Two is Company, N is a Crowd? Merchant Guilds and Social Capital*

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Abstract

The paper revisits the rationale for the emergence of merchant guilds within a competitive setting accounting for the dynamic incentives of merchants. Differently from previous literature, we focus on the role of local merchant guilds rather than that of alien guilds and investigate a number of hitherto neglected empirical observations concerning their organization. In particular, focusing on the role played by monitoring technologies, instead of capital-constraints, the simple model we develop delivers predictions about guild size, membership restrictions, and their welfare implications. As we show, these are consistent with the available historical evidence, and shed new light on the role of the guilds' social capital. Moreover, our analysis also provides a theoretical framework capable of accounting for the basic trade-offs involved when a polity's ruler faces the choice of granting recognition to a single or multiple guilds. This helps understanding the observed distribution of guilds, and provides a rationale for the establishment of both *local and alien* merchant guilds. Therefore, the paper reconciles, to some extent, the different views put forward in the existing literature.

Keywords: merchant guild, social capital, collusion, political economy, trade, taxation.

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1. Introduction

Since the pioneering work by Greif, Milgrom and Weingast (1994) (henceforth GMW), merchant guilds have attracted considerable attention by economists, and for good reason: this celebrated historical institution, which dominated trade for several centuries, has been portrayed by GMW as an important foundation for the medieval Commercial Revolution; it has also been viewed by many as a shining example of *social capital*[1], bringing major economic and social benefits - suggesting a very valuable potential role for such social capital even in modern (e.g. development or transition) economies.[2] In preliminary, never published work with a historian (Dessi and Ogilvie, 2003), one of us found little support in the historical evidence for this very positive view of merchant guilds and their social capital.

Our paper has two main goals. First, we wish to shed new light on the reasons for the emergence of merchant guilds, and on the role played by these guilds. Second, we wish to comment on the implications of our analysis for the debate over social capital. As we will show, the guilds' social capital[3] was indeed fundamental to their role, and did generate some efficiency gains. On the other hand, achieving and sustaining these gains required greater inequality: the benefits were concentrated among a subset of the population, while the remainder were excluded from them. Our analysis therefore highlights a trade-off between the *efficiency* and *equity* implications of the guilds' social capital. This may be just as relevant to various forms of "group" social capital in modern economies.[4]

Why did merchant guilds emerge? GMW were the first to present a theoretical model that addresses this question. In their model, individual alien merchants trading in a medieval polity were potentially vulnerable to attacks and expropriation. This made it impossible to sustain efficient trade in the absence of a credible commitment by the polity's ruler to provide commercial security. GMW argued that merchant guilds emerged as a solution to this commitment problem: by organizing themselves in associations which could enforce effective trade embargoes in response to misbehavior by rulers, merchants

[1] See for example Putnam et al. (1993).

[2] On this see Bardhan (1996), Dasgupta (2000), Raiser (2001) and Stiglitz (1999).

[3] Social capital has been defined in a variety of ways (see, among others, Bourdieu,1986; Coleman, 1990; Dasgupta and Serageldin, 2000; Glaeser, Laibson and Sacerdote, 2002; Lin , 2001; Putnam, 2000; as well as Sobel, 2002 for an excellent discussion). When applied to groups or networks, such as merchant guilds, the notion of social capital typically refers to cohesion and trust among members, and to their resulting ability to enforce group norms and engage in effective collective action. This is the notion we adopt in the present paper; we shall sometimes refer to it explicitly as "group" social capital - when comparing with other definitions - or simply as social capital.

[4] Our notion of "group" social capital differs of course from the notion of social capital as civic engagement and generalised trust. The distinction is similar to the one between "bonding" and "bridging" social capital in the sociology literature (e.g. Putnam, 2000).

were able to obtain commercial security. Moreover, rulers were willing to support such organizations of alien merchants precisely because they made it possible to sustain efficient trade. In this way, merchant guilds contributed to the expansion of trade in the late medieval period, and were beneficial for the whole economy.

Thus GMW developed a theory of *alien merchant guilds*; that is, associations of alien merchants supported by the rulers of the polities in which they traded. Historically though, most merchant guilds emerged as *local merchant guilds*, i.e., associations of local merchants that obtained recognition and privileges (including monopoly power over local trade) from their local rulers. Alien merchant guilds were typically formed by the members of local merchant guilds who were active in long-distance trade, and remained under the control and supervision of the guilds from the merchants' polities of origin. Moreover, only a subset of local merchant guilds went on to form such foreign 'branches', primarily in the main international trade centers.

Building on these observations, Dessi and Ogilvie (2003) developed a model of *local* merchant guilds, in which local rulers grant recognition and privileges to associations of local merchants in order to maximize their fiscal revenue from trade. In their model, giving monopoly power over local trade to a guild, in return for an appropriate transfer, yields a higher revenue than hiring a local agent to collect taxes on trade. The reason is that the agent, who has better information than the ruler concerning local demand shocks, will be able to earn informational rents ex post; moreover, he is assumed to be capital-constrained and hence unable to pay for these expected rents ex ante. In contrast, it is assumed that a sufficiently large group of merchants, by pooling their resources, will be able to pay the required ex-ante fee to the ruler, who can therefore extract all the surplus from trade. While there is indeed considerable historical evidence that medieval tax-collectors were often capital-constrained, it might be argued that this problem could have been solved through associations of tax-collectors rather than merchant guilds.

The basic model we present in Section 3 builds on the analysis of Dessi and Ogilvie but departs from it in several important ways. First, we do not assume that agents are capital-constrained (neither tax-collectors nor merchants), focusing instead on the role of monitoring technologies. Thus our explanation for the emergence of merchant guilds does not require potential tax-collectors to be capital-constrained, although the case for merchant guilds would only be strengthened by allowing for such constraints. Second, we model the dynamic incentives of individual merchants, in the presence of merchant guilds as well as in their absence. In this respect our analysis also differs from the one developed by GMW, enabling us to derive predictions about guild size, membership restrictions, and their welfare implications. As we show, these are consistent with the available historical

evidence, and shed new light on the role of the guilds' social capital. Third, we go on to study, in Section 5, the basic trade-off involved in choosing between having a single guild or multiple guilds. This helps us to understand the observed distribution of guilds, and provides a rationale for the establishment of both *local and alien* merchant guilds.

Our model examines the dynamic game between a large number of potentially active merchants and the ruler of a medieval polity. In the absence of merchant organizations, the ruler hires a local agent to monitor local trade and collect taxes on realized revenues from this trade. Since the agent is not capital-constrained, it is optimal for the ruler to delegate taxation to the agent in return for an appropriate transfer. The agent is then motivated to monitor and collect the revenue-maximizing taxes on trade. In each period, merchants individually decide whether to collude, deviate, or punish deviations (compete à la Bertrand), in the spirit of Rotemberg and Saloner (1986). Our first result is that *collusion among merchants is helped by the presence of the tax-collector.* The reason is that higher profits are taxed more, thereby reducing the potential gain from deviation.

However, the tax-collector regime is costly because the tax-collector has to be induced to monitor. If collusion among merchants can be sustained in the absence of a tax-collector, the ruler can increase his revenues by granting a monopoly over local trade to an association ("guild") of merchants, in return for a transfer. Indeed, this is exactly what happened in very many polities. For this to work, *the number of merchants belonging to the guild cannot exceed an endogenous threshold level* $\overline{n}(\delta)$, since increasing membership beyond this threshold would reduce each member's share of current and future collusive profits too much relative to the static gain from a deviation, making it impossible to sustain collusion in any state. It is interesting to compare this result with the GMW model, where it is always optimal to include all potentially active merchants in the guild, to ensure that no merchant chooses to trade (with the ruler's wholehearted support!) when the guild announces an embargo. Dessi and Ogilvie's analysis, on the other hand, only yields a lower bound on guild size, due to the need for capital; there is no upper bound. In contrast, our result provides a rationale for the restrictions on membership that were often imposed by guilds. At the same time, in our model guild membership cannot fall below a second threshold $\underline{n}$, because a very small number of guild members would not be able to monitor effectively and hence prevent the potential (unofficial and forbidden by the ruler) trading activities of the many excluded merchants. This second threshold will obviously depend on a variety of exogenous characteristics of the polity, including the size and geographical distribution of the population. It will also depend on the degree of trust and cohesion among guild members, and the extent to which they are able to overcome free-riding incentives and cooperate to monitor effectively - in other

words, on their social capital.

We therefore obtain two results concerning the ruler's choice between the tax-collector regime and the guild regime. For sufficiently *high values of the discount factor δ, the ruler always prefers the guild regime*: Intuitively, it is easier to sustain collusion in the guild regime when merchants are more patient. For *lower values of the discount factor, the choice will depend on the relative efficiency of the tax-collector's and the guild's monitoring technologies*. When the guild regime is chosen, the ruler and the guild bargain over how to share the resulting surplus. In particular, although the ruler will obviously obtain at least as much revenue as under the tax-collector regime, the guild may be able to secure a strictly positive share of the surplus. This will be the case when its members have sufficient cohesion (social capital), and there is no easy replacement for the guild. In the presence of membership restrictions, the result will be that a subset of potentially active merchants, the members of the guild, will be able to trade and earn strictly positive rents, while the remainder will be excluded from trade and obtain only their reservation utility. This illustrates the implications of the guild's social capital for equity and efficiency: in terms of efficiency, more social capital increases the guild's monitoring ability, which may help to sustain efficient collusion, and avoid the need for costly monitoring by the tax collector. In terms of equity, more social capital reduces the guild's minimum size, while increasing its bargaining power; this results in higher inequality between (possibly fewer) guild members and (possibly more numerous) excluded merchants.

The historical evidence, discussed in Section 2, shows that in some cases rulers granted recognition and privileges to more than one guild; for example, to a local merchant guild and to one or more alien merchant guilds. Existing theoretical models offer no explanation for this: both GMW and Dessi-Ogilvie predict that it is optimal for the ruler to recognize a single guild. In Section 5, we extend our analysis to study the trade-off faced by the ruler in choosing between recognizing one or two guilds. This is based on two main effects. The first is the effect on monitoring efficiency: by allowing each guild to target its monitoring so as to exploit its informational comparative advantage, recognizing two guilds instead of one may generate "economies of scale" in monitoring. This in turn relaxes the minimum size constraint for each guild, making it easier to provide the *individual* incentives required to sustain efficient collusion. The second effect concerns instead the *collective* incentives of the members of each guild, in the presence of multiple guilds. A key variable here is the probability θ that the two guilds recartelize following a deviation: the higher this probability, the harder it is to sustain collusion. We therefore find that rulers are more likely to grant recognition and privileges to multiple guilds when θ is lower, and when guilds are endowed with substantial social capital. This result may help to explain why

the establishment of a single guild of local merchants was the norm, while additional guilds of alien merchants were able to obtain recognition and privileges in a number of polities, and notably in important centers of international trade such as Constantinople or Bruges. Intuitively in the latter cases, national and cultural homogeneity within each of the guilds helped to generate the required internal cohesion and social capital, while heterogeneity across guilds made it difficult for trust to be restored after a deviation, reducing the probability of recartelization.

The paper is organized as follows. The remainder of this Section discusses the relationship with the existing literature. Section 2 reviews the historical evidence on merchant guilds. Our baseline model is introduced in Section 3. We then study the choice between the tax-collector regime and the guild regime in Section 4. The trade-off between establishing one or two guilds is examined in Section 5. Our concluding remarks are contained in Section 6.

1.1. Relationship to the literature

Beyond the literature on merchant guilds in economics, discussed in detail above, this paper is clearly related to two other important literatures. First, the literature on collusion in oligopolies. Our paper is closest in spirit to Rotemberg and Saloner (1986); we adapt their analytical framework to model the dynamic interaction between merchants. Although the baseline model developed in Section 3 does not bring new economic insights to the collusion literature, but it is rather used as a tool to explain the available historical evidence, an addition to this body of work is surely made by the extended model developed in Section 5, where the optimality of two cartels in a market is driven by the scale economies in the monitoring technology that the presence of more than one association of merchants may generate.

