apprenticeship contracts does not enable us to observe the real utilization of these connections. However, being related to a guild member likely implied getting access to economic opportunities, established client relationships and strategic advice. Overall, these findings suggest that kinship ties with actors in the urban labour market not only facilitated career advancement but also contributed to a segmented market structure, in which outsiders had to face greater obstacles to attaining mastership.

Interestingly, while guarantor ties also mattered, their effect was contingent on guild affiliation. Apprentices whose guarantors belonged to their guilds benefited more than those whose guarantors were merely kin or neighbours. However, these patterns do not necessarily imply direct institutional interventions by guilds. Rather, they once again underscore that apprentices who could draw on professional connections embedded within the guild network enjoyed advantages that extended beyond the immediate training contract. In the Genoese case, these dynamics are consistent with the broader literature on how informal ties within guild structures provided better access to opportunities, even without clear evidence of formal restrictions (Ogilvie 2019, pp. 110–116).

The importance of kinship ties for achieving mastership suggests that most of the func-

²⁶Figure B2 in Appendix B.2 shows that apprentices with pre-existing ties not only had higher chances of attaining mastership, but probably also reached it over a shorter time horizon, confirming that kinship ties accelerated both access and advancement within the guild system.

tioning of the Genoese market for skills appears to have been strongly shaped by informal connections between the actors involved which significantly influenced the outcomes and the professional success of guild apprentices.

This pattern has implications for our understanding of early modern economies. In Genoa at least, the market for skills had structures constraining meritocracy and access to economic opportunities for outsiders, thereby limiting occupational mobility and reinforcing existing social hierarchies (Ogilvie 2019). Such dynamics stand in stark contrast to more open and meritocratic apprenticeship markets observed in other contexts, such as early modern London, where returns to parent-specific human capital were relatively low (Humphries 2006; Leunig et al. 2011).

The 1470s economic contraction did not fundamentally alter this logic. As Genoa lost access to Eastern Mediterranean markets, guilds - particularly in trades most exposed to overseas commerce, such as silk - tightened their control over apprenticeship training. For this reason, these guilds began to increase apprenticeship length to rely on apprentices as a cheaper source of labour, while simultaneously trying to maintain their dominance in the urban economy by limiting avenues for upward mobility (Table 7). Yet, the crisis did not diminish the premium associated with kinship ties. These adjustments suggest that guilds sought to preserve stability for their members in a period of economic downturn, even if this meant shifting some of the costs onto apprentices. Rather than acting as uniformly restrictive cartels, Genoese trades appear to have responded to this external shock by balancing the protection of insiders with a necessary integration of apprentices into the urban labour market (Ogilvie 2019; Prak and Wallis 2019; Wallis 2025).

This study provides one of the first piece of quantitative evidence showing that kinship and professional networks had a positive effect on the achievement of guild mastership in early modern Italy. The low share of apprentices eventually becoming masters at the end of training confirms that apprentices and their families must have been aware that the achievement of mastership was the exception, not the rule, for those starting a training period. Yet, for those embedded in guild networks, the chances of attaining mastership were significantly higher. Although studies of mastership's attainment are still limited (Wallis 2019; Schalk et al. 2017), my results challenge interpretations that portray apprenticeship

as a broadly meritocratic mechanism of skill formation in continental Europe. At the same time, they highlight that in some cases apprenticeship was used also as a tool to ration opportunities and supply underpaid labour, especially during economic downturns.

6 Conclusion

This study has explored the role of family and professional connections in shaping the career trajectories of guild apprentices in early modern Genoa. Using the information contained in a sample of 8,000 apprenticeship contracts, I analysed how the kinship and professional ties of an apprentice influenced his likelihood of attaining mastership.

The evidence underscores the key role of social connections, particularly family ties, for securing professional advancement. Apprentices whose fathers were active in the same guild were approximately 60 per cent more likely to become masters in Genoa than those without such ties. The mechanism through which this happened was not only due to a better contract negotiation at the moment of binding but also reflected the benefits of accessing a network of insider knowledge and strategic advantage. Family networks provided enduring and key support throughout the apprenticeship process, from the selection of trades to negotiating better contractual terms, ultimately allowing young trainees to achieve professional success. Notably, this network-based advantage extended even to those apprentices whose fathers were not masters in the same trade, highlighting that the importance of family connections went beyond the internal hierarchy of guilds. These findings challenge the notion of a purely meritocratic guild apprenticeship and indicate that parental ties were crucial for accessing economic opportunities.

The analysis also underscores the role of guilds in structuring apprenticeship and occupational mobility within the urban context. My findings highlight that guilds restricted access to the upper tiers of their trades by adjusting apprenticeship terms and contract arrangements, particularly in response to economic fluctuations. Being already embedded in a guild-based network increased the probability of obtaining favourable career prospects, reflecting how kinship and professional ties operated alongside institutional structures to shape apprentices' opportunities.

Finally, by showing the interplay between family networks and guild structures, this

study shows that apprenticeship in Genoa was not inherently a vehicle for upward social mobility in early-modern continental Europe. Although guild apprenticeship gave access to technical training without being constrained by family lines, access to opportunities was strongly mediated by social connections, reinforcing existing hierarchies and economic disparities. My findings thus highlight the need for a deeper understanding of apprenticeship and its limitations and suggest caution against generalizing the role of this form of inter-generational transmission of skills across times and places, as this institution varied in its structure, access and professional implications according to the power dynamics of its key actors.

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Tables and Figures

Table 1: Number of contracts and average length of apprenticeships in the ten largest guilds

Guild	Observations	Avg. length of apprenticeship			
		All	1451-1470	1471-1530	Δ
Silk	2,696	6.4	6.3	6.5	0.2***
Wool	1,402	5.9	5.8	5.9	-0.1
Mercers	354	5.8	6.0	5.8	-0.2***
Tanners	348	5.9	6.1	5.9	-0.2
Shoemakers	324	6.0	5.8	6.0	0.2*
Joiners	283	6.6	6.0	6.6	0.6***
Barbers	194	5.8	5.7	5.8	0.1
Tailors	181	6.0	5.9	6.0	0.1
Bakers	163	5.2	4.9	5.2	0.3
Furriers	152	6.1	6.2	6.1	-0.1
Other guilds	1,266	5.6	5.6	5.7	0.1
Total	7,363	6.1	6.2	6.0	-0.2***

Notes: The table reports the number of apprenticeship contracts and the average contract length in years for the top 10 guilds in the linked Genoa sample, 1451-1530. The ten most frequently recorded trades are shown individually; remaining occupations are grouped under “Other guilds”. Columns (3)-(5) report average lengths for the full period and for the sub-periods 1451-1470 and 1471-1530 to highlight differences before and after the economic contraction of the 1470s. The last column (Δ) shows the difference in average length between these sub-periods from two-sample t-tests: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table 2: Characteristics of new apprentices in Genoa, 1451–1530

