Who will Monitor the Monitors?

Informal Law Enforcement and Collusion at Champagne

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Abstract

Informal monitors can sometimes substitute for formal law enforcement. Monitors hired to minimize cheating, however, are themselves vulnerable to collusion and extortion. I focus on one such informal monitor – the fair authorities at the trade fairs at Champagne – asking why the fairs survived for centuries instead of instantly crumbling in the face of the authorities' overwhelming incentives to collude. Milgrom, North and Weingast's (1990) seminal model of the Champagne fairs is not equipped to deal with collusion, though it does deal with extortion. I show that there is a collusion-proof equilibrium in an alternative model with a competing fair and merchant guilds/self-governed merchant communities and show how these institutions interact with the Champagne fair authorities' incentives. This is invulnerable to collusion, extortion and "reverse extortion" (unscrupulous clients threatening to smear a monitor's reputation unless bribed). I highlight the crucial roles of competition among monitors, the existence of a collective body to organize coordinated punishment of monitors caught colluding, and network effects among the monitor's customers that exacerbate any punishment.

Keywords: Collusion, institutions, monitors, competition, guilds, Champagne fairs, medieval Europe.

JEL Codes: D02, D82, N23, K42.

1. Introduction

Whenever moral hazard arises in situations beyond the reach of law, monitors are often employed to minimize cheating. This could happen, for instance, when formal law enforcement is weak or absent, or the legal process costly and dilatory. Reliance on informal monitors, however, requires monitoring the monitor. Specifically, monitors are themselves subject to two kinds of moral hazard. They could collude, for a consideration, with those they should monitor and turn a blind eye to cheating. Or they could threaten to falsely impugn the integrity of the latter unless adequately bribed. This second problem – of extortion – is relatively easy to deal

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with when the monitor lacks coercive authority and must depend on the market. The problem of collusion however is more complex – and its solution often requires specialized institutions.

In this paper, I attempt to study one particular informal monitor – the fair authorities at the medieval trade fairs at Champagne.. In this context. Milgrom, North and Weingast[2] (1990) have a seminal paper about the role of the law merchant[3] at the Champagne fairs. They show how authorities at these fairs, whom they call "law merchants" (LM), sustained incentives for honest trade despite absence of coercive power. The LM adjudicated disputes among traders at the fair which could arise from charges of cheating. The authors concede that the LM may himself be dishonest and derive parameters over which the LM will not attempt to extort bribes from honest traders by threatening to falsely smear their reputations. However, they do not analyze the possibility of collusion between the LM and a dishonest trader: they mention it but do not model its implications. I argue that their model has no inbuilt defence against collusion; in fact I show formally that no collusion-proof equilibrium can exist if we extend the MNW model to incorporate the possibility of collusion. However, had the Champagne fairs really been so vulnerable to collusion, they would have broken down extremely quickly. Instead, they survived for several centuries – at least from the beginning of the 12th century (Face, 1958) till well into the 14th, when they eventually declined, in part due to exogenous increases in transport costs (Munro 1999). I therefore focus on developing a model of the Champagne fairs with a collusion-proof equilibrium. Moreover, my approach has the added advantage of modeling the effect of the presence of multiple geographically dispersed trade fairs in different locations on collusion in any one trade fair. Both Williamson (1991) and MNW themselves commented that modeling more than one geographically dispersed LM was desirable.

Thus, while MNW's model is not collusion-proof, a different model of the Champagne fairs with a collusion-proof equilibrium could be designed. Among the innovations in my model, I allow for competition between different trade fairs and for merchants' membership in guilds (both guilds and rival fairs coexisted with the Champagne fairs). I use the term "guild" loosely to denote a self-governed community of merchants. The model also attempts to narrow the gap that Williamson mentions between the "theoretical LM" and the "actual LM". Unlike MNW's model,

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[2] Denoted in the rest of this paper by MNW. I summarize the key aspects of MNW's paper in Section 2.

[3] "Law merchant" is often used in the sense of the informal code of mercantile law which governed medieval traders' notions of what constituted cheating. MNW, however, use the term interchangeably with fair authorities or "private judges" who kept records of traders' past transgressions and adjudicated disputes between them, and I follow their terminology.

where there is no mechanism to detect collusion, the model I develop lends itself to a natural way of discovering it with some positive probability. I derive conditions where a transgression against one trader by the fair authorities would result in a credible threat from the trader's entire guild to switch to a rival fair. Moreover, due to network effects embedded in the model, traders outside the guild would also boycott the errant fair. Unlike MNW, or indeed unlike other papers on monitors, I also consider the possibility of "reverse extortion" – with individual clients of the fair threatening to unjustly smear its reputation unless bribed.

1.1 In Relation to the Literature

This subsection deals with related literature, apart from MNW itself, and situates my paper in this context. The MNW paper will be discussed at length in a subsequent section since I use its technical aspects to derive the result that if the MNW model were extended to allow the LM and a trader to collude, no collusion-proof equilibrium would exist (Proposition 1).