Second, our paper is obviously related to the literature on social capital. An important strand of this literature has studied the link between trust and economic outcomes: trust appears to be positively correlated with economic growth (Keefer and Knack, 1997, Knack and Zack, 2001) and with judicial efficiency (La Porta, Lopez-de-Silanes, Shleifer and Vishny, 1997). The determinants of trust (and trustworthiness) at the individual level have also been investigated (Alesina and La Ferrara, 2002, Glaeser, Laibson, Scheinkman and Soutter, 2000), as well as the determinants of participation in social activities in more or less heterogeneous communities (Alesina and La Ferrara, 2000). Yet another approach has been developed by Guiso, Sapienza and Zingales (2004), who study the link between social capital and financial development, using electoral participation and blood donation as measures of social capital. These studies have focused primarily on generalized trust

and civic engagement, which correspond broadly to the notion of "bridging" social capital used by sociologists. Our paper differs in this respect by focusing instead on an example of "group" social capital, closer to the sociologists' notion of "bonding" social capital. A key issue of interest here, of course, is the relationship between these two forms of social capital. Indeed, some of the very positive views that have been expressed about merchant guilds' social capital might be interpreted as positing a substantial degree of complementarity between the two (e.g. Putnam et al., 1993). Our theoretical analysis, on the other hand, suggests the opposite, and is consistent with the historical evidence reviewed in Section 2.

2. The historical evidence

This section reviews the historical evidence on merchant guilds, which will motivate our analysis. The evidence is discussed under five main headings as follows:

2.1. Origins of merchant guilds

Most merchant guilds emerged as associations of *local* merchants. These *local merchant guilds* were ubiquitous in medieval Europe, and were supported by their local rulers, who granted them official recognition and a variety of important privileges, including monopolies over local trade.[5] Some of these local merchant guilds then established foreign branches ("colonies" and "consulates") in important trade centers[6], when a significant number of their members engaged in long-distance trade. However, while very many European towns had a local merchant guild (in England alone, for example, there were over one hundred towns with a local merchant guild[7]), only a small subset of these towns established colonies or consulates in the main international trade centers.[8] These *alien merchant guilds* were closely linked to the local merchant guilds of their polities of origin, on whom they depended for their internal rules and governance, as well as for external

[5] See Bernard (1972), p.304; Dilcher (1984), pp. 72-76; Ehbrecht (1985), pp. 430, 449; Racine (1985), pp. 131-132, 134-138; Schulz (1985), p.411; Schütt (1980), p.79. The privileges granted to local merchant guilds are discussed below.

[6] See Planitz (1940), p.19; Racine (1985), pp.134-5; Schütt (1980), p.79; Woodward (2003), p.1.

[7] See Gross (1890), pp.9-20, for a list of all those for which there is explicit documentary evidence, many dating back at least to the eleventh and twelfth centuries. The actual number is likely to have been even greater, implying that by the thirteenth century, local merchant guilds were "one of the most prevalent and characteristic features of English municipalities." (p.22).

[8] On this see, among others, Bernard (1972), pp.299, 304-5; Epstein (2000), pp.27-9; Johanek (1999), pp.72, 76-7; Laiou (2000), pp.811-3; Prevenier (2000), pp.581-2.

recognition.[9]

2.2. Recognition and privileges

Local merchant guilds throughout medieval Europe obtained from their rulers a variety of privileges enabling them to restrict competition and secure rents. These privileges were sometimes granted as part of charters given to towns, which also gave the towns a degree of political, administrative and financial autonomy. This was the case in England, where many such town charters contained "a clause similar to the following: 'We grant a Gild Merchant with a hanse and other customs belonging to the Gild, so that [or 'and that'] no one who is not of the Gild may merchandise in the said town, except with the consent of the burgesses"'(Gross, 1890, p.8). Thus English local merchant guilds were granted the right to *exclude any non-member from trade*. In continental Europe, the granting of monopoly privileges to local merchant guilds was not always linked to the granting of greater political autonomy to towns. A good example is the guild of the *mercatores aque* ("water merchants") in Paris: in 1170, the French king, Philip Augustus, "granted them a virtual monopoly of the Seine traffic between the bridges of Paris and Mantes".[10] Yet under Philip Augustus, "Unlike those of most towns in the royal domain, the bourgeois of Paris were permitted no semblance of autonomy".[11]

The privileges granted to local merchant guilds in many medieval European cities meant that *alien* merchants could be either excluded from trade[12], or allowed to trade only subject to a number of restrictions clearly intended to favor local merchants. Among the most common of these restrictions were "staple" rights and brokerage rights. Local guilds' "*rights of staple*" meant that alien merchants had to bring their merchandise to municipal warehouses where members of the local merchant guild could buy them at favorable prices.[13] Local guilds' *brokerage rights* meant that alien merchants could not trade directly with consumers or with other alien merchants: they had to use members of the local merchant guild as intermediaries (brokers).[14] Local merchant guilds often enjoyed several of these privileges: for example, the local merchant guilds in cities such

[9]See Abulafia (1986), pp.530, 537-8; Abulafia (1997), pp. 54-5; Abulafia (2000), pp.660-1; Ashtor (1983), pp.13, 68-9, 78, 149, 411; Blom (1984), pp.20, 25; Choroskevic (1996), pp.71-2, 78, 86.

[10]Baldwin (1986), p.348.

[11]Baldwin (1986), p.349. See also Luchaire (1902), p.239.

[12]See Hibbert (1963), pp.169-74; Irsigler (1985), p.59; Leguay (2000), p.121; Planitz (1940), p.25; Postan (1973), pp.189-91; Reyerson (2000), pp.59-60; Schultze (1908), pp.498-502, 506, 523, 526-7; Spufford (2000), p.177.

[13]Bernard (1972), p.302; Kuske (1939); Reyerson (2000), p.58; Schultze (1908), p.500; Volckart and Mangels (1999), p.444.

[14]Bernard (1972), p.302; Choroskevic (1996), pp.84-6; Hibbert (1963), p.170; Schultze (1908), pp.498-502, 506, 523, 526-7; Spufford (2000), p.177.

as Bruges and Cologne enjoyed both staple rights and brokerage rights.[15] At the same time, local merchant guilds could also exclude from trade *local* individuals who were not members of the guild.[16]

2.3. Taxation and transfers

Local merchant guilds were granted exemptions from a variety of tolls and other taxes, and made regular direct transfers to their rulers.[17] Moreover, the transfers did not vary systematically with the profitability of trade, which is consistent with the model we develop in Section 3. In England, for example, the same town charters that granted legal recognition and monopoly privileges to the local merchant guild generally granted exemptions from all tolls and other taxes, in exchange for a fixed sum or farm (*firma burgi*) to be paid annually by the town to the ruler.[18] While local guild members enjoyed the right to trade freely and were generally exempt from all tolls, "unfranchised merchants, when allowed to practise their vocation, were hemmed in on every side by onerous restrictions. Of these the most irksome was probably the payment of toll on all wares that they were permitted to buy or sell."[19] Membership of the local merchant guild also carried obligations of course, notably participation in the town's assessments and payment of pecuniary charges - which ensured that the *firma burgi* was duly paid and the privileges granted in the charter maintained.[20]

A similar pattern can be observed in France: one of the earliest examples is the town of St. Omer, which obtained freedom from all tolls and other taxes in 1128 in return for a fixed annual sum or farm.[21] The local merchant guild in St. Omer enjoyed a variety of monopolistic privileges and contributed to the provision of local public goods.[22] In Spain, local merchant guilds made regular payments to the ruler in return for their privileges, obtained exemptions from tolls, and collaborated in the collection and administration of

[15] Bahr (1911), pp.21-2; Daenell (1905), p.14; Kuske (1939), pp.40-1; Prevenier (2000), p.593.

[16] Postan (1973), pp.189-91; Schütt (1980), p.121. For some detailed examples, see Planitz (1940), pp.25-8, on the Flemish local merchant guild in Ghent and the French local merchant guild in Valenciennes; Schulze (1985), pp.379-81, on the German local merchant guild of Stendal; Schütt (1980), pp.398-9, on the German merchant guild of Halberstadt; Woodward (2003), p.3, on Catalan and Aragonian local merchant guilds.

[17] For examples see, among others, Ehbrecht (1985), pp.425-6, on Germany; Freshfield (1938), p.17 and Racine (1985), p.139, on Constantinople; Hoffmann (1980), p.49, on Denmark; Racine (1985), pp.135-6, on Italy; Schütt (1980), pp.112-21, on Sweden.

[18] Gross (1890), pp.6-7.

[19] Gross (1890), p.43.

[20] Gross (1890), pp.53-4, 57.

[21] Lyon and Verhulst (1967), p.31.

[22] See Dilcher (1984), p.70; Hilton (1992), p.90; Irsigler (1985), pp.57-8; Kemble (1876), p.533; Planitz (1940), p.21.

taxes on trade.[23]

2.4. Guild norms, monitoring and sanctions

There is plenty of evidence that merchant guilds enforced their privileges, and established collective norms enabling them to restrict competition and secure rents.[24] In tenth-century Constantinople, for instance, local guild members were required to pool their resources and make purchases as a cartel.[25] Constantinople was unusual in having more than one local guild, but the local guilds specialized in trading different commodities and were not in competition with each other, which is consistent with the model we develop below. Indeed, the importance they attached to restricting competition is illustrated by their regulations; for example, the guild of raw-silk dealers required its members not to "sell unworked silk in their homes but in the market", and not to sell to other merchants for resale outside the city. Moreover, alien merchants were not allowed to spend more than three months in Constantinople.[26]

In England, Gross (1890) describes how alien merchants coming to trade in English towns "were carefully watched, lest they should sell or buy under colour or cover of a faithless gild-brother's freedom, the latter being expelled from the fraternity or otherwise severely punished, if found guilty of this offence"(p.48). Monitoring played a key role in enforcing compliance with guild norms both at home and in other polities. For example, the statutes of the merchant guild of the Italian town of Piacenza describe the duties of the consuls of the colony of merchants from Piacenza in Genoa: these include monitoring and collecting fines imposed by the merchant guild in Piacenza.[27] The same statutes also specify that in any colony where there are at least three merchants from Piacenza, two consuls must be elected![28]

Merchant guilds throughout medieval Europe employed a variety of sanctions against members who violated guild norms, ranging from fines to exclusion from the guild, confiscation of property and imprisonment.[29] Exclusion was both economic and social; for example, "For very serious offences the gildsmen of Andover fulminated a decree of ex-

[23] Smith (1940), pp.48, 61-5, 86; Woodward (2003), pp.3-4.

[24] On this see, for example, Bateson (1899), pp.205-7; Bernard (1972), p.320; Dilcher (1984), p.70; Freshfield (1938), pp.16-17, 19-22, 28-9; Irsigler (1985), pp.57-8; Planitz (1940), p.21; Racine (1985), p.139; Schulze (1985), pp.379-80.

[25] Lopez and Raymond (2001), p.21-22.

[26] Lopez and Raymond (2001), p.21-23.

[27] Racine (1979), p.307.

[28] Racine (1979), p. 307.

[29] See Ashtor (1983), p.415; Bateson (1899), pp.205-7; Choroskevic (1996), pp.74, 84-6; Freshfield (1938), pp. 16-7, 19-22, 28-9; Moore (1985), p.298; Racine (1985), p.139; Schulze (1985), pp.379-80; Schütt (1980), pp.112-21; Volckart and Mangels (1999), p.440.

communication against the erring brother - commanding 'that no one receive him, nor buy and sell with him, nor give him fire or water, nor hold communication with him, under penalty of the loss of one's freedom."' (Gross, 1890, p.32).