	All apprentices		1451-1470		1471-1530		Δ
	N	(%)	N	(%)	N	(%)	(%)
<i>Panel A. Family and professional ties</i>							
Father mentioned in contract	2,986	39.5	641	42.3	2,345	38.8	-3.5**
Father in same guild	377	5.0	69	4.6	305	5.1	0.5
Kinship tie with master	457	6.0	75	5.0	382	6.3	1.3*
Kinship tie with guarantor	4,145	54.9	952	62.8	3,193	52.9	-9.9***
Guarantor in same guild	1,445	19.1	236	15.6	1,209	20.0	4.4***
<i>Panel B. Geographic origins</i>							
Genoa city	947	12.5	223	14.7	724	12.0	-2.7***
Genoa dominion	4,264	56.4	992	65.5	3,272	54.2	-11.3***
Outside	1,080	14.3	151	10.	929	15.4	5.4***
Not specified	1,263	16.7	149	9.8	1,114	18.4	8.6***

Note: Panel A reports apprentices' family and professional connections observable in the contracts. A family tie is defined as a close kinship relation (father, brother, or uncle). Panel B reports apprentices' geographic origins, distinguishing apprentices from Genoa, its dominion, apprentices from outside the Republic, and cases not specified. Apprentices are considered pre-crisis when the year of start is prior to 1470. Categories in Panel A are not mutually exclusive (e.g., an apprentice may have both a father present and a tie with the master), so percentages are calculated relative to the total number of apprentices in each column. Statistical significance of differences between pre- and post-crisis proportions is indicated in the last column: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Source: see text and Appendix.

Table 3: Apprentices by number of training periods

No. appr.	Father absent	Father mentioned	Father = guild	Tie with master	Tie guarantor	All apprentices	
	(%)	(%)	(%)	(%)	(%)	N	(%)
1	94.7	95.4	91.9	89.4	95.6	7,172	95.0
2	4.6	4.1	7.1	9.0	3.9	333	4.4
3	0.6	0.4	0.4	0.8	0.4	41	0.5
4+	0.1	0.1	0.6	0.8	0.1	8	0.1

Note: Columns (2)-(5) indicate the share of apprentices in each family/social category who experienced 1, 2, 3, or 4+ apprenticeships. Categories are not mutually exclusive (e.g. an apprentice may have both a father in the same guild and a kinship tie with the master). The final two columns show absolute numbers and overall percentages for all apprentices in the dataset. Source: see text and Appendix.

Table 4: Summary statistics of the variables used in the regression analysis

Variable	Obs.	Mean	Std. Dev.	Min	Max
Father in same guild	7,498	0.05	0.22	0	1
Kinship tie with the master	7,498	0.06	0.24	0	1
Kinship tie with the guarantor	7,498	0.55	0.50	0	1
Guarantor in same guild	7,498	0.19	0.39	0	1
Father mentioned in the contract	7,498	0.40	0.49	0	1
Multiple apprenticeship periods	7,498	0.05	0.22	0	1
Contract length (years)	7,318	6.05	1.25	1	15
Experienced master	7,488	0.43	0.49	0	1
Genoese origin	6,246	0.18	0.38	0	1

Note: The table reports descriptive statistics for the variables employed in the regression analysis. Sample sizes differ slightly across variables due to missing information in some contracts.

Table 5: Determinants of access to mastership, Genoa 1460–1510

	Promotion to mastership					
	(1)	(2)	(3)	(4)	(5)	(6)
Kinship tie with the master	0.029*** (0.006)	0.029*** (0.006)	0.029*** (0.007)	0.027*** (0.006)	0.037*** (0.009)	0.027*** (0.007)
Father in same guild	0.029** (0.012)	0.029** (0.012)	0.028** (0.012)	0.026*** (0.007)	0.013** (0.006)	0.028*** (0.007)
Kinship tie with the guarantor	0.007 (0.005)	0.011* (0.006)	0.009 (0.006)	0.008 (0.005)	-0.012 (0.018)	0.008 (0.006)
Guarantor in same guild	0.012*** (0.004)	0.011*** (0.004)	0.010*** (0.003)	0.006 (0.004)	0.003 (0.010)	0.009 (0.006)
Father mentioned in the contract		-0.007 (0.006)	-0.006 (0.006)	-0.005 (0.005)		-0.004 (0.005)
Experienced master		-0.002 (0.009)	0.002 (0.007)	0.001 (0.006)	-0.000 (0.006)	0.001 (0.006)
Genoese						0.003 (0.004)
Time FE	N	N	Y	Y	Y	Y
Guild FE	N	N	N	Y	Y	Y
Observations	6,248	6,240	6,240	6,198	2,426	5,557
Sample mean of outcome	0.041	0.042	0.042	0.042	0.043	0.043
Number of clusters	27	27	27	25	21	25
R^2	0.01	0.02	0.04	0.07	0.11	0.07

Note: The dependent variable is a binary indicator equal to one if the apprentice later appears as a master. Coefficients are average marginal effects from probit regressions. Standard errors, clustered at the guild level, are shown in parentheses. ***Significant at 99%, **Significant at 95%, *Significant at 90%.

Table 6: The role of ties in contract length and number of apprenticeships

	Contract length (years)			Multiple apprenticeships		
	(1)	(2)	(3)	(4)	(5)	(6)
Kinship tie with the master	-0.111 (0.096)	-0.071 (0.093)	-0.074 (0.094)	0.022*** (0.007)	0.018*** (0.006)	0.017** (0.007)
Father in same guild	-0.123 (0.083)	-0.233*** (0.052)	-0.262*** (0.061)	0.026* (0.013)	0.024** (0.012)	0.023** (0.011)
Kinship tie with the guarantor	0.059 (0.044)	0.067 (0.043)	0.081 (0.048)	-0.009** (0.004)	-0.009** (0.004)	-0.007 (0.006)
Guarantor in same guild	-0.331*** (0.084)	-0.354*** (0.074)	-0.353*** (0.065)	0.007 (0.005)	0.005 (0.004)	0.003 (0.005)
Father mentioned in the contract	0.043 (0.052)	0.030 (0.058)	0.052 (0.069)	0.003 (0.006)	0.000 (0.006)	-0.005 (0.006)
Experienced master	0.117** (0.046)	0.032 (0.026)	0.029 (0.024)	-0.001 (0.003)	-0.002 (0.003)	-0.001 (0.003)
Genoese			0.040 (0.034)			0.001 (0.008)
Time FE	Y	Y	Y	Y	Y	Y
Guild FE	N	Y	Y	N	Y	Y
Observations	6,094	6,094	5,459	6,240	6,084	5,454
Sample mean of outcome	6.102	6.102	6.128	0.045	0.047	0.047
Number of clusters	27	27	27	27	23	23
R ²	0.07	0.16	0.17	0.03	0.05	0.05