Greif (2004, 2006) has highlighted the "community responsibility system"(CRS) in medieval trade, including the Champagne fairs. Merchants at the Champagne fairs comprised many different "self-governed communities". Each community had a common place of residence – establishing its communal identity – and usually even its own legal consul present at the fairs. CRS, when used at the fairs, essentially meant that the fair authorities would hold the members of a cheating merchant's community liable for his debts. Until restitution was made, the whole community would be banned from attending future fairs. This provided the defaulter's community with an incentive to pressure him to pay off the debt. Greif has emphasized that the informational requirements of the CRS depended on the ability to verify communal and personal identity, rather than requiring all merchants to have perfect information about all other merchants' past trading history. The CRS avoided the practical difficulty in individual punishment that a banned individual might be able to carry on trading through heirs or agents. As against this, the CRS itself ran into a practical difficulty – also mentioned in Greif (2004): in large communities, a trader could possibly circumvent a ban on his community by lying about his communal affiliation. In addition, Greif (2006) also contains a critique of MNW, arguing that the MNW model "identifies a theoretical possibility but does not establish that it corresponds to a historical reality"(page 317). Other sources, such as Ogilvie (2011), confirm the frequent use of the CRS in medieval trade.

My paper differs from this literature in some important respects. First, it is the sole paper, to my knowledge, to examine the issue of whether MNW's model is collusion-proof. Greif's critique of MNW does not deal with this aspect. Nor do other papers – like Edwards and Ogilvie (2012). I show that if other aspects of MNW are left unchanged, but the strategy space is extended to allow the LM to collude, no collusion-proof equilibrium can be supported. But this undermines the very credibility of the fairs and their existence over centuries becomes hard to explain. Greif's (2004, 2006) models on the functioning of the CRS, while fascinating, do not identify this problem with the MNW model, nor do they focus on collusion themselves.

Secondly, while designing a model with a collusion-proof equilibrium, I have tried to incorporate the possibility that punishments by fair authorities may or may not follow the CRS. Weaker punishments, such as those in which liability for a debt is restricted to the individual, can also suffice to support a collusion-proof equilibrium, though I have also identified the circumstances when a punishment based on CRS would do so. The reason for exploring both types of punishments is that in actual practice, both types seem to have been followed. Greif (2004) mentions how many individuals – including those trading at prominent trade fairs like the fair of St Ives - frequently produced royal licences of immunity from CRS and could only be held liable for their own debts (p. 129-130). Ogilvie (2011) cites evidence specifically for the Champagne fairs arguing that exemptions from CRS were often negotiated (p. 277-278). The prominent rival fairs of Flanders assured foreign merchants from 1253 onwards that only principal debtors would be held liable for any debts incurred at the fairs (p. 279). Edwards and Ogilvie (2012) mention that the evidence for CRS at the Champagne fairs is restricted to a certain time period, and conjecture that this may reflect the fact that in other periods of its existence, the Champagne fairs were sufficiently profitable that individuals were discouraged from defaulting because they did not want to lose the opportunity to attend future fairs (p. 145-146). It is therefore encouraging that I find that collusion-proofness can be supported by punishments either for individual defaulters or for the defaulter's whole community ie CRS.

Thirdly, because I consider both types of punishments, I am able to draw some inferences about when one type would have been more effective at solving the collusion problem than the other. I find that there is a threshold guild or community size below which CRS would be more effective, while above it, individual punishments would be more credible. This squares with evidence from Greif (2004) that when communities became large, they used CRS less and less.

While he hypothesizes that the CRS would be less effective in large communities due to the difficulties of verifying communal affiliation, my model provides another reason. If a defaulter's community were very large, the fair would lose much revenue by banning the whole community from future fairs, increasing the fair authorities' temptation to deviate from the proposed punishment and collude. For a large enough size, this factor would outweigh the greater ease of detecting collusion under CRS. Therefore, in such cases fairs using CRS would lose credibility, and would be pressured to shift towards punishments restricted to individual defaulters.

Fourth, unlike either MNW or the papers above, I model competition from a rival trade fair on one fair's incentives to collude. Such rival fairs existed. Munro (2000), mentions the Five Fairs of Flanders and the English Midlands Fair and others as coexisting with the Champagne fairs. This is confirmed by Verlinden (1963), Wedemeyer Moore (1985) and others.

The informational requirements of my alternative model are that (a) each trader knows his personal history, and recalls traders that have cheated him and not made restitution, (b) the fair authorities record the identities of defaulters, and (c) if individual traders observe evidence of collusion at future fairs, by spotting a trader who has cheated them but not made restitution, they can inform their guild that the fair authorities have been colluding. Requirement (a) is relatively uncontroversial. There is evidence to support requirement (b). Greif (2004) notes that "individual responsibility was indirectly enforced through the CRS: the community would generally seek to extract from the defaulter."(p. 125). Thus even if CRS were followed, the defaulter's identity would have to be specified by the fair authorities in their accusations. Ogilvie (2011) shows that the procedure for CRS began with the fair authorities naming the defaulter (p. 276). Thus defaulters' personal identity was known to the fair authorities. In my model, I do not require the fair authorities – or individual merchants - to remember the trading history of all fair participants; I only require that the authorities be able to ban defaulters – either individually, or along with their communities – from future fairs. I now turn to requirement (c), that merchants who discovered that a fair authority has been colluding should inform their guild of the fact. In my model, merchants have a direct incentive to do this. By informing the guild, they make it possible to set in motion a collective switch of the entire guild to a rival fair, while if they had not informed their guild, the best they could do would be to individually switch. However, their payoffs to being at the rival fair are much higher, because of network effects, when their entire guild switches than when they make the switch on their own. Moreover, since members of a community/guild resided at the same place when at the Champagne fairs (Greif (2004, 2006), communication costs within the guild would have been low. Hence, requirement (c) – which I formalize during the technical presentation of the model – seems reasonable.