2.5. Exclusive membership

Did local merchant guilds restrict membership? The answer is yes: membership was often contingent on having "citizenship" or "burgess" or "free" status, from which many were excluded.[30] As towns grew, attracting large numbers of rural immigrants, this exclusion affected an increasing number of urban inhabitants. In England for instance, "big towns had populations most of whose members were not 'free' - two thirds, for example in late-thirteenth-century London, a half in Oxford and more than three quarters in Exeter"(Hilton, 1992, p.92).

A key requirement for membership of local merchant guilds was the payment of entry fees and a variety of dues[31], which is consistent with the model we develop in Section 3. This implied the exclusion of those who could not afford to pay the, often substantial, entry fees, or who were unable to provide the required guarantees: "To become a gildsman...it was necessary to pay certain initiation-fees...The new comer was also required to produce sureties, who were responsible for the fulfilment of his obligations to the Gild - answering for his good conduct and for the payment of his dues".[32] The historical evidence makes it clear that many of the towns' inhabitants could not meet these requirements.[33] Moreover, admission to local merchant guilds was sometimes controlled by requiring that the potential new member be approved by a majority of existing members, and this requirement appears to have been used to restrict membership.[34]

In sum, local merchant guilds excluded an increasing proportion of the urban population, notably the least wealthy.

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[30] See Dilcher (1985), pp.88-9; Epstein (2000), pp.35-6; Leguay (2000), pp.110-1, 121-2; Schultze (1908), 475, 490-3; Schütt (1980), p.131.

[31] For examples see Ehbrecht (1985), p.445, on entry fees for the German merchant guild of Goslar; Dilcher (1984), p.69, and Volckart and Mangels (1999), pp.437-8, on dues levied by the Flemish merchant guild of Tiel; Schütt (1980), pp.112-21, on the dues levied by the Swedish merchant guild of Flensburg; Störmer (1985), pp.366-7, on entry fees for the Austrian merchant guild of Laufen; Origo (1986), p.44, on entry fees for the Italian merchant guild of Prato.

[32] Gross (1890), p.28.

[33] See Hilton (1992), p.92; Schultze (1985), pp.379-81.

[34] See Smith (1940), p.38.

3. The baseline model

This section introduces our model. We consider a medieval polity with three types of player: a ruler, merchants, and a tax-collector. For simplicity, they are all assumed to be risk-neutral.

Merchants: There is a large number N of identical individual merchants who can sell a homogeneous good. They play an infinite horizon game so that in each trade period, throughout denoted by $\tau \in (1, .., +\infty)$, a collusive, deviation or punishment phase takes place. The static (market) game is a reduced form of Bertrand competition: in each trade period τ merchants set prices simultaneously and, given the market demand, they produce at constant marginal costs, which are normalized to zero for simplicity. The dynamic version of the game follows Rotemberg and Saloner (1986). In an 'efficient' collusive phase, that is when all merchants charge the monopoly price, each earns a per-period profit equal to π^τ/N, while each earns 0 if not colluding, i.e., if all price at marginal cost.[35] The profit that a merchant makes by deviating from an efficient collusive agreement is equal to π^τ, so that unilateral deviations from a cartel are profitable in a static sense and yield a revenue π^τ.[36] The variable π^τ can be interpreted as a measure of the total market size. In each period, it is determined by the realization of a random variable, $\widetilde{\pi}^\tau$, which is identically and independently distributed over time (iid) with continuously differentiable cdf $F(\pi)$ drawn on the compact support $\Pi \equiv [\underline{\pi}, \overline{\pi}]$.

The ruler: The ruler governs the polity: he provides certain public goods, such as law enforcement and defence, and finances these with various sources of revenue, including the taxation of trade. He also spends on activities that provide him with private benefits, such as military campaigns and court display.[37] For our purposes it is sufficient to treat his expenditures and his other sources of revenue as given exogenously, and to focus on the revenue he can raise from the taxation of trade. The ruler is assumed to maximize this revenue. This is a reasonable assumption for the historical period under consideration, when rulers typically attached a low weight to the well-being of ordinary consumers.[38]

[35] As in Rotemberg and Saloner (1986) we shall allow for inefficient collusion: given any realization of the market size π^τ, merchants may set prices above marginal cost but below the monopoly level so as to obtain any intermediate profit $\beta\pi^\tau$, with $\beta \in [0, 1]$.

[36] This structure is standard in the literature analyzing collusion, see for instance Chan and Harrington (2007) and Chen and Rey (2007).

[37] For historical evidence on the importance of these, see Brewer (1989).

[38] The main exception would be that of essential commodities such as food, since excessively high food prices might well provoke urban riots. Thus the model should be thought of as applying to the taxation of other commodities.

Bargaining power: The ruler has all the bargaining power relative to individual agents (tax-collector, individual merchants), whose reservation utilities are normalized to zero. On the other hand, an association of merchants could have some bargaining power. The idea is that merchants, once organized in a guild and used to acting together in their common interest, may acquire some bargaining power relative to the ruler, particularly in the absence of an easy replacement. This possibility will be allowed for by assuming that the merchant guild receives a share $1-\alpha$ of any 'surplus' accruing from an agreement with the ruler ($\alpha \leqslant 1$). We can think of $1-\alpha$ as a measure of the guild's social capital (cohesion and trust among the members).

Commitment: We develop our analysis under the simplifying hypothesis that the ruler can make credible commitments. As we show, our theory provides a rationale for the emergence of merchant guilds which does not require imperfect commitment by the ruler. In particular, under full commitment, our objective is to disentangle in the clearest possible way the basic cost-benefit trade-offs associated with the establishment of merchant guilds even in the absence of any friction, such as by imperfect commitment, capital constraints, etc. As will become clear below, allowing for imperfect commitment by the ruler would entail less reliance on ex-ante fees and greater reliance on ex-post transfers to the ruler. While this would complicate the analysis, it would not in general make either the guild regime or the tax collector regime decisively more attractive to the ruler.[39] We therefore focus on the case of full commitment, which brings out clearly the basic trade-offs involved in choosing between the two regimes.

The guild regime: At time $\tau = 0$, the ruler may choose to grant recognition to a merchant guild, and endow it with privileges, notably the power to exclude individual merchants from trade (as discussed in Section 2, this power may be applied to individuals who are not members of the guild, and also to members who break guild rules). When the ruler grants recognition and privileges to a merchant guild, he requires an ex ante fee, call it R, which is shared equally among the guild's members, that is, each merchant pays R/N.[40] This fee is set at the level which solves a standard Nash-bargaining game between the ruler and the guild with weights α and $1-\alpha$, respectively. Once it has been granted recognition and privileges by the ruler, a guild can punish members who deviate from a collusive agreement by excluding them from future trade. The merchants remaining in

[39] This is because the need for ex-post transfers would make it harder to sustain collusion in the guild regime, by reducing each guild member's expected future collusive profits; but it would also make it harder to induce efficient monitoring and surplus extraction in the tax collector regime.

[40] As discussed in Section 2, guild members tpically paid some entry fees, as well as a variety of other dues. The guild then made transfers to the ruler.

the guild then recartelize with probability one.[41] We therefore assume that when a single merchant deviates from a collusive agreement, he is excluded from trade for the rest of the game[42] while the remaining guild members keep colluding with probability 1, as long as this continues to be profitable.[43]

The tax-collector regime: In the absence of merchant organizations, the ruler delegates trade taxation to an agent, call it the tax-collector. In order to make the case for the tax-collector regime as favorable as possible, we assume that the agent is not capital-constrained. As will become clear below, this means that it is optimal for the ruler to choose a very simple form of delegation: he endows the agent with the right to collect taxes on trade in the polity, in return for an ex ante royalty fee $\hat{R}$.[44] The agent then imposes and collects, at the end of each period, a per-merchant lump-sum tax on trade $T_i^\tau(\hat{\pi}_i^\tau)$. This tax is a function of each merchant i's realized profits $\hat{\pi}_i^\tau$, which in period τ depend on the merchants' actual market strategy (pricing decisions) as well as the realization of the market size π^τ: that is, $\hat{\pi}_i^\tau = \pi^\tau/N$ in an efficient collusive phase, $\hat{\pi}_i^\tau = \pi^\tau$ if merchant i deviates in period τ given that his competitors are pricing at the monopoly level and $\hat{\pi}_i^\tau = 0$ in a punishment phase.[45] Unlike the ruler, the agent in each period can observe the aggregate state π^τ as well as each individual state $\hat{\pi}_i^\tau$ by paying a monitoring cost $c > 0$. The key assumption here is that the ruler did not have direct access to detailed information about these realizations. This was generally the case for medieval rulers, who could not rely on a civil service to provide them with such information.[46] Local tax-collectors, on the other hand, had greater access to local information. For simplicity, we capture this by assuming that they could observe the relevant information by incurring the per-period monitoring cost c. Essentially, the idea is that the tax-collector had to go to the market and observe trade in order to tax and collect his revenue.

[41] Obviously exclusion does not apply if *all* guild members deviate at the same time. In that case, it seems reasonable to assume that there is no exclusion, and that members subsequently recartelize.

[42] Note that it will never be in the remaining members' interest to welcome an excluded member back into the guild.

[43] In some cases, as noted in Section 2, other punishments were used against guild members who deviated from guild rules, including jail and confiscation of property. As will become clear below, allowing for more severe punishments would simply make it easier to sustain collusion in the guild regime and hence strengthen the case for choosing the guild regime instead of the tax collector regime. We therefore abstract from these in the analysis.

[44] This is essentially "tax farming", a very widespread practice in medieval Europe (see for example Lyon and Verhulst, 1967, pp.33, 49; Webber and Wildavsky, 1986, p.202).

[45] These are the revenue-maximizing taxes. We focus on these so as to make the case for the tax collector regime as strong as possible.

[46] Indeed, medieval rulers had to rely on a variety of agents to collect taxes, and struggled to limit the extent to which these agents exploited their informational advantage for their own benefit. On this see Bisson (1984) and Spruyt (1994).

Timing and strategies: At time $\tau = 0$ the ruler decides whether to grant recognition to a merchant guild or hire an agent as tax-collector. Accordingly, he collects the associated royalty fees, R or $\hat{R}$. In each generic period τ the sequence of events is as follows: (i) Merchants observe the public history of the game up to period $\tau - 1$, which also includes the realization of the current state π^τ; (ii) they post prices simultaneously; (iii) trade takes place and taxes are levied in case an agent has been hired by the ruler. For the sake of simplicity in the following we shall rule out issues deriving from imperfect monitoring. We assume that if a deviation occurs in any period, other merchants observe the identity of the deviating merchant by the end of the period. This assumption seems realistic in the case of medieval polities. Indeed, as discussed in Section 2, most of the trading activities in that historical period were taking place in markets where merchants could easily monitor each other's pricing strategy.[47]

The (static) market game is repeated an infinite number of periods and all agents have a common discount factor $\delta \in [0, 1]$ which, as standard in the collusion literature, is assumed to be greater than $1/2$.[48]

A strategy for the ruler is a choice at $\tau = 0$ between recognizing a guild or hiring a tax-collector, together with an associated royalty fee. A strategy for the tax-collector instead involves: (i) a choice as to whether to participate in the game; (ii) a monitoring decision profile $\{m^\tau(h^\tau)\}_{\tau=1}^{+\infty}$ with $m^\tau(h^\tau) \in \{1, 0\}$, where, at each trade period $\tau \geq 1$ and for any public history h^τ, $m^\tau(h^\tau) = 1$ if the tax-collector monitors the merchants in that period, and $m^\tau(h^\tau) = 0$ otherwise; (iii) an intertemporal tax profile $\left\{T_i^\tau(\hat{\pi}_i^\tau | h^\tau)_{i \in N}\right\}_{\tau=1}^{+\infty}$, where in each period τ and for any public past history h^τ, $T_i^\tau(\hat{\pi}_i^\tau | h^\tau)$ maps the individual state of each merchant i, $\hat{\pi}_i^\tau$, into the set of all feasible lump-sum tax $T_i^\tau(.)$. Essentially, a (public) history profile in each period τ includes past trades as well as past tax rates. A strategy for each merchant i specifies a per-period decision on whether to trade and a pricing behavior, both contingent on the past history and the actual state of nature. Moreover, we shall assume that whenever expected profits from collusion are at least equal to expected profits from deviating, merchants will prefer to collude.[49]

We shall look for the (pure strategy) subgame perfect Nash equilibria (SPNE) of this game.