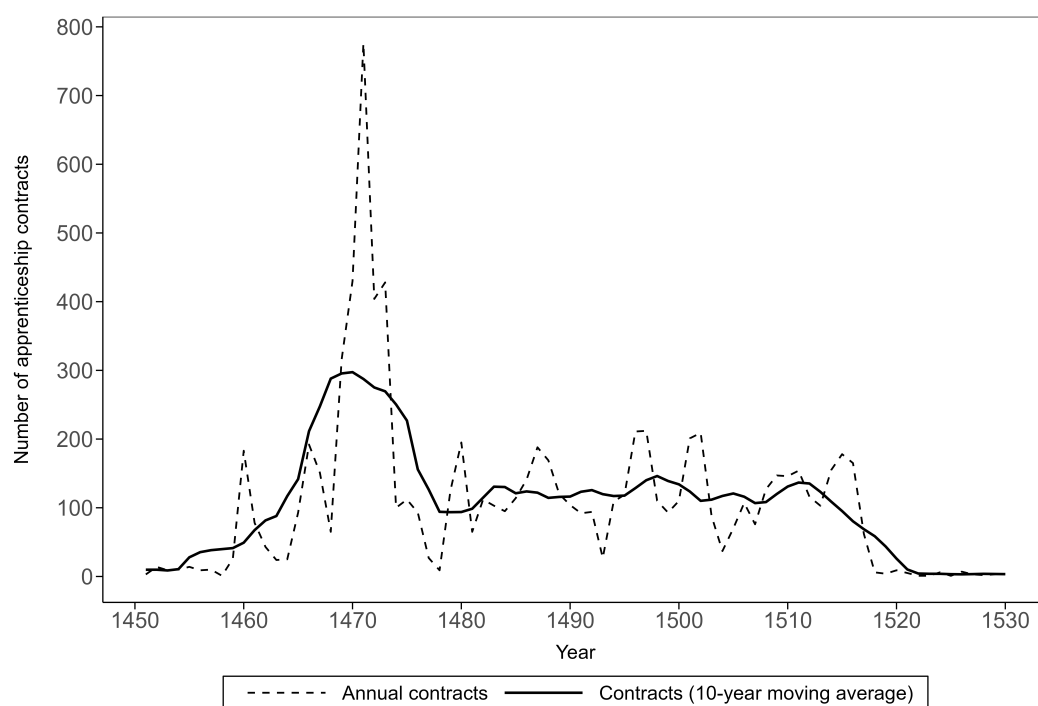
Note: Columns (1)-(3) report OLS estimates where the dependent variable is the length of the apprenticeship contract (in years). Columns (4)-(6) report probit marginal effects at mean, where the dependent variable equals one if the apprentice undertook multiple training periods. Standard errors, clustered at the guild level, are shown in parentheses. ***Significant at 99%, **Significant at 95%, *Significant at 90%.

Table 7: Networks and urban guilds during the 1470 crisis

	Contract length		Promotion to mastership	
	(1)	(2)	(3)	(4)
<i>Panel A: Network during Crisis</i>				
Kinship tie with the master	-0.261** (0.108)	-0.269** (0.121)	0.036*** (0.008)	0.030*** (0.009)
Kinship tie with the master x Crisis	0.225** (0.103)	0.240* (0.133)	-0.013 (0.014)	-0.006 (0.014)
Father in same guild	-0.095** (0.045)	-0.184*** (0.040)	0.037*** (0.010)	0.041*** (0.009)
Same guild x Crisis	-0.181 (0.121)	-0.101 (0.112)	-0.014 (0.011)	-0.018* (0.011)
Crisis	0.269*** (0.065)	0.285*** (0.057)	-0.031*** (0.007)	-0.033*** (0.008)
Time FE	Y	Y	Y	Y
Guild FE	Y	Y	Y	Y
Observations	6,094	5,459	6,198	5,557
Sample mean of outcome	6.102	6.121	0.042	0.043
Number of clusters	27	27	25	25
R ²	0.15	0.16	0.05	0.05
<i>Panel B. Urban guilds during Crisis</i>				
Silk	0.786*** (0.108)	1.010*** (0.128)	-0.015 (0.009)	-0.013 (0.009)
Wool	0.317*** (0.106)	0.528*** (0.127)	-0.009 (0.009)	-0.007 (0.009)
Shoemakers	0.262** (0.105)	0.475*** (0.125)	0.001 (0.009)	0.005 (0.009)
Silk x Crisis	0.267* (0.143)	0.254* (0.125)	-0.031*** (0.011)	-0.036*** (0.010)
Wool x Crisis	0.069 (0.139)	0.050 (0.123)	0.019* (0.011)	0.016 (0.010)
Shoemakers x Crisis	0.175 (0.142)	0.192 (0.125)	-0.014 (0.011)	-0.025** (0.010)
Crisis	0.068 (0.144)	0.097 (0.127)	-0.015 (0.011)	-0.013 (0.010)
Time FE	Y	Y	Y	Y
Guild FE	Y	Y	Y	Y
Observations	6,094	5,459	6,198	5,557
Sample mean of outcome	6.102	6.121	0.042	0.043
Number of clusters	27	27	25	25
R ²	0.16	0.17	0.05	0.06

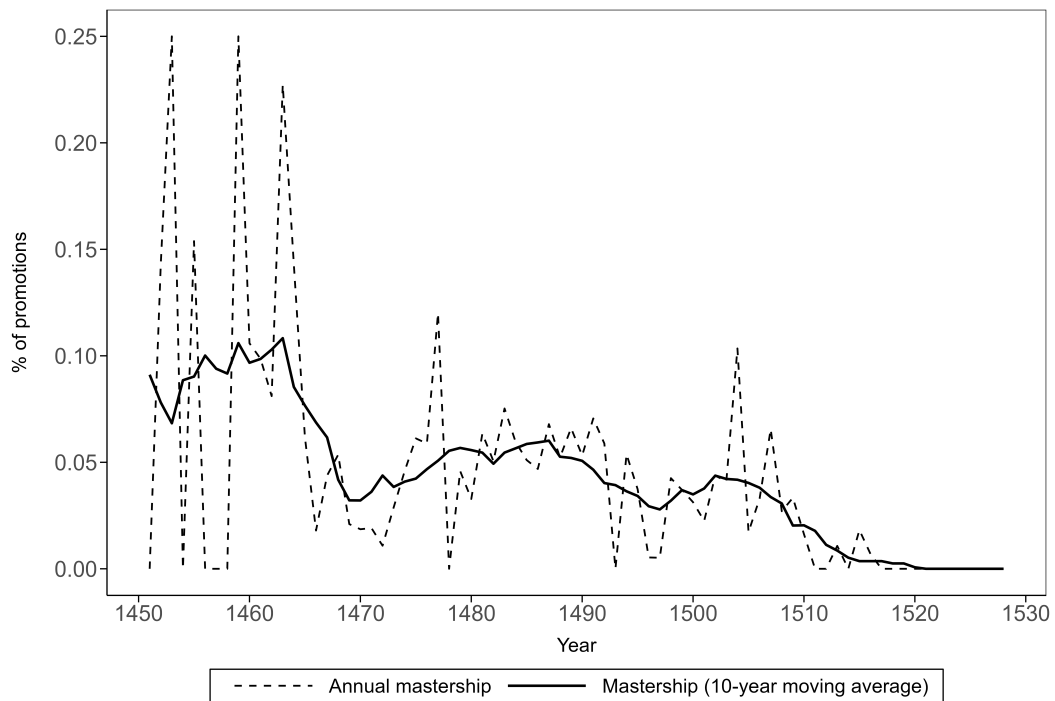
Note: Columns (1)–(2) report OLS estimates where the dependent variable is the length of the apprenticeship contract (in years). Columns (3)–(4) report probit marginal effects at mean, where the dependent variable is a binary indicator equal to one if the apprentice later appears as a master. Panel A tests whether the effect of family and guild ties changed during the 1470s crisis. Panel B examines how the crisis affected three major urban guilds in Genoa (silk, wool, and shoemakers). Standard errors, clustered at the guild level, are shown in parentheses. *Significant at 99%, **Significant at 95%, *Significant at 90%.