Yet another related paper is Greif, Milgrom and Weingast (1994) – henceforth GMW. GMW is a seminal paper underlining the importance of merchant guilds in medieval trade. In their paper guilds use their powers of enforcing "collective reprisals" – forcing their members to boycott trading with towns whose rulers expropriated a single guild member – to discipline rulers and ensure honest trade. The ruler's potential expropriation took the form of either extorting excessive taxes from foreigners or shirking on a promise to provide costly services like protection. The issue of geographically dispersed rulers or trade centers is not considered.

The main similarity with my approach is that guilds also play an important role in my model and are able to solve problems of collective action. However, there are important differences. First, the potential misbehavior considered by GMW is essentially extortion – a problem which MNW also deal with – not collusion between a monitor and some one he should monitor. The ruler in GMW does not accept side payments from a third party for his breach of trust. Secondly, the fair in my model differs intrinsically from the ruler in GMW. It is an informal rather than a formal authority. Though the fairs were sponsored by princely rulers – the counts of Champagne – I focus on the incentives of the fair wardens' court which had limited coercive power. Third, unlike GMW who do not consider rival trade centers, I do. Fourth, , unlike in GMW, in my model merchants who are not members of the punishing guild would also abandon the Champagne fair and switch to a rival in the event of collusion.

A final difference is that my guild does not force its members to abandon Champagne – it merely organizes a collective switch, which, under the conditions I specify, is also in the individuals' interest. In contrast in GMW the guild has to force a collective reprisal on its members. However, this difference can be traced to a difference in the assumptions made in the two models. In GMW's model, a ruler faces diminishing returns to trade. Therefore, when an embargo is in place and trade volume is small, he is willing to offer special terms to embargo-breakers, and this is credible because of the high marginal value that the ruler places on trade. Unless a guild that announces an embargo coerces its members, a few traders will therefore be tempted to break the embargo. In my model, this problem does not arise because the fair authority's gains are assumed to be linear in the number of participants. Indeed, as long as the authority faces either constant or increasing returns to trade, the issue remains moot. With an assumption similar to GMW's, the guilds in my model would also have to coerce their members not to switch back to the errant fair. While my model highlights the complementarities between informal institutions like trade fairs and guilds, showing that each reinforced the need for the other, a complementary need for formal organizations is thus not ruled out.

Greif (1993) is an interesting paper about multilateral punishment supporting intra-community trade within the medieval trading community of the Maghribis. Both MNW and my paper, in contrast, are set in the context of inter-community impersonal exchange.

Other historical sources, besides the ones already mentioned, that I have consulted include Bourquelot (1865), Bautier (1970), Gelderblom (2005), Munro (1999, 2003), Volckart and Mangels (1999), Reyerson (1999), Keene and Rumble (1985), Halphen (1964) and Dobson (2000). I refer to these in the relevant portions of my model.

The rest of the paper is organized as follows. In Section 2 I summarize the key aspects and contributions of MNW's paper. In Section 3 I discuss why their model has no mechanism to deter collusion, formally demonstrating no collusion-proof equilibrium can be supported if the strategy space in their model is extended to allow for collusion. In Section 4 I propose a different model and derive conditions supporting a collusion-proof equilibrium. I also discuss the possibility of a new form of extortion and derive conditions under which the system is both collusion and extortion-proof. I show – in section 4.4 as well as in appendix A under different assumptions about the collusion detection technology - that it is not possible to sustain an equilibrium in which both fairs continue to exist with some amount of collusion going on in both.[4] Finally, I show that if cheats are subjected to CRS rather than to individual-based punishments, a collusion-proof equilibrium continues to exist, and identify circumstances in which either type of punishment does better. In Section 5 I discuss alternative solution strategies and add a discussion of various robustness issues. Section 6 contains a discussion. Section 7 concludes.

2. Key Results in MNW

MNW model the institution of the Law Merchant at the Champagne fairs as an individual who supplies traders who query him with information on the past of prospective trading partners. A trader could apply to the LM (after paying a fee Q) for information about the past of a potential

[4] Appendix A also discusses issues of uniqueness.

trading partner. He then traded (provided the information was satisfactory) and, if he believed himself to have been cheated in the trade, could appeal to the LM at a personal cost C. The LM would deliver a judgment J in his favor if his appeal was valid, but 0 if it was not. The accused party, if the judgment went against him, could then pay – at a personal cost f(J) – or refuse to do so. If he refused, the fact was recorded by the LM and reported to any trader who inquired about him in future. The LM earned a revenue of ε from each trader who queried him.

MNW derive parameters for which there always exists a judgment J* such that in equilibrium, each trader who has no unpaid judgments outstanding queries the LM about his partner. If each is assured that his partner has no outstanding judgments, the pair trade honestly. Honesty is ensured by the credible threat that, in the event of cheating, the injured party will appeal to the LM, who will award a judgment J* against the cheat, the cost of which to him, f(J*), exceeds what he might gain by cheating. Appealing remains credible as long as the cost of appeal, C, is less than the judgment J* that the plaintiff expects to be awarded. Moreover, no one can gain by first cheating and then disappearing without paying the fine, as this would then be recorded by the LM and reported to future partners, and the value of future trading opportunities exceeds that of a one-time cheating gain.