Technical assumptions: For expositional simplicity, in the rest of the analysis we will make the following assumptions:

[47] Probably the most famous example is that of the Champagne fairs, but of course there were very many other markets, including numerous local ones accommodating primarily local trade.

[48] As we shall explain in Section 3.2 this assumption will ensure that efficient collusion is possible in some states of the world when the ruler recognizes a merchant guild.

[49] This is the standard assumption in the collusion literature and avoids cumbersome notation.

(A1) *All agents in the polity are capital unconstrained.*

A1 guarantees that our results do not rely on binding capital constraints neither on the tax-collector nor on the guild's side.

(A2) *The monitoring cost c is lower than the expectation of the market value $\mathbb{E}[\pi]$, that is $c < \mathbb{E}[\pi]$.*

This assumption implies that if the tax-collector expects merchants to collude, he will always find it optimal to monitor. This renders the tax-collector regime non-trivial.

Let $n \leq N$ be the guild's size, i.e., the number of its active members,

(A3) *A guild requires a minimum number of active members to be profitable, that is $n \geq \underline{n}$, with $\underline{n} < N$ and $\inf\{\underline{n}\} = 2$.*

A3 rules out the unrealistic and uninteresting possibility of a 'single member' guild. This assumption is motivated by the historical evidence, and it captures, in the simplest possible way for our purposes, the idea that guilds with fewer members were more likely to be exposed to competition by excluded merchants since their ability to monitor trading activities taking place outside the 'regular' market, i.e., that officially permitted by the ruler, decreased with the number of active members. Indeed, preventing unofficial trade required a minimal amount of prevention effort (e.g. supervision of the trading activities of the polity citizens), whose cost was generally shared by the guild members. Thus we are assuming that the cost per member was sufficiently small to be normalized to zero as long as the number of members did not fall below $\underline{n}$. In the following analysis we shall interpret $\underline{n}$ as being a measure of the guild's monitoring ability, that is, the larger is the lower-bound $\underline{n}$, the less efficient is the guild's monitoring "technology".[50] Alternatively, this parameter can be viewed as a proxy for the polity's '*openness*', meaning that variations in $\underline{n}$ capture the extent to which different polities were more or less open to foreigners, international trade etc. In this view, a larger $\underline{n}$ reflects the greater difficulty of monitoring trade in a polity that is more open to alien merchants.

4. Trade, taxation and collusion with a single guild

We begin by considering what the ruler can achieve when merchants are not organized in a guild, then proceed to examine the role of guilds.

[50] One way of thinking about this is to imagine that a guild can be effective in preventing excluded merchants from trading in the polity if the number of these merchants, $N - n$, is lower than a given threshold, say $\overline{N}$, that is if $N - n \leq \overline{N}$. This inequality immediately delivers the minimum size constraint $n \geq N - \overline{N} = \underline{n}$.

4.1. Trade and taxation in the absence of merchant guilds

In the absence of merchant organizations, the ruler hires an agent who can observe in each period τ the realized market value π^τ as well as the individual profit $\hat{\pi}_i^\tau$ of each merchant upon paying the per-period monitoring cost c. In this case, the agent is given the power to impose and collect a lump-sum tax $T_i^\tau(\hat{\pi}_i^\tau)$ contingent on every merchant i's realized profit. That is, at the end of each trade period τ, this agent collects $T_i^\tau(\hat{\pi}_i)$ from each merchant i, which is left with

$$u_i^t(\hat{\pi}_i^\tau) = \hat{\pi}_i^\tau - T_i^\tau(\hat{\pi}_i^\tau).$$

where, as described before, the variable $\hat{\pi}_i^\tau$ represents the actual profit of merchant i in period τ and it changes depending on whether the trade market is in a collusive, punishment or deviation phase. We solve the model backward by analyzing the subgame between the merchants and the tax-collector assuming that this agent has been hired by the ruler.

A first important point to emphasize is that, given our assumptions, there exists a class of simple and intuitive SPNE of this game where the tax-collector always monitors and sets a zero-profit tax rate which leaves merchants with no surplus in each trade period τ, that is $T_i^\tau(\hat{\pi}_i^\tau) = \hat{\pi}_i^\tau$ for each i and τ, while merchants collude at a price which guarantees an expected profit at least equal to c in each period.[51] Indeed, since we have assumed that whenever indifferent between colluding and deviating merchants will collude, it immediately follows that this type of equilibria exist, and collusion is self-enforcing for every number of active merchants, N, and for any possible discount factor, δ. The reason is that taxation reduces the merchants' post-tax profits to zero when they deviate as well as when they collude, thereby eliminating any incentive to deviate. In order to make the case for the tax-collector regime as strong as possible, in what follows we focus on the equilibrium where collusion if fully efficient and the tax collector extracts the maximum surplus from trade.

The next proposition characterizes this equilibrium: it describes the optimal ex ante royalty fee and the payoffs of all players.

Proposition 1: *When the ruler hires a tax-collector there exists a SPNE of the game between merchants and the tax-collector where: collusion is always efficient and, in each*

[51] When N is small there may exist other SPNE of the game between merchants and the tax-collector, in which the tax-collector never monitors and merchants collude by setting a price such that total profits are equal to $c - \varepsilon$, with ε small enough. Clearly, in this case, there is no scope for hiring a tax-collector, thereby making the ruler's decision at $\tau = 0$ trivial. We therefore abstract from such equilibria in the remainder of the paper.

period, the equilibrium tax rate is $T_i^\tau(\hat{\pi}_i^\tau) = \pi^\tau/N$, *which leaves merchants with no surplus. Moreover, the tax-collector's ex ante participation constraint binds,*

$$\hat{U}(\delta, c) = \frac{\mathbb{E}[\pi] - c}{1-\delta} - \hat{R} = 0 \quad \forall \ (\delta, c).$$

and the ruler gets a profit equal to

$$\hat{V}(\delta, c) = \frac{\mathbb{E}[\pi] - c}{1-\delta}.$$

Clearly, the incentive for the ruler to hire the tax-collector increases the larger is the difference between the expected market size and the monitoring cost, and the larger is the discount factor.

In the next section we shall study how the incentives to collude change when a guild is recognized. In particular, we shall show that in that case both the discount factor and the number of active merchants play a key role in the analysis.

4.2. Merchant guilds: trade, taxation and privileges

A possible alternative for the ruler, enabling him to achieve a higher profit, is the following. A subset of merchants organize themselves as a group, able to act in the group members' collective interest: Call this group 'the guild'. The ruler grants privileges to the guild, and in particular monopoly power over trade - that is, only members of the guild are authorized to trade. Under what conditions can the guild implement a better outcome than the tax collector, from the ruler's point of view?

To answer this question, we begin by characterizing the incentives of individual guild members; i.e., their benefits and costs of collusion. We shall then go on to examine the ruler's optimization program. Let $n \leq N$ be the subset of active merchants belonging to the guild. Given our timing and assumptions, the analysis of collusion follows closely Rotemberg and Saloner (1986). In particular, for any given realization of the market size $\pi \in \Pi$ in period τ, a merchant who charges the monopoly price, given that the other members of the guild do the same, obtains an expected discounted utility equal to:

$$u_i^{g,c}(\pi) = \frac{\pi}{n} + \frac{\delta \mathbb{E}[\pi]}{n(1-\delta)}, \tag{4.1}$$

while a deviation from a collusive agreement would secure him an intertemporal profit equal to

$$u_i^{g,d}(\pi) = \pi. \tag{4.2}$$

Where π is the spot gain from an individual deviation by merchant i in period τ given that the other $n-1$ members of the guild are behaving collusively, while the continuation payoff following a deviation is equal to zero since the merchant will be excluded from the market starting from the next period $\tau+1$.

Given (4.1) and (4.2), the condition for collusion to be sustainable in a generic state π is simply

$$\pi \leq \frac{\delta \mathbb{E}[\pi]}{(n-1)(1-\delta)}. \tag{4.3}$$

This condition shows, as might be expected, that it is more difficult to sustain collusion when the guild's size (number of members) increases. Intuitively, the greater the number of merchants in the guild, the lower is the individual gain that each merchant can appropriate from collusion. Conversely, holding guild size constant, collusion is easier to implement the larger is the expectation of market value.

For sufficiently large realizations of π, it may not be possible to sustain efficient collusion, as the potential gain from deviation would be too high. In such cases, collusion will entail setting a price below the monopoly price, which makes the potential gain from deviation smaller. It seems reasonable, given that we are considering the incentives of guild members, to focus on equilibria in which the price is set at the highest level compatible with sustaining collusion. Specifically, there may exist a threshold $\pi^* \in \Pi$, with $\pi^* < \overline{\pi}$, such that for all $\pi \leq \pi^*$ each merchant obtains a profit π/n from being in an efficient collusive phase, while for $\pi > \pi^*$ the maximal profit that a guild member can obtain is π^*/n,[52] with π^* being defined by:

$$\pi^* = \frac{\delta \mathbb{E}[\pi]}{(n-1)(1-\delta)}, \tag{4.4}$$

Because of this cut-off rule, we have:

$$\mathbb{E}[\pi] = \int_{\underline{\pi}}^{\pi^*} \pi dF(\pi) + (1 - F(\pi^*))\pi^*. \tag{4.5}$$

Thus, when the market value is high, the guild will obtain a collective profit, π^*, which is lower than the monopoly one. Substituting (4.5) into (4.4) we have:

$$\pi^* = \frac{\delta}{(n-1)(1-\delta)} \left\{ \int_{\underline{\pi}}^{\pi^*} \pi dF(\pi) + (1 - F(\pi^*))\pi^* \right\}.$$

[52] The case where $\pi^* < \overline{\pi}$ corresponds to instances where in order to support collusion in states higher than π^* merchants must charge prices lower than the monopoly one. Formally, this implies that the guild total profit in each of these states is $\beta\pi$ with $\beta = \pi^*/\pi \leq \overline{\pi}$.

To pursue the analysis, we now specialize our model and impose the following simplifying assumption:

(A4) *The distribution of the market size is uniform and is drawn from the unit interval* $\Pi \equiv [0,1]$*, that is* $\widetilde{\pi}^{\tau} \sim \mathrm{U}[0,1]$.

A4 is made only for ease of computation and to work with tractable closed-form solutions. All our qualitative results can be generalized to the case of any generic cdf $F(\pi)$ which satisfies standard regularity conditions.[53] Under this specification, it is easy to show that the cut-off value π^* depends only on δ and n, and is equal to:

$$\pi^*(\delta, n) = \frac{2(1 - n(1-\delta))}{\delta}.$$

This cut-off value is obviously increasing in δ, since more patient merchants are less attracted by deviations. Moreover, the larger is the size of the guild, i.e., the larger is n, the lower is $\pi^*(.)$, since each merchant is tempted to deviate more often in an environment where the gain from collusion has to be shared among many. In other words, the fewer members a guild has, the larger is the subset of Π in which the incentive compatibility constraint for collusion does not bind. Thus to have $\pi^*(.)$ as large as possible, the guild cannot have too many members. In particular, it will never be profitable to have a guild when its size exceeds the maximum threshold level compatible with sustaining collusion in at least some state. This upper bound on the number of guild members is obtained by setting $\pi^*(\delta, n) = 0$, and is given by the following lemma.