Figure 1: Apprenticeship contracts registered in Genoa, 1451-1530.



Notes: The dotted line shows the annual number of apprenticeship contracts registered in Genoa each year. The solid line shows the 10-year moving average to account for short-term fluctuations. See text and Appendix A for further details.

Figure 2: The long-run trend in the percentage of apprentices obtaining mastership



Notes: The long-run trend in the percentage of apprentices for each year of start reaching the role of masters after the completion of apprenticeship. The dashed line shows the number of apprentices promoted for each year of start. The dark line shows the 10-year moving average to account for short-term fluctuations. Source: see text and Appendix.

Appendices

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A Data and Methodology

A.1 Sources and database construction

The collection with all the apprenticeship contracts used in this paper is preserved in the State Archive of Genoa, within the collection of “Antique Notaries” (Archivio di Stato di Genova, *Fondo Notai Antichi*).²⁷ Figure A1 shows a model contract in its entirety.

<p>In nomine Domini amen. Johannes de Podio de Lavania, vicariatus Clavari, quondam Thome, sponte etc. promissit et solemniter convenit Benedicto de Gropalo pexario, quondam Andree, presenti stipulanti etc. facere et curare cum effectu quod Leonardus filius ipsius Johannis, etatis annorum quatordecim in circa, presens ac consentiens, stabit et perseverabit cum eodem Benedicto pro famulo et tamquam famulus ipsius annis sex continuis proxime venturis, causa adiscendi dictam artem pexariorum, ab eoque toto dicto tempore non discedet, furtum aut aliquid aliud illicitum non committet in domo et apoteca dicti Benedicti, nec committere volenti consentiet, imo potius notificabit dicto Benedicto, sibi que Benedicto, tam in domo et apoteca ipsius quam extra, bene et fideliter serviet et quecumque que fuerunt sibi imposita licita et honesta faciet, observabit et dimplebit, omniaque et singular alia demum faciet que fieri consueta sunt per similes amulos dicte artis erga magistros suos.</p> <p>Et versavice dictus Benedictus presens et acceptans predicta promissit et solemniter convenit dicto Johanni presenti et stipulanti nomine dicti Leonardi mihique notario infrascripto, tamquam persone publice officio publico stipulanti et recipienti nomine et vice eiusdem Leonardi, toto eius posse eundem Leonardum docere dictam artem ipsumque in domo eius tenere toto diete tempore ac eum alere et gubernare tam sanum quam infirmum ac illum vestire et calciamenta prestare bene et decenter secundum consuetudinem similium famulorum, omniaque alia erga eum facere ad que tenentur et seu facere consueti sunt magistri dicte artis erga famulos suos. Que omnia etc. sub pena librarum decem januinorum in quam etc. tociens quotiens etc.</p> <p>Ratis etc. Et proinde etc.</p> <p>Actum Janue in sala prima Palacii Communis, ubi jura redduntur per egregios dominos Consules Rationis, videlicet ad banchum mei notarii infrascripti, anno dominice nativitatis MCCCCLXXnono, indicione duodecima secundum Janue cursum, die lune XXVIII novembris in terciis, presentibus Antonio Morando de Capriata, carsolario, et Bernardo Tasorelo quondam Benedicti, civibus Janue, testibus ad premissa vocatis et rogatis</p>	<div>Guarantor</div> <div>Master/Acceptor</div> <div>Apprentice's name and age</div> <div>Contract's lenght and conditions</div>
	<div>Date</div>
	<div>Witnesses</div>

Figure A1: An example of an apprenticeship contract (*acordacio famuli*) included in the database. Key information later stored in the dataset is highlighted in red.

²⁷Archivio di Stato di Genova (ASG), Fondo Notai Antichi. A guide to the collection is available at: <http://www.archiviodistatogenova.beniculturali.it/index.php?it/205/guida-ai-fondi-archivistici>.

Table A1: Storage and standardisation of four contracts drafted in Genoa in 1499.

N.	First Name	Last Name	Role	Occupation	Father	Lenght
66	Cristoforus	De Promontorio	Apprentice	Wool dealer	Beneditus	8
66	Iohannes Antonius	De Promontorio	Guarantor	-	Franciscus	8
66	Raphael	Richenie	Master	Wool dealer	Neapoleonis	8
66	Mattheus	Beriso	Witness	Wool dealer	Bartholomaeus	8
66	Gaspar	De Sanpetro	Witness	Wool dealer	Antonius	8
89	Nicolaus	Collanis De Teirano	Apprentice	Silk dealer	Santinus	7
89	Santinus	Collanis De Teirano	Guarantor	Silk dealer	Iacobus	7
89	Augustus	Iusto	Master	Silk dealer	Lucas	7
89	Nicolaus	De Palodio	Witness	Silk dealer	Bartholomaeus	7
89	Pantaleone	Bottario	Witness	Silk Spinner	Antonius	7
98	Beneditus	Calistanus	Apprentice	Food retailer	Simon	6
98	Simon	Calistanus	Guarantor	Cap maker	Beneditus	6
98	Petro Baptista	De Andrea	Master	Food retailer	Thomas	6
98	Pantaleone	Marsano	Witness	Cap maker	Iacobus	6
102	Castilionus	De Carbono	Apprentice	Wool dealer	Lanfrancus	6
102	Lanfrancus	De Carbono	Guarantor	Sock manufacturer	Iohannes	6
102	Petro Baptista	De Andrea	Master	Wool dealer	Thomas	6
102	Hieronymus	Iexicco De Sigestro	Witness	Wool worker	Nicolaus	6
102	Bartholomaeus	De Vairolo De Levio	Witness	Wool worker	Cristoforus	6

Following the criteria used by Casarino et al. (1979), during the transcription, I maintained all the info digitized in Latin, the language used in the original contract and I translated them into English in a second phase. This approach facilitates integration with other Latin-based sources from late medieval Genoa.

The standardised structure of Genoese apprenticeship contracts eased the extraction of key information. Some recurring figures appear in nearly all contracts. The guarantor (*promittente-dante*) acted as an intermediary, offering security to both parties: for the master, a safeguard against potential losses from an apprentice’s misconduct or departure; for the apprentice, especially as a minor in an unfamiliar environment, a guarantee of fair treatment and protection of rights. In more than half of the cases (Section 3), the guarantor was related to the apprentice and therefore could have exercised parental authority either by right or by mandate. The master (*promittente-accettante*) accepted the apprentice and was responsible for his training.²⁸ The apprentice (*famulus*), committed himself to serve the master. Each contract contains the names of two or three witnesses, who provide a guarantee of its validity. Contracts sometimes mention additional figures, but their occasional presence makes them unsuitable for systematic analysis.