Throughout, each merchant's payoffs from honesty and cheating have the traditional prisoner's dilemma structure and are constants.

MNW's LM was thus a centralized information source from which traders could access potential partners' histories. This provided a mechanism whereby a cheat could be punished by all potential future matches, without the need for continuous multilateral information exchange.

For the bulk of their paper, MNW assume that the LM is honest. But they also provide a rigorous treatment of conditions under which the LM will not "extort" where "extortion" implies that the LM would threaten to falsely report a past misdeed when queried about a trader unless bribed. While collusion is mentioned as a possibility, it is not modeled. I now turn to a discussion of why the MNW model is not collusion-proof.

3. A Mechanism to Deter Collusion?

In MNW, the LM is the source of all information. In every period, each merchant gets information about his prospective trading partner by querying the LM (for a fee of Q). In this system, any collusion of the sort described above would be *undetectable.* The LM merely has to accept a bribe from a merchant who has cheated and not paid a fine, agreeing to suppress this information from those who query. The LM's transgression remains secret. But if merchants can collude with the LM to cheat with impunity and share their cheating gains with him, they would have an incentive to do so. The LM would also have an incentive to collude, as he increases income while – as I show formally below – he suffers no penalty. Thus the system is not collusion-proof and will unravel.

Proposition 1 below extends the strategy space in MNW to allow collusion, It shows that no collusion-proof equilibrium can be sustained. As in MNW, the discount factor is δ while the size of the cheating gains is α -1 (α being the payoff from cheating and 1 that from honesty). The condition in MNW for the equilibrium judgment J* to support honest trade was

$$\delta(1\text{-}Q)/(1\text{-}\delta) > f(J^*) > \max[\alpha -1, f(C)] \qquad (1)$$

Condition (1) specifies that the cheat's cost of paying the judgment must be must lie between his cheating gains and the present value of his future gains from trading in the LM system. The cost of appealing must also be small enough to make appealing a credible threat for the plaintiff.

In MNW, cheating is solely observable by the trading pair (though verifiable on appeal by the LM).[5] Further, MNW's specified equilibrium strategies require all traders – including those cheated and not compensated – to query the LM next period unless they themselves have not paid a judgment (MNW, p. 11). Cheats who have not paid a judgment do not query the LM next period because they expect to be exposed by him. We now turn to

Proposition 1: *If we extend the strategy space in the MNW model to allow for the possibility of collusion between the LM and a trader, no collusion-proof equilibrium exists.*

Proof: Suppose, to the contrary, that a collusion-proof equilibrium exists in which all traders are honest and no one colludes with the LM. Can a single trader find a profitable deviation that involves cheating his partner, not paying the judgment and bribing the LM to conceal this information from future partners?

The deviant trader realizes cheating gains of α – 1. His partner would appeal, given (1), and the deviant would be ordered to pay J* at cost f(J*). However, suppose the deviant does not pay and approaches the LM again next period with the following offer "If a prospective partner queries about me in this period, pretend that I have a clean record in exchange for a bribe whose payment I will synchronize with your delivery of a clean report." If the LM agrees to this offer

[5] "We suppose that choices in each bilateral exchange are known only to the trading pair, so that each individual possesses direct information *solely about his own past trading experiences*" (MNW, p. 9: italics in original).

(which, as I show next, he will always do), the deviant repeats this procedure of bribing in exchange for a clean report in every subsequent period. Let B denote the bribe paid by the deviant in each period. Then the trader has an incentive to deviate in this fashion provided

$$\delta B/(1-\delta) < \alpha - 1 \tag{2}$$

signifying a bribe small enough for its discounted costs throughout the future to be outweighed by the deviant's cheating gains. Then the deviant prefers cheating and colluding to a lifetime of honesty. Given (1), he also prefers cheating and colluding to cheating but paying the judgment and not colluding, because (1) and (2) yield $\delta B/(1-\delta) < f(J^*)$. He is also able to afford each period's bribe because, again from (1) and (2), $B < 1-Q$. Thus, (2) is a sufficient condition for the deviant to gain from his proposed deviation and to repeat it indefinitely

Would the LM accept such an offer? Clearly, the offer adds B to his income in any one period. Will the LM face a penalty for colluding? In the model, collusion cannot be detected as no one can tell if a LM suppresses the fact that the deviant has cheated before but not paid a judgment. However, can traders observe cheating (by the deviant) and withdraw their custom from the LM? As pointed out earlier, only the trading pair can observe whether cheating has occurred in a bilateral exchange. Now, from MNW's specified strategy (pointed out just before Proposition 1), if the LM did not collude he would lose the revenue ε from the cheat, who would not use his services after cheating for fear of exposure. If he does collude, however, the cheat uses his services again and he gains this revenue (in addition to the bribe) in each period in which he accepts the offer. What about the cheated merchant's actions? According to MNW's specified strategy, the cheated merchant would continue to query the LM in future periods even if his partner had fled without paying the judgment. However, even if the cheated merchant withdrew his custom permanently from the LM, this loss of revenue (-ε in each period) would be exactly cancelled by the gain in revenue from the custom of the cheat. Therefore, accepting the deviant's offer would still give the LM a net gain in income of B in each period in which he agreed to be bribed. He would therefore accept the offer. Thus, a collusion-proof equilibrium can never exist: an individual merchant would always find a profitable deviation involving collusion, and the LM would agree. ***QED***