Lemma 1: *For a guild to be profitable, its size (number of members) must be lower than an upper bound* $\overline{n}(\delta)$*, given by:*

$$n < \overline{n}(\delta) = \frac{1}{1-\delta}.$$

Thus if $N \geq \overline{n}(\delta)$ guild membership will be restricted: there will be some exclusion. Clearly the upper-bound on the number of guild members is higher when merchants are more patient, i.e., the higher is δ.

The need for the upper-bound $\overline{n}(\delta)$, together with the minimum size requirement imposed in **A3**, leads to a necessary condition for a guild to represent a potentially valuable option for the ruler. This condition is given in the next lemma.

Lemma 2: *A guild can be recognized if and only if* $\delta > 1/2$ *and* $\underline{n} < \overline{n}(\delta)$.

[53] We refer the reader to Rotemberg and Saloner (1986) for a more technical analysis of the collusion model presented in what follows.

Lemma 2 formalizes the intuition that the ruler may have an interest in granting recognition to a merchant guild only when its members are sufficiently patient and able to protect their trading 'territory' from excluded local or alien merchants. Of course, the more merchants are patient, the higher is the upper bound for guild size, and the less binding is the membership constraint.

We can now turn to the bargaining game between the ruler and the guild. Assuming that $\pi^* \in [0,1]$ and using the fact that π is iid, one can verify that the guild's expected intertemporal profit, $W(\delta, n)$, is:

$$W(\delta, n) = \frac{\int_0^{\pi^*(\delta,n)} \pi dF(\pi) + (1 - F(\pi^*(\delta, n)))\, \pi^*(\delta, n)}{1-\delta}, \tag{4.6}$$

Once again, this equation captures the fact that the guild is successful in enforcing efficient collusion only if $\pi \leq \pi^*(.)$, that is in those states where merchants do not find it profitable to deviate from a collusive agreement. When instead $\pi > \pi^*(.)$, the profit of every guild member has to fall below the fully efficient collusion level, π/n, because the incentive constraint (4.3) would not be satisfied otherwise. Clearly, if n can be chosen so as to imply efficient collusion in all states, i.e., $\pi^*(\delta, n) \geq 1$, one has

$$W(\delta, n) = \frac{\mathbb{E}[\pi]}{1-\delta},$$

in the region of parameters where $\pi^*(\delta, n) < 1$, instead, simple integration yields

$$W(\delta, n) = \frac{2(1 - n(1-\delta))(n-1)}{\delta^2}.$$

Now, let

$$U(\delta, n, R) = W(\delta, n) - R,$$

be the guild's expected intertemporal payoff net of the royalty fee. The ruler chooses n and R so as to solve the following Nash bargaining program:

$$\mathcal{P}: \max_{(R,n) \in \Re_+ \times [\underline{n}, \overline{n}(\delta)]} (R - \hat{V}(\delta, c))^{\alpha} U(\delta, n, R)^{1-\alpha}.$$

Where $\hat{V}(\delta, c)$ measures the ruler's outside option, which is the expected payoff he would obtain by hiring a tax-collector. On the other hand, the outside option of the guild is zero since single merchants would make zero profits if a tax-collector is hired. It is then

immediate to check that the solution of $\mathcal{P}$ entails:

$$R^*(\delta, \alpha, c) = \hat{V}(\delta, c) + \alpha \left[W(\delta, n) - \hat{V}(\delta, c) \right], \tag{4.7}$$

which also defines the ruler's profit from granting recognition and privileges to a guild, i.e., $V^*(\delta, \alpha, c) = R^*(\delta, \alpha, c)$. The guild obtains an intertemporal payoff equal to

$$U^*(\delta, \alpha, c) = (1 - \alpha) \left[W(\delta, n) - \hat{V}(\delta, c) \right], \tag{4.8}$$

which is shared equally among its n members. As standard, equations (4.7) and (4.8) are the solution of the Nash bargaining problem with weights α and $1 - \alpha$, according to which the ruler and the guild share the total surplus defined by the difference between the intertemporal surplus from trade and the value of the ruler's outside option, i.e., $W(\delta, n) - \hat{V}(\delta, c)$.

As noted earlier, we interpret the guild's share, $1-\alpha$, as a measure of its social capital: the greater is the cohesion and trust among guild members, the greater is their ability to act effectively in their collective interest, by establishing appropriate norms of behavior, and enforcing them through mutual monitoring and sanctions against deviations. This tends to increase their bargaining power relative to the ruler, because it makes it difficult for the ruler to replace them with other, less well-organized and less effective merchants.

Now, let

$$n^*(\delta) = \frac{2 - \delta}{2(1 - \delta)}$$

be the value of n which solves $\pi^*(\delta, n) = 1$; i.e., the highest number of guild members compatible with sustaining efficient collusion. The next proposition describes what happens when a guild is recognized by the ruler.

Proposition 2: *Whenever a guild is recognized the following properties hold:*

(i) *if* $\delta \geq 2/3$ *and* $\underline{n} \leq n^*(\delta)$, *collusion is fully efficient in all states* $\pi \in \Pi$. *In this case, the optimal guild size is such that* $\underline{n} \leq n \leq n^*(\delta)$, *and each merchant obtains a profit* π^τ / n *in every period* τ.

(ii) *if* $\delta < 2/3$ *or if* $\underline{n} > n^*(\delta)$, *collusion cannot be fully efficient in all states* $\pi \in \Pi$. *In this case, the optimal guild size is equal to* $\underline{n}$. *In any period* τ *where* $\pi^\tau \leq \pi^*$ *each guild member obtains* $\pi^\tau / \underline{n}$, *while in any period* τ *where* $\pi^\tau > \pi^*$ *each gets* $\pi^* / \underline{n}$.

Intuitively, collusion can be efficient in every state only if the discount factor is large enough and merchants' monitoring ability is sufficiently effective. In this case, incentives

to deviate are *per se* weak, therefore exclusion does not need to be extreme (i.e., we can have $n > \underline{n}$) in order to implement efficient collusion in all states π. However, when guild members are not very patient, or not sufficiently able to keep excluded merchants out of the market, efficient collusion cannot be enforced in all states even when the guild's size is reduced to its lower bound, $n = \underline{n}$. In this case the guild will not be able to extract all the potential surplus from trade. Interestingly, we shall see below that precisely in this region of parameters the ruler may face a trade-off between hiring a tax-collector and granting recognition to a merchant guild. This trade-off will be at the core of the analysis developed in the next section.

4.3. Merchant guild versus tax-collector

We are now ready to study the conditions under which recognizing a merchant guild is optimal for the ruler. Of course, when recognizing a guild and granting it a monopoly over local trade ensures efficient collusion in all possible states, the ruler will prefer not to hire the tax-collector, unless his monitoring cost is zero. When instead collusion cannot be fully efficient under the guild regime, that is if $\pi^*(\delta, \underline{n}) < 1$, the ruler faces an interesting trade-off. On the one hand, hiring a tax-collector ensures efficient collusion in all states, irrespective of the discount factor and the number of active merchants on the market: a collusion-enhancing effect of the tax-collector. On the other hand, the tax-collector's monitoring activity is costly and thus there are limits to the surplus that the ruler can extract from this simple form of delegation: a costly-monitoring effect associated with the tax-collector. The trade-off between these two effects shapes the ruler's optimal choice and is analyzed in the next proposition:

Proposition 3: *If $\delta \leq 1/2$ or $\underline{n} \geq \overline{n}(\delta)$ the ruler's best strategy is to hire a tax-collector. When $\delta > 1/2$ and $\underline{n} < \overline{n}(\delta)$, the ruler's choice between granting recognition to a merchant guild or hiring a tax-collector is determined as follows:*

(i) *If $\delta \geq 2/3$ and $\underline{n} \leq n^*(\delta)$ the ruler always prefers to recognize a guild rather than hiring a tax-collector.*

(ii) *If $\delta < 2/3$ or $\underline{n} > n^*(\delta)$ there exists a positive function $c^*(\delta, \underline{n})$ such that the ruler prefers to recognize a guild rather than hire a tax-collector whenever $c \geq c^*(\delta, \underline{n})$, while the converse holds otherwise. Moreover, in the relevant range of parameters, $c^*(\delta, \underline{n})$ is increasing in $\underline{n}$ and decreasing in δ.*

This result has a simple and immediate economic intuition. Of course, the ruler is unable to grant recognition to a guild if its ability to keep excluded merchants out of the market is sufficiently poor. Conversely, when the guild is endowed with a strong monitoring ability, the ruler always prefers to deal with an association of merchants instead of hiring a tax-collector, as long as the merchants are sufficiently patient to sustain efficient collusion in every state of nature. Finally, when a guild cannot ensure efficient collusion in all states of nature, the ruler may still prefer the guild regime to hiring a tax-collector. This will be the case if the tax collector's monitoring cost is above a given threshold, which depends positively on the discount factor and negatively on the minimum guild size.

Clearly, the guild's monitoring ability plays a crucial role in the trade-off between the guild regime and the tax-collector regime. This monitoring ability will depend on several factors, including the geographical and population characteristics of the polity, which may make it easier or harder to detect alien or excluded local merchants who engage in unauthorized trade, as well as the polity's openness to foreigners, and its attractiveness to alien merchants. Monitoring ability will also depend, on the other hand, on the degree of trust and cohesion among guild members, and the extent to which they are able to overcome free-riding incentives and cooperate to monitor effectively - in other words, on their *social capital*. In this sense, the guild members' social capital is valuable not just for them, but also for the ruler.

5. Trade, taxation and collusion with multiple guilds

We now extend the previous analysis to the case where the ruler has the option of granting recognition and privileges to more than one guild. The model is motivated by the historical evidence (discussed in detail in Section 2), and its objective is to identify the basic cost-benefit trade-offs emerging when a ruler considers dealing with more than one group of merchants. To be consistent with the earlier analysis, and thereby bring out clearly the implications of recognizing more than one guild, we continue to assume that the ruler has full commitment power and that merchants are capital unconstrained. Once more, this assumption will guarantee that the results do not rely on the presence of frictions linked to imperfect commitment and/or capital constraints. For simplicity, we shall focus on the case where the ruler chooses between recognizing one or two guilds. As we shall see, this is sufficient to identify all the trade-offs we are interested in.[54]

Consider a polity with $I = 2N$ potentially active merchants who can sell a homogenous

[54] The analysis can be easily adapted to study the case of $M > 2$ guilds.

good. Each merchant belongs to one of two symmetric[55] groups ($j = 1, 2$), of size $N_j = N$.[56] A natural interpretation for the two groups, discussed below, would be local and alien merchants, or alien merchants from two different polities of origin. Merchants belonging to both groups compete in the same market by setting prices and both the static and the dynamic games are modeled as in Section 4.[57] In each period τ the market size is captured once again by the realization of a random variable $\widetilde{\pi}^{\tau} \sim \mathrm{U}[0, 1]$ which is iid over time.

To study the ruler's choice between recognizing one or two guilds, we assume that in each of the two groups, a subset of merchants organize themselves as a subgroup, able to act in its members' common interest: i.e., a "guild". A first natural question one may want to ask is how the presence of two guilds modifies the bargaining game between ruler and merchants. The answer seems intuitive: if the ruler only needs to recognize *one guild* in order to maximize his revenue from trade, the presence of two potential candidates allows him to gain bargaining power by playing the two competing organizations one against the other. A simple way of modeling this is to assume that the ruler gains full bargaining power vis-à-vis each guild (whose reservation value is zero). This would be the case, for example, if recognition and privileges were assigned through an auction, forcing each guild to bid competitively. The analysis and results of the previous section would then apply, with $\alpha = 1$. This will be our benchmark for the single-guild case.