The dataset includes personal details (names, patronymics, roles), contract length, date

²⁸“*Docere artem bene et legaliter*”, Casarino et al. (1979).

of binding, and - where available - the father's name and other family relations. After the first phase of collection and digital reproduction of the archival source, all information was organised in a single spreadsheet. Rather than coding one row per contract, I created one row per individual mentioned. This allows each figure to be analysed separately. In Table A1, I provide a visual representation of how the content of four contracts was stored in my database.

Finally, to make the record linkage process easier, all references to relatives were standardised into distinct columns according to their relationship (e.g. father of, son of, uncle of). This organisation eased the identification of kinship ties across contracts.

A.2 Occupational standardization and guild classification

I standardised the occupational information from the contracts to facilitate record linkage and to enhance comparability with existing studies on late medieval and early modern Italy. The main reference for this work was Luciana Gatti's catalogue of professions in late medieval Genoa,²⁹ which lists occupations according to their original denomination. Building on this source, I created a codebook covering the hundreds of occupational terms found in the contracts and provided English translations for each.

To allow broader comparison, I further coded occupations using two widely adopted international classifications: the Historical International Standard Classification of Occupations (HISCO),³⁰ which allows to group trades into macro-categories, and the Cambridge PSTI six-point code, which captures the Primary-Secondary-Tertiary division. For the roles of individuals within contracts, I translated the original Latin terms following the descriptions provided by Casarino et al. (1979).

Reconstructing guild affiliations required additional steps. Despite the State Archive of Genoa containing various statutes and other records of guild activity in the fifteenth century, for several trades there is no direct evidence of either their foundation or survival.

For this reason, to reconstruct all the guilds active in Genoa between 1450 and 1530, I had to rely on the three most consistent secondary sources tracing Italian guilds. The first is

²⁹Gatti, *Un catalogo di mestieri*, Genova, 1980.

³⁰See <https://historyofwork.iisg.nl/> for details on HISCO.

the Italian Guild Database, which documents 1,385 guilds in 50 different Italian cities³¹. The second source is the dataset created by Sheilagh Ogilvie in 2019, which contains observations for 600 different Italian guilds.³² The third source is the *Catalogo Chelazzi*³³, a ten-volume work published between 1943 and 2024 that compiles guild statutes, customs, and privileges from the Middle Ages to the eighteenth century. The Chelazzi catalogue, named after its first curator, Corrado Chelazzi, collects works by Italian historians from the mid-19th century onwards, hence in some cases, it employs sources not covered by the other two databases.

By merging these sources and applying strict criteria for cross-referencing guild names and categories,³⁴ I was able to assign each occupation in my dataset to its corresponding Genoese guild. This standardisation ensured consistency across contracts and underpins the occupational and guild-level analyses presented in Sections 3 and 4.

A.3 Standardisation of first names

The transcription of apprenticeship contracts revealed a wide variety of spellings and forms of first names. Such variation is typical of late medieval notarial sources, where orthographic rules were fluid and often reflected the preferences of individual notaries. To ensure consistency across the dataset, I harmonised these spellings into standardised forms. For example, names such as *Barnaba* could appear as *Barnabonum*, while *Petrus* was often rendered as *Petro*. In each case, I adopted a single canonical form - *Barnaba* and *Petrus* respectively - while retaining the original spellings in a separate column to preserve the version mentioned in the original source.

Standardisation also involved collapsing variant or colloquial forms into a single recognised name. Thus, *Ludovicus* was used in place of the diminutive *Bigo*. Suffixes that denoted relative age or stature were likewise eliminated: *Iohanninus* (“Little John”) and *Iohannonus* (“Big John”) were both recorded as *Iohannes*. This procedure follows established approaches

³¹ Available online at <https://dataverse.nl/file.xhtml?fileId=1446&version=1.0>.

³² Available online at <https://www.econ.cam.ac.uk/people/faculty/sco2/projects/ogilvie-guilds-databases>.

³³ *Catalogo della raccolta di statuti, consuetudini, leggi, decreti, ordini e privilegi dei comuni, delle associazioni e degli enti locali dal Medioevo alla fine del secolo XVIII*

³⁴ Bonato, Edoardo (2024). *Guilds in the 12th–18th Century: An Empirical Approach*. Milano: Università Bocconi. [Unpublished master’s thesis].

in historical name standardisation.³⁵ Diminutives were often applied to younger individuals but usually disappeared over time, as they were replaced by the adult form of the name.

This task is not merely clerical as name variants often conveyed social meaning. In many cases, diminutives were used to identify younger individuals within a family or community, but they typically disappeared over time as apprentices grew up and were recorded under the adult form of their name. This decision to standardise such names therefore not only eases record linkage - by reducing the risk of treating the same individual as two separate entries - but also reflects an awareness of the naming conventions of the time.

A.4 Record linkage

The apprenticeship contracts did not contain any unique identifier, which made it necessary to construct links between records in order to follow individuals across contracts and to identify those that achieved mastership in Genoa. For this purpose, I employed Splink, a Python package for probabilistic record linkage that implements the Fellegi-Sunter model of record matching.³⁶

For my dataset on Genoese apprentices, the basic task was to compare pairs of records and decide whether they represent the same entity. As with any large dataset, it is computationally infeasible to compare every row with every other row, since the number of comparisons grows quadratically with the number of records. To address this, I relied on blocking rules, which generate only those pairwise comparisons that are plausible matches. For example, I restricted comparisons to cases where either the first name or the surname matched. Record linkage therefore proceeded in two stages:

1. Blocking rules generated candidate pairs of records.
2. A probabilistic model scored each candidate pair to determine whether it represented a match.

When designing blocking rules, there was a trade-off between performance and accuracy. For example, rules that were too loose generated excessive comparisons and reduced

³⁵See Bloothoof (1994), Thorvaldsen et al. (2015), and Postles (1996).

³⁶For an in-depth guide to the package see: <https://moj-analytical-services.github.io/splink>.

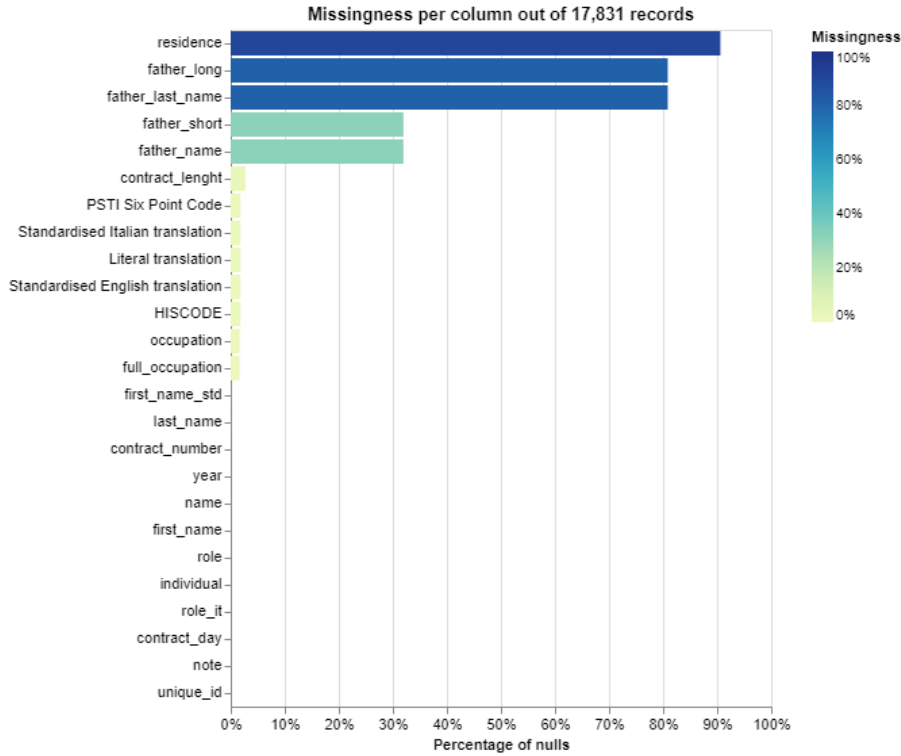


Figure A2: Levels of missingness by variable in the dataset of apprentices and masters.