4. "Collusion-Proofing" the model: Fairs, Guilds and Competition

Actual practice at the Champagne fairs was somewhat different from the MNW model (as the authors themselves point out). The fair authorities, who played the LM's role, controlled entry to the fair. If any one cheated another merchant at the fair and escaped without paying a fine, the fair authorities would, if honest, debar him from future fairs [see Bourquelot 1865, Bautier 1970]. If the punishment for cheating and not making restitution involved barring the cheat from future fairs*,* collusion would be tantamount to letting him attend future fairs, in exchange for a bribe. If the punishment for a cheat extended to his community members (CRS), barring the community from future fairs until restitution was made, collusion would imply letting the community in in exchange for a bribe (whose present value would be no greater than the cost of making restitution). I initially examine the first case, and then the second, because as already discussed, there is reason to suppose that both types of punishment may have been practiced.

The historical record does not indicate any exact parallel to MNW's LM. But it points to fair authorities who controlled entry to the fair, heard disputes and attempted to punish cheating merchants by barring them from future fairs until they made restitution. These fair authorities usually consisted of two "fair wardens" assisted by a number of subordinates including lawyers, clerks and notaries (Volckart and Mangels 1999, Ogilvie 2011, Reyerson 1999). The wardens were usually chosen from among the local bourgeoisie (Reyerson 1999) and the fair wardens' court had independent jurisdiction over commercial disputes at the fairs. The princely and ecclesiastical sponsors of the fairs also empowered the fair wardens' court to bar particular merchants from future fairs when judicial institutions in these defaulting merchants' home towns failed to compel them to make restitution (Munro 2003). Interestingly, the fact that fair wardens often conducted lengthy correspondence with the legal authorities of defaulting merchants' home towns, requesting them to compel the defaulters to make restitution (Ogilvie 2011) indicates that it *was* feasible for a merchant to cheat at a fair and flee without making restitution, as MNW had assumed, in spite of the existence of some police forces at the fairs (Verlinden 1963). Cheating and absconding were facilitated by the fact that transactions often involved contracts for future delivery, involving a separation between the quid and the quo (Greif 2004, page 117).

Unlike collusion in MNW, collusion in the actual Champagne fairs – allowing a cheating merchant access to future fairs in exchange for bribes - would very likely have been detectable with some probability. I depart from MNW's assumptions as follows to analyze the situation.

1. While MNW consider payoffs in a traditional prisoner's dilemma game – where each merchant's payoff was unaffected by the number of merchants – in my "fair-centric" model, I make payoffs to attending a fair a function of the number of merchants at that fair. Network

effects are likely to be important at a trade fair: the larger the number of others at the event, the more worthwhile is it for an individual merchant to attend. Moreover, the fairs served not only as a meeting place for traders, but also as a financial clearing house, increasing the importance of network effects.

2. I introduce an element of competition by assuming the presence of more than one fair.
3. I also allow merchants to belong to a guild, or more generally, to a self-governed community. (This community may be a guild, but may also be a self-governed commune, town, "nation" or principality.)The importance of merchant guilds – and of more general self-governed groups of merchants - is substantiated in papers such as GMW (1994) (who, however, apply its existence to a rather different problem, that of a ruler's ability to commit not to expropriate foreign merchants)[6]: moreover the merchant guilds coexisted with the Champagne fairs (Gelderblom 2005). I do not, however, assume that all merchants who attended one fair (say Champagne) belonged to the same guild. In fact, there is evidence (Bautier 1970, Verlinden 1963) of some fifteen different merchant guilds at the Champagne fairs.

In summary, my assumptions are consistent with documented historical evidence on the existence of rival fairs and of merchant guilds over the time period that the Champagne fairs were in place. I allow collusion to take the straightforward form of the fair authority allowing a trader who has cheated in a previous fair (but not made restitution) to enter a future one. This is an intuitive interpretation of collusion in the context of trade fairs, and it differs completely from MNW's formulation wherein traders simply query the LM about a partner's past records – completely ruling out the possibility of detecting the LM in collusion. In my formulation, admitting a trader into a future fair is equivalent to declaring that his record is clean. Indeed, according to Bourquelot (1865), and to others mentioned in the introduction, the authorities of the Champagne fair did explicitly bar merchants from attending future fairs if they had cheated and not compensated other merchants at a previous fair.

4.1 A Model

Let the total number of merchants be N, where N is large but finite. Of these N merchants, at t = 0, a number M attends the Champagne fairs. In the interests of simplicity, I

[6] As mentioned in the introduction, other works by Greif (2004, 2006) substantiate the importance of self-governed communities in medieval trade including trade at the fairs. These merchant communities had their own places of residence at the fairs.

assume competition from only *one* other fair. I also assume that each merchant transacts with only one other merchant at the fair.[7]

If the authorities at the Champagne fair are honest, their payoff is a function of the revenue generated at the fair, which in turn depends on the number of attending merchants. [Interestingly, Keene and Rumble (1985) describes how officials at another famous medieval trade fair – the fair of St Giles in Winchester – reimbursed themselves out of the revenues of the fair. This did not include guards in charge of physical security, who were paid regular wages, but did include officials who controlled entry to the fairs, with whom I am concerned here. This provides support for assuming that fair wardens' compensation would at least be sensitive to the revenues generated at the fair].