Clearly, the ruler will only grant recognition to *both guilds* if this entails some (net) benefit relative to the single-guild case. Our analysis so far suggests a very likely potential advantage of granting recognition and privileges to both guilds: this may induce more efficient monitoring, and thereby relax the minimum size requirement for each guild. For example, a guild of local merchants is likely to have better access to information about possible unauthorized trading activities by excluded local merchants, while a guild of alien merchants from a particular polity of origin will be more easily informed about any trading activities by other citizens of that polity (who are not members of the guild). To capture this as simply as possible, we assume that when both guilds are recognized, the minimum size of each is reduced by a fraction ϕ, that is, $\underline{n}_j = \phi \underline{n}$. The parameter $\phi \leq 1/2$ captures the extent to which having the two guilds, rather than just one, increases monitoring

[55] Symmetry is assumed only for expositional simplicity.

[56] As will become clear in the remainder of the analysis, allowing for asymmetric groups (i.e., with different sizes) would not bring additional insights, since the individual incentive constraint that needs to be satisfied for collusion to be an equilibrium of the market game with multiple guilds depends only on the total number of merchants active in both guilds.

[57] Obviously, it would be easy to provide a rationale for multiple guilds if we assumed that different groups sold different goods and were active in different markets. We abstract from this possibility to focus on the more interesting trade-off between one and two guilds when merchants sell the same good and are active in the same market.

efficiency: when $\phi < 1/2$, multiple guilds generate '*economies of scale*' in monitoring[58], and these scale economies are greater for lower values of ϕ.

Intuitively, while multiple guilds may increase monitoring efficiency, they may also make it harder to sustain collusion. To investigate the interaction between these two effects, and the resulting trade-off between recognizing one or two guilds, we start by analyzing the collective behavior of the two guilds, as well as the behavior of their individual members.

We retain the same assumptions as in the earlier analysis concerning behavior *within* each guild: in particular, an individual guild member who deviates from guild norms (e.g. by setting a lower price and thereby "stealing" trade from other guild members) will be punished by exclusion.[59] The main difference relative to the single-guild case concerns collusion *between* guilds. Here we assume that if the members of one guild collectively deviate from a collusive agreement with the other guild, collusion may be restored with probability $\theta \in [0, 1]$, after a period of punishment where each active merchant gets zero profits. This assumption differs from the assumption of infinite punishments in Rotemberg and Saloner (1986); however, as they argue, "such infinite-length punishments are unlikely to be carried out in practice". Indeed, two of the reasons they give for considering infinite punishments unrealistic in the case of oligopoly seem to apply with at least equal force to the case of merchant guilds: first, "once the punishment period has begun, the oligopoly would prefer to return to a more collusive arrangement". Second, "one can think the reason why firms succeed in punishing each other at all (even though punishments are costly) is because of the anger generated when a rival cheats on the implicit agreement. This anger, as any "irritational" emotion, may be short-lived". Moreover, one important factor hindering collusion in an oligopoly setting is of course the possibility of being caught breaking the law, and the constraints this places on firms' ability to communicate effectively and trust each other. Merchant guilds, in contrast, would not have had to worry about any such sanctions and constraints imposed by rulers.[60] We therefore follow Harrington (2007) in assuming that "recartelization" occurs with some probability. The parameter θ is meant to capture cultural, social and ethnic differences between merchants belonging to different groups. The idea is that greater heterogeneity

[58] These are "economies of scale" in the sense that more guilds make it possible to achieve the required level of monitoring with a smaller total number of merchants.

[59] Clearly, a merchant who undercuts his fellow guild members and is expelled from his guild will not be welcomed in the other guild.

[60] In our model, the ruler will be simply indifferent about collusion among merchant guilds, once the ex-ante fees have been paid. If we introduced capital constraints and/or imperfect commitment, implying the need for ex-post transfers from the guilds to the ruler, recartelization after a deviation would be in the ruler's interest; this would make the case for allowing recartelization, with some probability, even stronger.

between the two groups will entail a lower probability of recartelization θ. Essentially, sharper differences in cultural, ethnic and social characteristics make it harder for the two groups to communicate effectively and trust one another again once a collusive agreement has been broken by one group's collective deviation, hampering future recartelization.[61]

In line with the earlier analysis, we rule out the unrealistic and uninteresting case of 'single member' guilds by assuming:

(A5) $\phi\underline{n} \geq 2$ **(**implying that $\inf\{\underline{n}\} = 4$**,** to ensure consistency between the two conditions, $\phi\underline{n} \geq 2$ and $\phi \leq 1/2$**).**

Finally, we also assume that the ruler cannot create a single 'mixed' guild, i.e., an association of merchants consisting of members of both groups. There are two main reasons for this. First, substantial heterogeneity within a guild would make it harder to generate the required cohesion and trust among its members (social capital). Second, suppose the ruler of a given polity could establish a guild of local and alien merchants. Individual deviations from guild norms would then be punished by exclusion from this guild. However, this might be a rather weak punishment for alien merchants, who could always continue to trade in other polities, and back home. In contrast, if alien merchants from any given polity belonged to a foreign "branch" of the local merchant guild in their polity of origin, exclusion would be a much more serious punishment, since it would apply both at home and abroad. Indeed, as discussed in Section 2, such foreign branches of local merchant guilds were common - mixed guilds were not.

5.1. Individual versus collective incentive constraints

We can now study individual and group behavior when two guilds are granted recognition and privileges. In this case, two types of incentive constraint must be satisfied for collusion to be feasible. First, collusion needs to be incentive compatible from each individual's point of view: that is, given that the two guilds decide to cartelize, none of their members should find it profitable to deviate from such a 'group' strategy. It is straightforward to check that this individual incentive constraint is the same as in the case of a single guild analyzed above and is given by:

$$\pi \leq \frac{\delta \mathbb{E}[\pi]}{(n-1)(1-\delta)}, \tag{5.1}$$

[61] There is substantial evidence showing that ethnic diversity can make it harder to achieve trust and cooperation; see Alesina and La Ferrara (2005) for an excellent survey.

where $n = n_1 + n_2$ now defines the total number of merchants active in the market and belonging to both groups, with $n_1 = n_2 = n/2$ because of symmetry. As before, this constraint implies that collusion can be enforced if the total number of active merchants is not too large, if merchants are patient enough, and if expected market profitability is sufficiently high.

However, we must now also make sure that both guilds find it profitable to collude: i.e., that collective deviations (at the guild level) are not profitable. Since we have assumed that following a collective deviation the two guilds recartelize with an exogenous probability θ after a period of punishment, this incentive constraint can be written as:

$$\frac{\pi}{2} + \frac{\delta \mathbb{E}[\pi]}{2(1-\delta)} \geq \pi + \delta^2 \theta \frac{\mathbb{E}[\pi]}{2(1-\delta)}. \tag{5.2}$$

The left-hand-side of this inequality captures the (intertemporal) collective gain that each subgroup of merchants can obtain from a collusive agreement when two guilds are endowed with privileges. Its right-hand-side measures the gain from a collective deviation: the first term is the guild's spot gain from a deviation today, while the second term represents the expected gains from future recartelization, which materializes with probability θ one period after the punishment phase. This probability θ will play a key role in the ruler's choice between recognizing one or two guilds.

We begin by studying the link between the individual and collective incentive constraints, (5.1) and (5.2). The latter condition can be rewritten in a more compact way as:

$$\pi \leq (1 - \delta\theta) \frac{\delta \mathbb{E}[\pi]}{1-\delta}, \tag{5.3}$$

which makes it easy to see that the collective incentive constraint becomes tighter the larger is the probability of recartelization θ: if future recartelization is more likely, collective deviations become more attractive. Note that since this condition does not depend on the number of active merchants, only the discount factor δ affects simultaneously (5.1) and (5.3).

The analysis proceeds along similar lines to the one-guild case of Section 4. If neither incentive constraint binds, efficient collusion is feasible. When one of the two constraints binds, collusion can only be sustained if merchants price below the monopoly level. In particular, the incentive constraints (5.1) and (5.2) yield two thresholds, call them π^* and $\widehat{\pi}$ respectively, such that for all states of nature satisfying $\pi > \min\{\pi^*, \widehat{\pi}\}$, merchants price below the monopoly level, and each guild gains a total profit $\pi_j = \min\{\pi^*, \widehat{\pi}\}/2$. On the other hand, collusion is fully efficient for all $\pi < \min\{\pi^*, \widehat{\pi}\}$. In these states the two guilds obtain a profit equal to $\pi_j = \pi/2$.

Two cases must then be distinguished. First, if $\min\{\pi^*, \widehat{\pi}\} = \pi^*$, the analysis follows the same lines as that developed in the previous section. Hence, for any pair (δ, n) one has

$$\pi^*(\delta, n) = \frac{2(1 - n(1-\delta))}{\delta}.$$

If, instead, $\min\{\pi^*, \widehat{\pi}\} = \widehat{\pi}$ one must have:

$$\mathbb{E}[\pi] = \int_0^{\widehat{\pi}} \pi dF(\pi) + (1 - F(\widehat{\pi}))\widehat{\pi},$$

where, for any pair $(\delta, \theta) \in [0,1]^2$, the cut-off $\widehat{\pi}$ solves:

$$\widehat{\pi}(\delta, \theta) = \frac{\delta(1-\delta\theta)}{1-\delta}\left\{\int_0^{\widehat{\pi}} \pi dF(\pi) + (1 - F(\widehat{\pi}))\widehat{\pi}\right\}.$$

Using the uniform specification over the unit support, simple integration yields:

$$\widehat{\pi}(\delta, \theta) = \frac{2(2\delta(1-\theta) - 1)}{\delta(1-\delta\theta)}.$$

Which of these cut-off values is lower depends on the discount factor, the total number of guild members, and the probability of recartelization. As a preliminary step, it is important to observe that since $\pi^*(\delta, n)$ is decreasing in n, an exclusion result similar to the one illustrated in Lemma 1 obtains:

Lemma 3: *If privileges are recognized to both subgroups of merchants, there is an upper bound on the number of members for each guild; that is,*

$$n_j < \frac{\overline{n}(\delta)}{2} = \frac{1}{2(1-\delta)} \quad \forall \quad j = 1, 2.$$

As before, in order to sustain collusion, the size of each guild cannot be too large. At the same time, it cannot be too small, because of the need to monitor effectively and prevent unauthorized trade (and in particular, prevent excluded merchants from undercutting guild members). In addition, we now have a collective incentive constraint that can only be satisfied if the probability of recartelization is not too large. Let

$$\overline{\theta}(\delta) = \frac{2\delta - 1}{2\delta}$$

be the value of θ which solves $\widehat{\pi}(\delta, \theta) = 0$, and

$$\overline{n}(\delta, \phi) = \frac{1}{2\phi(1-\delta)}.$$

be the value of $\underline{n}$ which solves $2\phi\underline{n} = \overline{n}(\delta)$, respectively. Moreover, denote by $\delta^*(\phi)$ the discount factor solving $\overline{n}(\delta, \phi) = \inf\{\underline{n}\}$. The following result provides the necessary conditions for the ruler to be able to grant recognition to both subgroups of merchants.

Lemma 4: *The ruler will consider recognizing two guilds if, and only if, merchants are sufficiently patient,* $\delta \geq \max\{1/2, \delta^*(\phi)\}$*, the probability of recartelization is not too large,* $\theta < \overline{\theta}(\delta)$*, and the merchants' monitoring technology is not too inefficient,* $\underline{n} < \overline{n}(\delta, \phi)$*.*

This result provides necessary conditions for two guilds to be a viable option for the ruler. It captures the simple economic intuitions discussed above. First, for a ruler to find it worthwhile to grant recognition to both subgroups of merchants these must be sufficiently patient; moreover, their ability to prevent excluded merchants from trading and undercutting the cartel must be sufficiently effective, that is $\underline{n} < \overline{n}(\delta, \phi)$. Finally, the probability of recartelization must be sufficiently small, so that collective deviations are not too attractive, $\theta < \overline{\theta}(\delta)$. The idea here is that if guilds anticipate that the likelihood of recartelization is sufficiently large in any subgame following a collective deviation, the temptation to break the cartel will be so strong as to make it impossible to construct equilibria where collusion can be sustained.