efficiency, while rules that were too strict risked missing some valid matches. I therefore allowed comparisons where the first name matched exactly, or where the surname and the initial letter of the first name coincided (to account for siblings active in the same trade). Before proceeding, I examined the level of missingness across my variables, since columns with a high level of missingness reduce the accuracy of linkage. Figure A2 shows the extent of missingness in my dataset, restricted here to apprentices and masters.

The probabilistic linkage model estimated a *match score* for each candidate pair, reflecting the likelihood that the records referred to the same person. This involved learning the relative importance, or “match weights” of different fields. For instance, a shared surname is a stronger indicator of identity than a shared occupation. Conversely, a mismatch in occupation is less informative than a mismatch in first name, since names were often entered with more orthographic variation (subsection A.3).

Match weights are derived from the parameters of the underlying Fellegi–Sunter model: the m - probability (the likelihood that two records agree on a field given that they are the same person) and the u - probability (the likelihood that two records agree given that they are not the same person). Splink estimates these parameters through various iterative

routines. In my case, matches were based on first name, surname, father’s name, and occupation, with term-frequency adjustments for occupation to avoid bias from trades appearing more often, such as silk weaving.

The model estimated that the probability of any two random records being a true match was $8.58e^{-5}$ - meaning that among all possible 158,963,365 comparisons, approximately 13,636 represented true links. The u parameters were estimated from random samples of non-matches (up to 3 million pairs), while the m -parameters were estimated via Expectation Maximisation (EM). To ensure robustness, I employed two EM passes: one blocking on exact matches of first and last name, and a second blocking on father’s name, thereby generating parameter estimates across all columns.

- Random match probability: $8.58e^{-5}$ (≈ 1 in 11,655 comparisons).
- Sample size for u -estimation: 3 million random pairs.
- m -estimation: Expectation Maximisation using two blocking passes (first name + surname; father’s name).

Another interesting application of my trained model was to identify *unlinkable* records, entries too sparse to be matched with confidence. An example is a record containing only “Andrea Doria” with no additional details. By linking records to themselves, it is possible to identify such cases: if a record fails to meet its own match threshold, it will never match with others. As shown in Figure A3, nearly 16 per cent of records were unlinkable at a match weight of 2.10, corresponding to a probability of 81.1 per cent.

For the final linkage, I set the threshold probability at 0.27: any comparison scoring below this was discarded. The resulting output consisted of clusters of records, each representing a unique individual, rather than a simple list of pairwise matches. This approach allowed me to identify repeated appearances of apprentices and masters across contracts, track kinship relations, and ensure that the database reflected coherent career progressions rather than fragmented record entries.

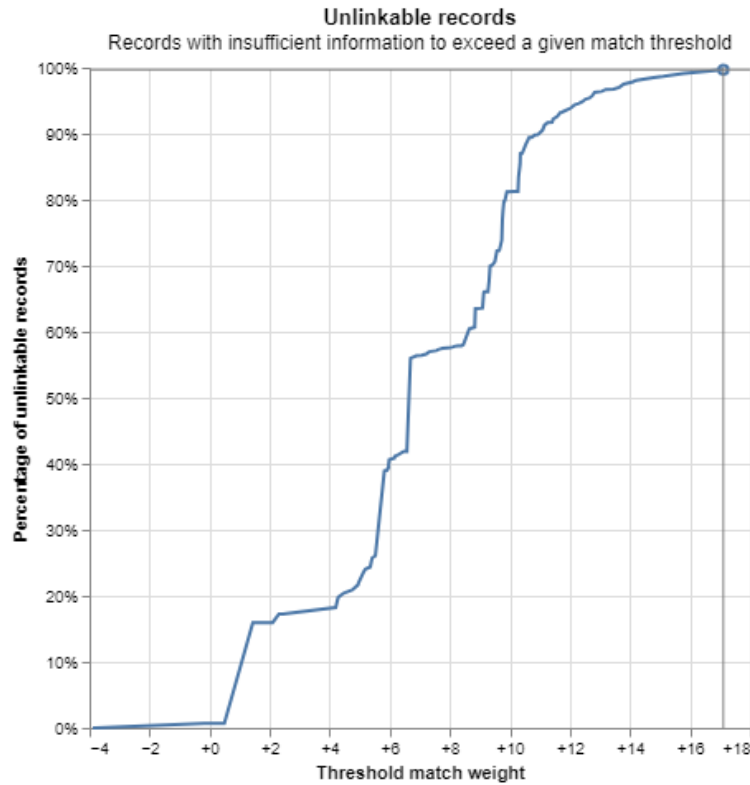


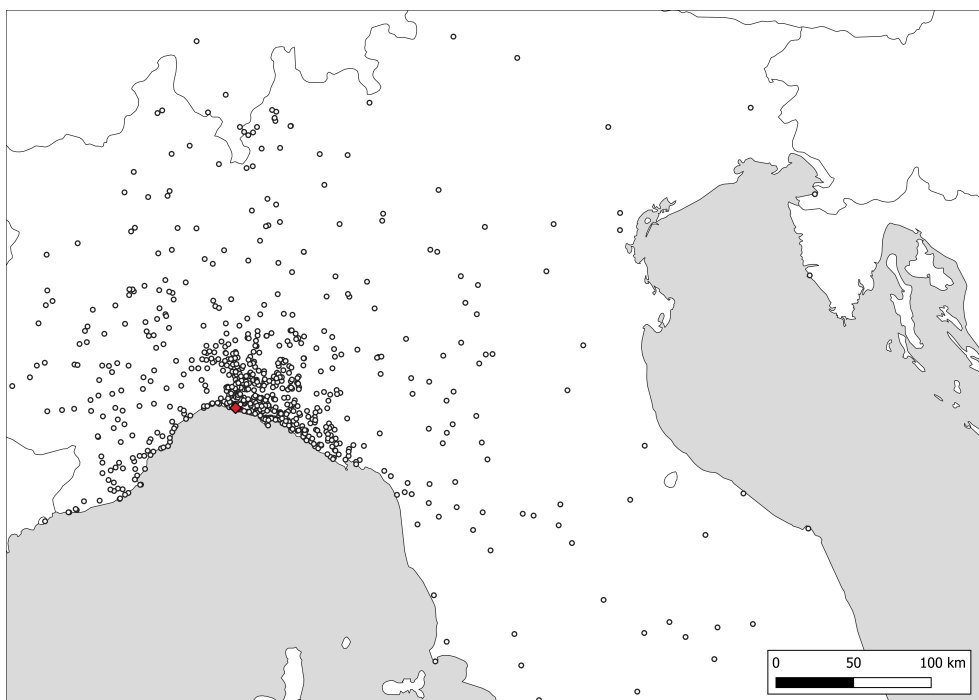
Figure A3: Share of records with insufficient information to exceed given match thresholds.