I use R(M) to denote the fair wardens' payoff when honest, where R'(M)>0. I allow R(M) to take a particularly simple form[8] here:

$$R(M) = \varepsilon M \tag{3}$$

An individual merchant's per period benefit from attending the Champagne fair and being honest is a function H(M) of the number of traders attending the fair. This could be so for several reasons. First, if the number of participants is large, each trader has a larger choice set in terms of whom to trade with. Second, a fair with a large clientele enables merchants to cultivate valuable contacts that might help him in his business later or provide lines of credit or letters of introduction to their own networks. Thus $H(M) > H(M-1)$ for all possible values of M. The trader's one-period payoff from cheating a partner who acts honestly is $\alpha(M) > H(M)$ for all M (so that in a one period game, merchants always cheat). If both traders cheat, they get 0 as in the PD game while an honest trader cheated by his partner gets $-\theta < 0$.

Let the returns that an honest merchant at the rival fair could earn be a function $\beta(n)$, where n merchants attend the rival fair, and $\beta(n) > \beta(n-1)$ for all n in the interval (2,N)[9]. However, there is also a merchant-specific cost to attending this fair instead of Champagne, a composite of

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[7] This assumption is made for simplicity. Alternatively, if there were no restriction on the number of merchants one could trade with in one period, the fair's expected payoff would be proportional to the number of potential pairings, ${}^{M}C_2$, while each merchant's expected payoff would be proportional to the number of other merchants at the fair, M-1. Nothing of essence would change if this were so – in fact the results would be reinforced.

[8] If R(M) were concave, instead of exhibiting constant or increasing returns to M, there would be implications for the role of guilds, as pointed out in the introduction. They would need to have some coercive power. Note that if the fair authorities tax transactions and multiple pairings were allowed as suggested in footnote 7, the fair authorities' payoff would become convex in M.

[9] $\beta(0)=\beta(1)=0$. If there is only one trader at a fair, he has no one to trade with and cannot reap any benefits.

individual-specific locational factors, that may be negative for low values of n[10]. These merchant specific costs are denoted by C_n, n = 1 to N, with C_1 denoting the lowest cost, and C_N the highest. Therefore, the n-th merchant will choose the rival fair if and only if

$$\beta(n) - H(N - n + 1) > C_n \tag{4}$$

To understand (4): if the n-th merchant goes to the rival fair, he earns β(n) (as there would then be n merchants at the rival fair, and N-n at Champagne) and incurs a cost of C_n (relative to Champagne). If he goes to Champagne instead, he avoids the cost, and earns H(N - n + 1) (there are only n-1 merchants at the rival fair, and hence N-n+1 at Champagne).

In the analysis that follows, I focus on building a collusion-proof equilibrium. I assume that traders presume authorities at any fair to be innocent of collusion unless they have contrary information. While ruling out deviations from the no-collusion equilibrium, I will only consider *unilateral* deviations ie those in which only one fair is colluding. While the analysis below focuses on deriving the conditions that rule out collusion (and "reverse extortion") at the Champagne fairs, the parallel conditions for the rival fair are spelt out in Appendix B for the sake of completeness.

4.2 Detecting Collusion and the role of the Guild (Individual Punishments)

In this subsection I deal with the case where prescribed punishments for a cheat were limited to the cheating individual and his community was exempt. Modifications in the results for the CRS case and a comparison of the two cases follows in section 4.3.

The authorities at the Champagne fair would find it profitable – unless deterred by a prohibitive punishment – to collude with a trader who had cheated and not paid fines. The authorities would, in exchange for a bribe, let this trader attend future fairs. However, unless there is a deterrence mechanism, a merchant at the fair would expect to be cheated. So if he stayed on at Champagne, he would expect the stage payoff from the one-shot equilibrium (cheat, cheat) in the prisoner's dilemma game (normalized to 0 as stated earlier). It would be better for him to switch from Champagne to a competing fair – provided that the payoff he expected at this fair (β(N - M + 1)) exceeded his switching cost (at least C_{N-M+1}) .

[10] Indeed C must be negative for at least some merchants. If this were not so, no competition between fairs could emerge in this model, as Champagne presumably had the first mover advantage over rival fairs, and the analysis would become uninteresting. A negative C might reflect the merchants' place of origin. For example, Italian merchants might have lower costs of attending an Italian fair, while Flemish merchants would prefer to attend one in Flanders.

$$\beta(N - M + 1) > C_{N-M+1} \quad (5).$$

He could therefore use the threat of withdrawal as a deterrent to collusion. The fair authorities know that there is a finite probability that a merchant who was cheated in the past also attends the Champagne fair in the future, and sees the trader who had cheated him. The cheated merchant could then infer that the Champagne authorities had been involved in collusion and implement his threat. (5) is a minimal requirement for such a threat to be credible. Even if this credibility condition is fulfilled, would this unilateral threat suffice to deter the fair authorities from colluding? The latter have to weigh their prospective bribe-income from collusion against the future loss of custom from this one merchant, which in turn has to be weighted by the probability (denoted by p) that he indeed detects collusion. Moreover, we have to factor in the added possibility that the merchant detects the collusion after t periods where $t>1$, in which case his withdrawal also takes place after the t^{th} period. Thus the overall expected loss in income that the fair authorities face is given by

$$\delta\varepsilon/(1-\delta)\ [p+\delta(1-p)p+ \delta^2(1-p)^2p+ \delta^3(1-p)^3p+\ldots..] = \delta p\varepsilon/[(1-\delta)(1- \delta(1-p))]$$

where we account for the fact that detection may occur in any period t, provided it had not occurred before.