Note that for $\phi \leq 1/2$ one has $\overline{n}(\delta, \phi) \geq \overline{n}(\delta)$, with equality only at $\phi = 1/2$. Therefore, since $\overline{n}(\delta, \phi)$ is decreasing in ϕ, when $\phi < 1/2$ there will be cases in which recognizing a single guild is not feasible, while it is possible to recognize both.

We now study the conditions under which collusion is fully efficient with two guilds. Let

$$n^{**}(\delta, \phi) = \frac{2-\delta}{4\phi(1-\delta)}$$

be the value of $\underline{n}$ which solves $2\phi\underline{n} = n^*(\delta)$, and

$$\theta^*(\delta) = \frac{3\delta - 2}{\delta(4-\delta)}$$

denote the value of θ such that $\widehat{\pi}(\delta, \theta) = 1$. Moreover, let $\delta^{**}(\phi)$ be the value of δ such that $n^{**}(\delta, \phi) = \inf\{\underline{n}\}$. The following proposition shows how the possibility of sustaining fully efficient collusion with two guilds depends on the interplay between the probability of recartelization, monitoring ability, and the discount factor:

Proposition 4: *Granting recognition and privileges to both subgroups of merchants makes it possible to sustain efficient collusion in all states of nature if, and only if,* $\delta \geq \max\{\delta^{**}(\phi), 2/3\}$, $\underline{n} \leq n^{**}(\delta, \phi)$ *and* $\theta \leq \theta^{*}(\delta)$.

The intuition underlying this result is similar to that provided for Proposition 2, with the additional requirement that in the case of multiple guilds the collective incentive constraint must also be satisfied in all states of nature (for collusion to be fully efficient). In particular, granting recognition to both subgroups of merchants allows the two guilds to jointly implement monopoly profits in the region of parameters where both the individual and collective incentive constraints are satisfied in all states of nature. This is true when: (i) the discount factor is large enough so as to satisfy both constraints (5.1) and (5.2); (ii) the probability of recartelization is sufficiently small so as make collective deviations unattractive; and (iii) the guilds' ability to prevent excluded merchants from undercutting the cartel is sufficiently high.

This clearly illustrates the key potential *cost and benefit* of recognizing two guilds instead of one, when it comes to implementing efficient collusion: the cost is that fully efficient collusion may be harder to sustain - in particular, we have an additional condition that has to be satisfied, $\theta \leq \theta^{*}(\delta)$. When the probability of recartelization is too high, efficient collusion is not feasible with two guilds, whereas it may be feasible with a single guild. When the probability of recartelization is not too large, on the other hand, efficient collusion may be feasible with two guilds but not with one. The reason is that, in the presence of economies of scale in monitoring, it may be possible to satisfy the minimum size constraints when two guilds are recognized but not when only one guild is recognized: for $\phi < 1/2$, $n^{**}(\delta, \phi) > n^{*}(\delta)$. This trade-off will be important in determining the ruler's optimal strategy; in addition, we will need to take into account what happens when fully efficient collusion is not feasible - but some collusion can nevertheless be sustained. We do this in the following section.

5.2. The ruler's optimal strategy with multiple guilds

The previous section described the individual and collective incentive constraints that need to be satisfied for collusion to be enforceable when two guilds are recognized. We can now turn to the ruler's optimization program for this case. Let

$$W_j(\delta, n, \theta) = \frac{\int_0^{\min\{\widehat{\pi}(.), \pi^*(.)\}} \pi dF(\pi) + (1 - F(\min\{\widehat{\pi}(.), \pi^*(.)\}))\min\{\widehat{\pi}(.), \pi^*(.)\}}{2(1-\delta)}, \tag{5.4}$$

be guild j's expected intertemporal profit, and denote by $U_j(\delta, n, \theta, R_j) = W_j(\delta, n, \theta) - R_j$ its ex ante utility net of the royalty fee. Our objective in this section is to study the trade-off between recognizing one or two guilds due to factors other than bargaining power. In particular, it may be that if there are only two guilds and the ruler wants to recognize both, the guilds have some bargaining power: the ruler cannot simply force them to bid competitively in an auction (as in the single-guild case). However, we are only considering the case with two (as opposed to multiple) guilds for simplicity, and if, for example, we had three guilds and the ruler could take full advantage of possible economies of scale in monitoring by recognizing just two guilds, an auction with competitive bidding would again be feasible. Thus it seems reasonable, and more interesting, to abstract from *ad hoc* differences in bargaining power and assume that the ruler has full bargaining power in both cases. In the case where he recognizes two guilds, the ruler will then choose R_j and n so as to solve the following optimization program:

$$\hat{\mathcal{P}}: \begin{cases} \max\limits_{(R_j,n)_{j\in\{1,2\}} \in \Re_+^2 \times [2\phi\underline{n},\ \overline{n}(\delta)]} \sum_{j\in\{1,2\}} R_j \\ \text{s.t.} \\ U_j(\delta, n, \theta, R_j) \geq 0 \quad \forall \ \ j \in \{1,2\}. \end{cases}$$

In a symmetric equilibrium the ruler's optimal (total) transfer, which defines his profit, is given by:

$$V^{**}(\delta, n, \theta) = 2R^{**}(\delta, n, \theta) = 2W(\delta, n, \theta).$$

Since the ruler extracts all the surplus from both guilds, his profit is equal to the total market surplus.

We can now study the ruler's optimal strategy. To make the exposition easier to follow, it is useful to distinguish and study in turn three parameter regions.

5.2.1. Tax collector

First, it is immediate to see that when δ is sufficiently small or $\underline{n}$ is very large the only feasible action for the ruler is to hire a tax-collector. In this parameter region, it is not possible to satisfy the minimum size requirements *and* sustain collusion, whether one guild is recognized (Lemma 2) or two guilds (Proposition 3):

Proposition 5: *If* $\delta < \max\{1/2, \delta^*(\phi)\}$ *or* $\underline{n} \geq \overline{n}(\delta, \phi)$ *the ruler can only hire a tax-collector.*

5.2.2. Tax collector or two guilds?

The second case obtains when $\underline{n} \in \Gamma(\delta, \phi) = [\overline{n}(\delta), \overline{n}(\delta, \phi))$. In this parameter region, the ruler's action space includes two options: hiring a tax-collector or granting recognition to both guilds. In particular, as observed before, when $\phi < 1/2$ the upper-bound on a single guild size, $\overline{n}(\delta)$, is lower than that required when two guilds are recognized, $\overline{n}(\delta, \phi)$, so that the interval $\Gamma(\delta, \phi)$ is non-empty. As a consequence, for all $\underline{n} \in \Gamma(\delta, \phi)$ it is not possible to sustain collusion with one guild, whereas collusion can be sustained if both guilds are granted recognition and privileges. The ruler's best action is to recognize two guilds if

$$2W(\delta, n, \theta) \geq \hat{V}(\delta, c),$$

while a tax-collector will be hired otherwise. The choice will therefore depend on the discount factor δ, the tax-collector's monitoring cost c, the probability of recartelization θ and the guild's minimum size requirement $\phi\underline{n}$. Of course, if the probability of recartelization is too large, i.e., if $\theta > \overline{\theta}(\delta)$, collusion can never be efficient with two guilds and hence the ruler's optimal choice is to hire a tax-collector. If $\theta < \overline{\theta}(\delta)$, on the other hand, the ruler will recognize the two guilds when the tax-collector's monitoring technology is not sufficiently effective, that is, c is relatively large. Otherwise, he will hire a tax collector. The result can be summarized as follows.

Proposition 6: *Assume $\phi < 1/2$, $\delta \geq \max\{1/2, \delta^*(\phi)\}$ and $\theta < \overline{\theta}(\delta)$, then for all $\underline{n} \in \Gamma(\delta, \phi)$ there exists a positive function $c^{**}(\delta, \underline{n}, \theta, \phi)$ such that if $c \geq c^{**}(\delta, \underline{n}, \theta, \phi)$ granting recognition to both guilds is optimal for the ruler. A tax-collector is hired otherwise.*

This result is similar in spirit to Proposition 3. The difference is that now the ruler may face a trade-off between hiring a tax-collector and granting recognition to two guilds (rather than one as in the earlier analysis). As already pointed out, hiring a tax-collector delivers efficient collusion, but at a price, because of the agent's cost of monitoring trade. When two guilds are granted recognition, on the other hand, there are no monitoring costs but collusion is not necessarily efficient because of the interplay between the individual and the collective incentive constraints (5.1)-(5.3). As a consequence, the ruler will prefer to grant recognition to both guilds when the tax-collector's monitoring cost is higher than the loss of profits due to inefficient collusion.

5.2.3. One guild, two guilds or tax collector?

Finally, perhaps the most interesting case occurs when $\underline{n} < \overline{n}(\delta)$. In this parameter region, the ruler's action set is the largest possible and it includes the option of granting

privileges to a single guild or to both, as well as the possibility of delegating taxation to an agent. This is a natural case to study if one is interested in describing the basic trade-offs faced by a ruler who can decide whether to grant recognition only to a local guild or to accommodate also foreign merchants organized as an independent association. Leaving aside the option of hiring a tax-collector, the relevant trade-off is the following: granting recognition to a single guild is better for the purpose of enhancing collusion, as in this case there is no collective incentive constraint to satisfy, which is instead a key requirement when recognition is extended to multiple guilds. However, in the presence of scale economies in monitoring (i.e., when $\phi < 1/2$), granting recognition to two guilds may enable the ruler to relax the individual incentive constraint, relative to the case in which the single-guild regime entails minimum size. The ruler will then choose to recognize two guilds if:

$$2W(\delta, n, \theta) \geq \max_{j \in \{1,2\}} \left\{ \hat{V}(\delta, c), W(\delta, n_j) \right\},$$

where $W(\delta, n_j)$ is the surplus he would obtain when dealing only with guild j. The next proposition summarizes the result:

Proposition 7: *Assume $\delta > \max\{1/2, \delta^*(\phi)\}$. Then, the following properties are satisfied:*

(i) *The ruler weakly prefers to recognize one guild instead of two if one of the following conditions hold: $\phi = 1/2$, $\underline{n} < n^*(\delta)$, or $\theta > \overline{\theta}(\delta)$. In this parameter region his choice will be as described in Proposition 3.*

(ii) *Assume $\phi < 1/2$ and $\underline{n} \in [n^*(\delta), \overline{n}(\delta))$. Then, if $c \geq c^*(\delta, \underline{n})$ there exists a function $\widehat{\theta}(\delta, \underline{n}, \phi) < \overline{\theta}(\delta)$ such that for all $\theta \leq \widehat{\theta}(\delta, \underline{n}, \phi)$ the ruler prefers to recognize both guilds. Otherwise he prefers to have a single guild.*

(iii) *Assume $\phi < 1/2$ and $\underline{n} \in [n^*(\delta), \overline{n}(\delta))$. Then, if $c < c^*(\delta, \underline{n})$ the same qualitative results as in Proposition 6 obtain; that is, the ruler prefers to recognize two guilds only if c is sufficiently large. Otherwise he hires a tax-collector.*

The intuition for this result is simple. Clearly, the ruler prefers to recognize a single guild, rather than multiple guilds, in the following cases: (a) if having two guilds does not bring any efficiency gain in monitoring; (b) if merchants' monitoring ability is sufficient to deliver efficient collusion with a single guild; (c) if the probability of recartelization is so large that efficient collusion cannot be sustained with multiple guilds. The trade-off between a single guild and a tax collector is then the same as in the earlier analysis.

On the other hand, when the single-guild regime generates inefficient collusion because the minimum size constraint is binding, recognizing two guilds may increase efficiency (of collusion), as long as there are economies of scale in monitoring, and the probability of recartelization is not too high. The trade-off between two guilds and a tax collector is then the same as in Proposition 6.