A.5 Reconstruction of geographic origins

The expansion of the Genoese economy in the fifteenth and sixteenth centuries - particularly in the textile trades - drove urbanisation and attracted hundreds of workers from across the Republic and beyond. The heterogeneous geographic origins of this workforce are reflected in the apprenticeship contracts and, consequently, in my dataset.

Out of more than 8,000 contracts, 5,874 contain explicit information on the place of origin of the apprentice. The most direct indication is residence at the time of contract stipulation, though this appears in only 15 per cent of cases. In early modern Genoa, last names (*cognomina*) had the precise scope of indicating the place of origin of an individual and her family. They typically consisted of a toponymic element preceded by the prefix “de” (e.g. de Montobio, de Savignono, de Novi). Some included additional patronymic or locative elements (Aycardus, Ricius, Bottus). In the former case, the toponymic reference could become simplified as migrants settled in the city - for example, “de Montanario de Rovereto” might later stabilise as “de Montanario”. The existing literature (Casarino et al. 1979; Ghiara 1991) confirms that in the Republic of Genoa, last names were stable for at

Figure A4: Geographic origins of apprentices in Genoa



Notes: Each dot marks a distinct municipality from which apprentices originated, illustrating the large geographic reach of the Genoese apprenticeship network. The red diamond corresponds to Genoa, highlighting its role as the main destination for apprentices in the region.

least two generations and were uniformly attributed to all family members

Reconstructing the link between a place of residence or a last name as mentioned in the source and the underlying geographical entity is a fundamental prerequisite to carry out more sophisticated historical-spatial analyses in a GIS (Geographical Information System) environment³⁷. This task was articulated in several stages. The first one involved attaching coordinates to places of residence by translating the original lemma from Latin and using GeoNames to geo-reference them. With the names of unfamiliar small settlements, on the contrary, it was first necessary to identify the place, also considering its ancient name in the vernacular language. To recognise the rarest toponymics forms, use was made of secondary sources (Bezzina 2015; Ghiara 1991) and historical cartography - mostly using digital collections³⁸. Where surnames provided the only indication of origin, I matched them to geographic entities whenever possible, prioritising the first element of the name and then subsequent components. When the first element of the last name did not contain

³⁷On this process, see Cossu (2022)

³⁸Available online at <https://ianua.arianna4.cloud/>

any geographic indication, I checked whether it was the case for the second element or the following ones. This procedure yielded geographic attributions for 4,015 out of 4,876 distinct surnames.

The resulting georeferenced dataset provides the basis for the spatial analyses presented in Section 3. As shown in Figure A4, apprentices were drawn not only from Genoa and its immediate hinterland but also from more distant regions. A significant share came from the Levante coast and from the Oltregiogo in the northern part of the Republic. Others came from beyond Genoese territory, notably from the Duchies of Milan and Savoy. These findings underscore the role of apprenticeship as a channel of migration into Genoa and highlight the city's position as a regional hub for labour mobility.

B Additional results and alternative regression specifications

B.1 Guild flexibility and contractual adaptations

In theory, guilds may have relaxed institutional constraints following the economic contraction of the 1470s, leaving a greater space for bilateral negotiation or departures from standard training norms. In this Appendix, I try to proxy institutional flexibility using the intra-guild dispersion of apprenticeship contract lengths, measured through the Herfindahl–Hirschman Index (HHI). Following Ogilvie (2019), who argues that guilds varied significantly in their ability to enforce rules, I interpret a higher intra-guild dispersion as evidence of greater space for bilateral negotiation. The underlying logic is that tightly clustered contract lengths reflect strict enforcement of standard terms, whereas greater variation suggests tolerance or incapacity to prevent contractual heterogeneity.

Figure B1: Apprenticeship contract lengths in the top 5 guilds, pre vs. post 1470

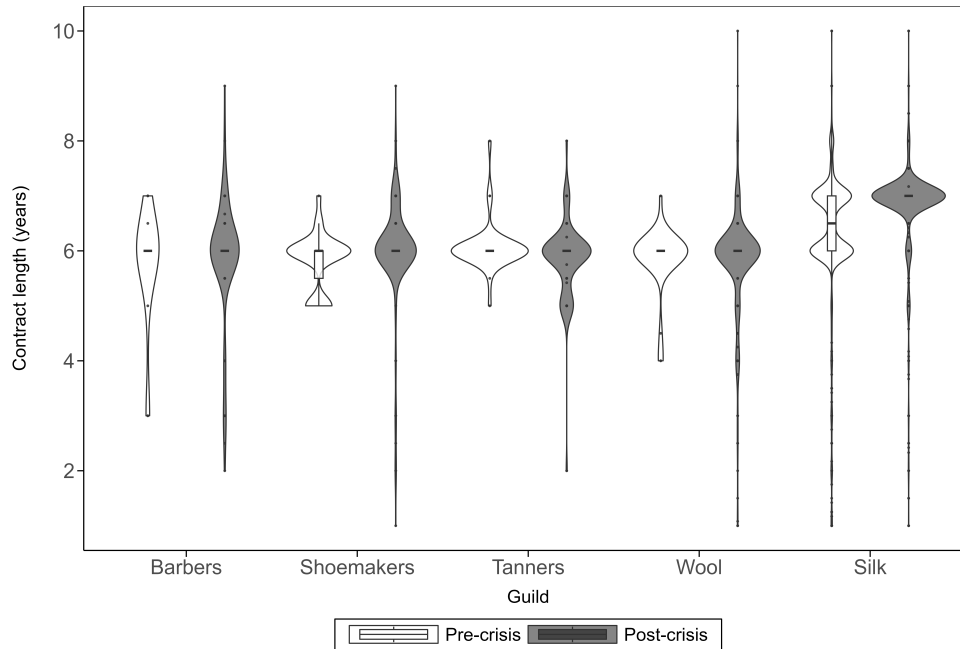


Figure B1 shows the distribution of contract lengths in the five largest guilds in Genoa before and after the 1470s crisis, confirming a clear broadening of contract lengths post-crisis in several guilds. This is consistent with the idea presented in the main text (Section 2) of greater institutional flexibility in times of economic stress.

Table B1 presents the HHI values in contract length for the ten largest guilds before

and after the 1470s crisis. The difference column (Δ) highlights changes in intra-guild dispersion, with negative values indicating increased heterogeneity post-crisis and positive values indicating greater clustering.

Table B1: Dispersion in contract length before and after the crisis for the top 10 guilds.