The fair authorities can extract bribes of $\alpha(M) - H(M)$ from a cheating merchant (his gains from cheating), which fall short of the expected present discounted value of the loss of custom of the cheated merchant iff

$$\alpha (M) - H(M) < \quad \delta p\varepsilon/[(1-\delta)(1- \delta(1-p))] \quad .(6)$$

This is a very strong condition that severely limits the possibility of unilateral punishment deterring collusion. The results up to this point may be stated as

Proposition 2. *A single merchant at Champagne would not have to face a cheat with whom the fair authorities collude iff conditions (5) and (6) above obtain.*

Suppose however that this previously cheated merchant belonged to a merchant guild.-- a highly likely event in view of the importance of guilds around this time. [See Gelderblom (2005) on the German and Flemish “hansa” and the “nations” of the Italian and Spanish merchants, as well as on the numerous local guilds.] This merchant would then be able to spread information about the Champagne fair’s unreliability to other guild members.

Since information is a public good, the merchant must be motivated to incur the cost of spreading this information to the other members of his guild. Suppose merchants incur a small cost c of informing guild members about the fair's unreliability. The cost c may but need not be zero; it is small because, as noted by Greif (2004), all merchants belonging to the same community lived at the same place while at Champagne. Now, an individual trader has a direct incentive to spread the information. If he does not do so, then as noted above, the best he can do is to individually switch to the rival fair. However, if he complains to his guild, the guild can organize a collective switch of all its members to the rival fair. Because of the network effects noted earlier, the individual merchant would get a higher payoff in the rival fair if it had more participants, providing him with an incentive to complain. We assume that network effects are strong enough and the cost of intra-guild communication at the fairs small enough to maintain this incentive. Formally, let the total number of members from the complaining merchant's community at the Champagne fairs be G. Note that G cannot be larger than M (total participants at the Champagne fair). We have

A1: $\beta(N\text{-}M\text{+}G) - \beta(N\text{-}M\text{+}1) > c \geq 0$.

A question might arise at this point: if communication between merchants were feasible, what purpose do the fair authorities at a trade fair serve? Wouldn't it be possible to enforce honesty in all transactions through a multilateral punishment system such as the one among the Maghribi traders described in Greif (1993)? There are however two important differences between this system and the one in Greif (1993). While the latter enabled intra-community exchange, the former – dealing with trade at the fairs – enabled inter-community trade. Secondly, merchant guilds might not be able to keep track of the history of individual merchants, especially those from outside their guilds, but it would be much easier to keep track of the activities of fairs, particularly major trade fairs like the Champagne fairs. Obviously the number of fairs would be very much smaller than the number of merchants, so this is not unrealistic. Coupled with A1, we see that intra-guild information-sharing about collusion on the part of fair authorities would also directly serve individual traders' interests. Moreover, I have modeled the fair as providing a stream of benefits arising simply from the fact that a large number of merchants congregated there (so a merchant's payoff from attending the fair is a function of the total number of participants).

Returning to the analysis, suppose that the costs that members from the complaining merchant's guild would incur in switching to the competing fair range from a minimum of $\underline{C}_g$ to a maximum of $\hat{C}_g$. Obviously, $C_{N-M+G} \geq \hat{C}_g \geq \underline{C}_g$. I assume that the guild can solve collective action problems to the extent of being able to initiate a collective shift of its members away from future Champagne fairs to the competing fair when one member reports collusion on the part of the Champagne authorities. [According to Wedemeyer Moore (1985), Flemish merchants traveling to the Champagne fairs were accompanied by guild wardens with absolute authority over them. Therefore, the assumption that the guild could solve collective action problems may not be a bad one. Similar assumptions are made in GMW(1994), while Greif (2004) points out that most merchant communities trading at the fairs even had their own legal consul with authority over merchants from that particular community]. In that case, it could, and would, organize a similar shift even without such a complaint if that was profitable to all its members. This leads to

Proposition 3. *If the Champagne fairs were attended by some guild members and*

1. $H(M) + \underline{C}_g > \beta(N - M + G) > C_{N-M+G} + c$,
2. $\alpha(M) - H(M) < \delta p \varepsilon G/[(1-\delta)(1- \delta(1-p))]$,

this would imply a collusion- and extortion-proof equilibrium in transactions involving the guild members.

Proof. If the fair authorities colluded with a merchant who cheated, this would be detected by a guild member with probability p. He would then report the fact to his guild which would organize a collective boycott of the fair by all its members. Since guild members knew that the fair authorities would cheat unless deterred by the prospect of adequate punishment, a member who did not participate in the boycott would expect to be cheated and to earn zero. On the other hand, if he shifted to the rival fair, he would earn $\beta(N - M + G)$ while incurring a cost c of complaining to his guild as well as a switching cost between $\underline{C}_g$ and $\hat{C}_g$. Since $C_{N-M+G} \geq \hat{C}_g \geq \underline{C}_g$, the second inequality in condition (1) of the proposition ensures that no guild member would defect from the collective boycott: the boycott would be self-enforcing.

Now the maximum bribe that the Champagne authorities could expect to extract from a merchant was the LHS of inequality (2) of Proposition 3, while the RHS represented the present value of the loss due to the withdrawal of the guild in the event of detection of collusion (where we have accounted for the fact that collusion may be detected after t periods where t>1; the collective punishment starts after the collusion is detected). Thus, condition (2) would deter collusion.