6. Concluding remarks

We have revisited the rationale for the emergence of merchant guilds within a competitive setting accounting for the dynamic incentives of merchants. Differently from previous literature, our analysis has been focused on the role of local merchant guilds rather than that of alien guilds. Taking this perspective, we have investigated a number of hitherto neglected empirical observations concerning the organization of guilds. By focusing on the role played by monitoring technologies, instead of capital-constraints, the simple model we have developed in the paper delivers predictions about guild size, membership restrictions, and their welfare implications. As we have seen, these are consistent with the available historical evidence, and shed new light on the role of the guilds' social capital. Moreover, our analysis also provides a theoretical framework capable of accounting for the basic trade-offs involved when a polity's rulers had to choose between granting recognition to a single or multiple guilds. This helps us to understand the observed distribution of guilds, and provides a rationale for the establishment of both *local and alien* merchant guilds. In this view, the paper reconciles, to some extent, the different views put forward in the existing literature.

7. Appendix

Proof of Proposition 1: The proof of this result is immediate. Indeed, given **A2**, one can easily show that it is strictly dominant for the tax-collector to pay the monitoring cost c in each period and extract all the surplus from the merchants if he expects them to collude efficiently. Moreover, if merchants expect the tax collector to monitor in each period, they will charge the monopoly price. In fact, in this case, they would be indifferent between colluding and price at the marginal cost anyway as all the surplus they get from the market is taken away by the zero-profit tax imposed by the agent. Hence, there exists a SPNE of the game where the tax collector monitors in each period and merchants collude. Notice that if $N > 1/(1-\delta)$ this equilibrium is also unique. Indeed, in this case, a SPNE where the tax-collector does not monitor cannot exist because individual

deviations will always be profitable for any equilibrium candidate where merchants get a profit lower than c. ■

Proof of Lemma 1: This result can be immediately established by the definition of $\pi^*(\delta, n)$. Indeed, for this cut-off value to be positive one must have $n < \overline{n}(\delta)$. ■

Proof of Lemma 2: The proof of this result rests on the idea that in order for the ruler to grant recognition to a merchant guild, the minimum size condition $n \geq \underline{n}$ must be compatible with the necessary condition for collusion to enforceable at least in some state π, that is $n < \overline{n}(\delta)$. Given the definition of $\overline{n}(\delta)$, and the fact that $\inf\{\underline{n}\} = 2$, it is immediate to show that the necessary conditions for a guild to be recognized are $\delta > 1/2$ and $\underline{n} < \overline{n}(\delta)$. ■

Proof of Proposition 2: First, observe that $\pi^*(\delta, n) \geq 1$ is a necessary condition for collusion to be fully efficient in all states $\pi \in \Pi$. Hence, solving $\pi^*(\delta, n) = 1$ yields the maximum n, in the text denoted by $n^*(\delta)$, which ensures that collusion is fully efficient in the whole support Π. Then, observe that if $\underline{n} > n^*(\delta)$, granting recognition to a merchant guild is incompatible with efficient collusion, while the converse holds otherwise. Therefore, for collusion to be efficient in all states of nature one needs $\underline{n} < n^*(\delta)$. But, as we have assumed $\inf\{\underline{n}\} = 2$, a necessary condition for this to be true is that $n^*(\delta) > 2$. This inequality yields immediately $\delta > 2/3$, which provides a second necessary condition for collusion to be efficient in all states. Moreover, in this case, the optimal guild size is such that $n \in (\underline{n},\ n^*(\delta)]$ provided that this interval is non-empty. Differently, if $\delta \leq 2/3$ or $\underline{n} > n^*(\delta)$ the minimum size constraint binds as $\pi^*(\delta, \underline{n}) < 1$. In this case, the guild reaches its minimum size $\underline{n}$ and collusion cannot be efficient, i.e., for all states $\pi > \pi^*(\delta, \underline{n})$ merchants need to price below the monopoly level. ■

Proof of Proposition 3: Of course, when $\delta \leq 1/2$ or $\underline{n} \geq \overline{n}(\delta)$ the ruler cannot implement the guild as in this case the minimum size requirement is incompatible with the maximum size condition implied by Lemma 2. Hence, in this region of parameters the ruler is forced to hire a tax-collector. If $\delta > 1/2$ and $\underline{n} < \overline{n}(\delta)$, instead, the ruler will always grant recognition to a merchant guild whenever this ensures efficient collusion in all states of nature, that is, if $\delta > 2/3$ and $\underline{n} \leq n^*(\delta) < \overline{n}(\delta)$ as shown in Proposition 2. Differently, when $\delta < 2/3$ or $n > n^*(\delta)$ collusion cannot be fully efficient under the guild regime. In this case, if the ruler decides to grant recognition to a guild he obtains a intertemporal expected utility equal to

$$V^*(\delta, \underline{n}) = \hat{V}(\delta, c) + \alpha\left[W(\delta, \underline{n}) - \hat{V}(\delta, c)\right],$$

where

$$W(\delta, \underline{n}) = \frac{\int_0^{\pi^*(\delta,\underline{n})} \pi dF(\pi) + (1 - F(\pi^*(\delta, \underline{n})))\, \pi^*(\delta, \underline{n})}{1-\delta}$$
$$= \frac{2(1-\underline{n}(1-\delta))(\underline{n}-1)}{\delta^2}.$$

Hence, granting recognition to a merchant guild is optimal if and only if $W(\delta, \underline{n}) \geq \hat{V}(\delta, c)$, that is

$$\frac{2(1-\underline{n}(1-\delta))(\underline{n}-1)}{\delta^2} - \frac{\mathbb{E}[\pi] - c}{1-\delta} \geq 0,$$

since $\mathbb{E}[\pi] = 1/2$ under the uniform specification $\widetilde{\pi}^{\tau} \sim \mathrm{U}[0,1]$ the above inequality implies:

$$c \geq c^*(\underline{n}, \delta) \equiv \left[\frac{2\underline{n}(1-\delta) - (2-\delta)}{\delta\sqrt{2}}\right]^2. \tag{7.1}$$

Clearly, for $c < c^*(\underline{n}, \delta)$ hiring a tax-collector will be the ruler's best choice. Finally, showing that $c^*_{\delta} < 0$ and that $c^*_{\underline{n}} > 0$ in the relevant range of parameters is immediate from the expression (7.1). ■

Proof of Lemma 3: The proof of this result follows the same logic as the proof of Lemma 2. Since the individual incentive constraint (5.1) does not change when the ruler considers granting recognition to both subgroups of merchants, in order for each merchant not to find it optimal to deviate from a 'grand' collusive agreement, the total number of active merchants must be limited. Using symmetry, this implies immediately $n_j < \overline{n}(\delta)/2 = 1/2(1-\delta)$ for all $j = 1, 2$, thus $n < \overline{n}(\delta)$. ■

Proof of Lemma 4: The proof of this result rests on the idea that recognizing privileges to both subgroups of merchants can be profitable only if this guarantees collusion to be efficient at least in some state π. For this to be true one needs to have $\widehat{\pi}(\delta, \theta) \geq 0$ and $\pi^*(\delta, n) \geq 0$ for all $n \geq \underline{n}$. It is then straightforward to show that for $\theta < \overline{\theta}(\delta)$ and $\underline{n} < \overline{n}(\delta, \phi)$ these inequalities are satisfied altogether. However, $\overline{\theta}(\delta) > 0$ only if $\delta > 1/2$ and $\overline{n}(\delta, \phi) > \inf\{\underline{n}\} = 4$ only if $\delta > \delta^*(\phi)$, where

$$\delta^*(\phi) = 1 - \frac{1}{8\phi}.$$

Hence, the ruler will consider granting recognition to both guilds only if $\underline{n} < n(\delta, \phi)$, $\theta < \overline{\theta}(\delta)$ and

$$\delta > \max\{1/2, \delta^*(\phi)\}.$$

This concludes the proof. ■

Proof of Proposition 4: The proof of this result follows closely the logic of the proof of Proposition 2. For collusion to be efficient in the whole space of parameters it must be $\widehat{\pi}(\delta,\theta) \geq 1$ and $\pi^*(\delta,n) \geq 1$. It can be immediately verified that these inequalities can be jointly satisfied if and only if $\delta \geq \max\{\delta^{**}(\phi), 2/3\}$, $\underline{n} \leq \overline{n}^*(\delta,\phi)$ and $\theta \leq \theta^*(\delta)$. Conversely, if one of these conditions does not hold, collusion cannot be efficient. ■

Proof of Proposition 5: The proof of this proposition is an immediate consequence of Lemma 4 and the facts that: (i) $\overline{\theta}(\delta) \leq 0$ for all $\delta \leq 1/2$, and (ii) $\overline{n}(\delta,\phi) \geq \overline{n}(\delta)$ for $\phi \leq 1/2$. ■

Proof of Proposition 6: The proof of this result follows the same lines as the proof of Proposition 3. First, it is immediate to verify that $\Gamma(\delta,\phi)$ is non-empty for $\phi < 1/2$ and that only in the region of parameters where $\delta > \max\{1/2, \delta^*(\phi)\}$, $\theta < \overline{\theta}(\delta)$ and $\underline{n} < \overline{n}(\delta,\phi)$, the ruler will consider to grant recognition to both guilds. Then, it is straightforward to show that if $c = 0$ the ruler will always prefer to hire the tax-collector as this will provide efficient collusion at no monitoring costs; while, if $c = \mathbb{E}[\pi] = 1/2$, he will strictly prefer to grant recognition to both subgroups of merchants. Therefore, a simple continuity argument implies that there must be a function $c^{**}(\delta,\underline{n},\theta,\phi)$ such that for all $c < c^{**}(\delta,\underline{n},\theta,\phi)$ a tax-collector will be hired, differently privileges will be granted to both subgroups of merchants. ■

Proof of Proposition 7: First, observe that restricting attention to cases where $\delta > \max\{1/2, \delta^*(\phi)\}$ implies that the regime with two guilds is feasible. In the opposite case, following the logic of Proposition 3, the result would be to recognize one guild or to hire the tax collector.

In order to prove part (i) it is useful to remember that in the region of parameters where $\theta \geq \overline{\theta}(\delta)$ it must be true that $\widehat{\pi}(\delta,\theta) \leq 0$, so that the ruler will always prefer to deal with one guild. Indeed, in this case, granting recognition to both subgroups renders collusion impossible via the collective incentive constraint. Moreover, the same result holds if $\phi = 1/2$. In this case, there is no difference between the individual incentive constraint with one or two guilds, i.e., having two guilds does not bring any efficiency gain; thus, dealing with one guild must be weakly preferred to deal with two. Finally, for $\underline{n} < n^*(\delta)$ it must be true that one guild is efficient, hence the ruler must (weakly) prefer to deal with one guild.

The proof of part (ii) is simple. Indeed, when $\phi < 1/2$, $c \geq c^*(\delta,\underline{n})$ and $\underline{n} \in [n^*(\delta), \overline{n}(\delta))$ the ruler has two options available: either he recognizes one or two guilds. However, for $\underline{n} > n^*(\delta)$ having one guild does not guarantee efficient collusion. In this

region of parameters, the ruler will clearly prefer to deal with two guilds if θ is small enough since this would imply $\pi^*(\delta, \underline{n}) < \pi^*(\delta, \phi\underline{n})$. Differently, if θ is large enough, say for instance close to $\overline{\theta}(\delta)$, having two guilds will never be optimal since, in such a case, fully efficient collusion will be enforced in a smaller subset of the support Π relative to a single guild regime. A simple continuity argument then implies that there must exist a function $\widehat{\theta}(\underline{n}, \phi, \delta)$ such that for all $\theta < \widehat{\theta}(\delta, \underline{n}, \phi)$ the ruler prefers to grant recognition to both guilds, and the converse holds true otherwise.

Finally, to prove part (iii) notice that for $c < c^*(\delta, \underline{n})$ the ruler prefers the tax-collector to a single guild regime. Hence, the same qualitative results as in Proposition 6 obtain. ■

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