Guild	HHI		
	Pre-1470	Post-1470	Δ
Apothecaries	0.78	0.70	-0.08
Bakers	0.25	0.29	0.04
Barbers	0.45	0.45	-0.01
Furriers	0.68	0.65	-0.03
Joiners	1.00	0.63	-0.37
Shoemakers	0.47	0.54	0.07
Silk	0.31	0.66	0.36
Tailors	0.48	0.55	0.07
Tanners	0.75	0.44	-0.31
Wool	0.75	0.51	-0.24

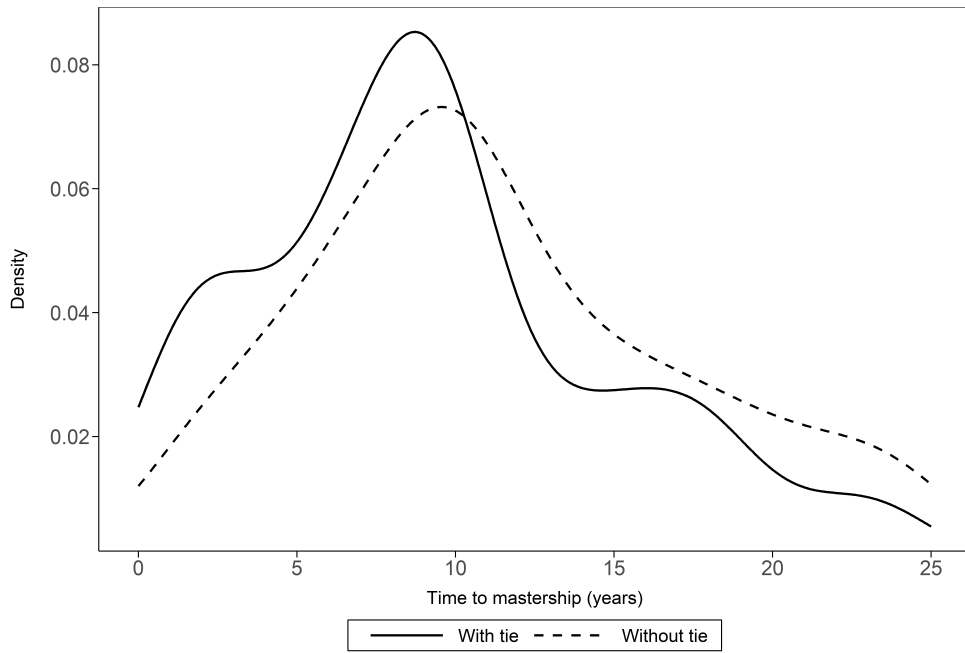
Overall, the post-crisis period seems to be characterized by increased variation in contract lengths across multiple guilds in Genoa, as reflected by negative Δ values in Table B1. Taken together, the figure and table indicate that guilds exercised measurable flexibility in the aftermath of the 1470s crisis. Instead of uniformly enforcing rigid institutional rules, several guilds allowed or were unable to prevent greater contractual heterogeneity.

B.2 Time to mastership

A different angle to study the impact of ties within the guild system is the time required to achieve mastership. In Figure B2, I show the evolution of the time to mastership for apprentices in Genoa, distinguishing between those with pre-existing ties to the guild from those without such connections. The figure reveals a pronounced leftward skew among apprentices with ties, indicating that these not only reached master status more frequently, as shown in Section 4, but also did so over a shorter time horizon.

It is important to interpret these estimates with caution. Time to mastership is inferred from the first recorded appearance of an individual as a master rather than from precise contractual data. As a result, it may underestimate the actual time for some apprentices, particularly when formal registration of the first contract as a master was delayed or incompletely recorded. For this reason, these results are not included in the main text, but they

Figure B2: Distribution of the time to mastership



Notes: Distribution of time to mastership for apprentices in Genoa. “With ties” refers to apprentices who either had a kinship tie with their master or whose father/guarantor belonged to the same guild.

remain informative for understanding general patterns of career progression.

The pattern in Figure B2 is consistent with two complementary mechanisms. First, as shown in the main text, apprentices embedded in networks - through family, kinship, or other connections, appear to have benefited from preferential access to advancement opportunities. At the same time, ties seem to have accelerated as evidenced by the clustering of connected apprentices at the lower end of the time-to-mastership spectrum. This pattern suggests that guild networks functioned not only as entry facilitators but also as channels for faster professional advancement.

These findings point to a segmented apprenticeship market, with some similarity with frameworks proposed for both contemporary and pre-industrial labor markets (De Vries 1994). Apprentices with ties effectively participated in a “primary” networked market, characterized by higher chances of promotion and an accelerated advancement. Those without ties operated in a more fragmented “secondary” market, facing longer apprenticeships, greater variability in outcomes and, ultimately, lower probabilities of reaching mastership.

These findings complement my results on Genoese guilds highlighted in the main text, where access to mastership and subsequent career progression often depended on kinship

and professional networks. Similar dynamics have been documented in other pre-industrial urban labour markets, where network membership not only facilitated initial entry but also promoted retention and rapid advancement within the craft hierarchy (Buscemi 2024; García-Zúñiga and López-Losa 2021; Lombardo 2001). In the Genoese context, this implies that the guild system did not merely enforce formal rules regarding training and apprenticeship length but also operated as a conduit for reproducing social and professional advantages across generations.

B.3 Regression table with robust standard errors

As a complement to Table 5, Table B2 reports the same set of probit specifications but estimated with heteroskedasticity-robust standard errors that are not clustered at the guild level. Results remain consistent with the clustered estimates in the main text, suggesting that the findings are not driven by the choice of clustered versus non-clustered inference.

Table B2: Determinants of access to mastership, Genoa 1460–1510

	Promotion to mastership					
	(1)	(2)	(3)	(4)	(5)	(6)
Kinship tie with the master	0.027*** (0.009)	0.028*** (0.009)	0.027*** (0.008)	0.028*** (0.008)	0.041*** (0.012)	0.029*** (0.009)
Father in same guild	0.029*** (0.009)	0.030*** (0.009)	0.028*** (0.009)	0.027*** (0.009)	0.013 (0.017)	0.029*** (0.009)
Kinship tie with the guarantor	0.006 (0.005)	0.010 (0.007)	0.008 (0.006)	0.009 (0.006)	-0.008 (0.018)	0.008 (0.007)
Guarantor in same guild	0.012* (0.006)	0.011* (0.006)	0.010 (0.006)	0.011* (0.006)	0.011 (0.020)	0.015** (0.007)
Father mentioned in the contract		-0.007 (0.007)	-0.006 (0.006)	-0.005 (0.006)		-0.004 (0.007)
Experienced master		-0.002 (0.005)	0.001 (0.005)	0.002 (0.005)	0.001 (0.007)	0.001 (0.005)
Genoese						0.002 (0.006)
Time FE	N	N	Y	Y	Y	Y
Guild FE	N	N	N	Y	Y	Y
Observations	6,513	6,513	6,513	6,198	2,426	5,557
Sample mean of outcome	0.041	0.041	0.041	0.042	0.043	0.043
R ²	0.01	0.02	0.03	0.05	0.08	0.06

Note: The dependent variable is a binary indicator equal to one if the apprentice later appears as a master. Coefficients are average marginal effects from probit regressions. Robust standard errors are shown in parentheses. ***Significant at 99%, **Significant at 95%, *Significant at 90%.

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