If some guild members attend the Champagne fairs in equilibrium, this implies that it is not worthwhile for the guild to collectively withdraw from Champagne if the fair authorities are honest. Even if the entire guild were to move to the rival fair, the excess payoff from the latter over Champagne would not offset the switching costs of some guild members. Thus,

$$\beta(N - M + G) - \hat{C}_g < H(M). \tag{7}$$

a condition that ensures that guild members with the highest switching costs would refuse to participate in a collective switch away from Champagne.

This condition however does not suffice to rule out extortion by a guild member with lower switching costs. If the latter gains personally from a collective switch, he would have an incentive to induce such a switch through a false report against Champagne. He would therefore mount a credible threat to the Champagne fair authorities and use this threat for extortion. This possibility could be ruled out if we impose the stronger assumption contained in the first inequality in condition (1) of the proposition,

$$\beta(N - M + G) - \underline{C}_g < H(M). \tag{8}$$

Now, if a guild member threatened to falsely report the fair authorities for cheating to his guild, thereby precipitating a collective boycott unless paid a bribe, this would not be a credible threat. If the fair refused to submit to his extortion bid, it would not be worth his while to implement his threat: even if his report was not checked by his guild and induced an immediate boycott, the merchant would know that he himself stood to lose from a false complaint. He would lose H(M) and gain only $\beta(N - M + G)$ while incurring a switching cost at least as large as $\underline{C}_g$. The complaining cost of c would further dampen his incentives to institute the false complaint. Extortion therefore would not be subgame perfect.

The same condition also rules out collective extortion by the guild. Imagine a situation where in spite of honest behavior by the fair authorities, an entire guild threatens to switch to the rival fair unless bribed not to do so. Given (8), this extortion threat may be ignored as it is not credible; even guild merchants with the lowest switching costs could not gain from a collective switch of the guild to the rival fair, in case the Champagne fair was really honest.

Note that a colluding fair authority does not attempt to "buy off" a merchant who detects it in collusion. Presumably the purpose of such a side payment would be to bribe the merchant not to report the collusion to his guild. However, this side payment would not be made for two reasons. First and most important, the merchant has no mechanism to credibly commit *not to report* the fair authority's collusion to his guild. He can conceivably accept the side payment and report the collusion anyway, particularly as, given the second inequality in condition 1 of the proposition, he may feel a switch is in his individual interest. Knowing this, the fair authority would not make the side payment. Secondly, the fair authority does not necessarily receive prior warning when its collusion is detected. A merchant who realizes the fair authority has been colluding might simply make his report to his guild without informing the fair authority first. ***QED***

Proposition 3 defines conditions under which fair authorities would not collude in the cheating of guild members alone. Merchants outside the guild would not enjoy the benefits of Proposition 3, but only those of Proposition 2. However, their presence at Champagne permits a weakening of the conditions delineated in Proposition 3. The weaker conditions are given by

Proposition 4. *If the Champagne fairs were attended by some guild members and*

1. $H(M) + \underline{C}_g > \beta(N - M + G) > C_{N-M+G} + c$,
2. $\alpha(M) - H(M) < p[\delta\varepsilon G + \delta^2\varepsilon M/(1-\delta)]/[1-\delta(1-p)]$,

this would imply a collusion- and extortion-proof equilibrium for the guild members.

Proof. Condition (1) implies that the guild would collectively boycott Champagne if the authorities colluded with cheats. If condition (2) of Proposition 3 is not fulfilled, this would not suffice to deter collusion. However, in the first period after the detection of collusion, the withdrawal of the guild members would have two effects on the other merchants. First, all merchants with switching costs not more than $\hat{C}_g$ would switch in the second period to the rival fair for the same reason that impelled all guild members to willingly participate in the boycott of Champagne. Second, the boycott by the guild would signal to all merchants the fact that the Champagne authorities would collude in cheating unless deterred by severe enough punishment. All merchants therefore would know that if they stayed at Champagne, they could expect to be cheated and to receive at most a zero payoff. Accordingly, they would withdraw. The fair authorities would receive nothing from any merchant from the second period after the collusion was detected. The present value of the loss of this income stream from the second period on and of the first period income from the guild members is represented by the RHS of condition (2) (again, after taking into account that the collusion may be detected after a gap of t periods where t>1) while the LHS is the maximum value of the fair's initial gain from collusion. (2) therefore insures against collusion. Extortion is ruled out for the same reasons as in Proposition 3. ***QED***

Corollary 1: *If guilds publicly announce boycotts*[11], *condition 2 of Proposition 4 becomes*

$$\alpha(M) - H(M) < p\delta\varepsilon M/(1-\delta)[1-\delta(1-p)] \qquad (9)$$

Proof: Suppose that in the first period in which a guild member detects collusion (and informs his guild), the member's guild publicly announces its plans to boycott the fair starting from the next period. Then the other merchants no longer have to wait one period to observe the absence of the guild. Their withdrawal is then instantaneous by the same effects as in Proposition 4, so that, from the period following the detection of collusion, all M merchants abandon the Champagne fair. Thus the RHS of condition 2 of Proposition 4 changes accordingly. ***QED***

Clearly, the fair authorities behaved very differently with guild members than with independent merchants. The former were treated in much more gingerly fashion, the authorities refraining from collusion with those who cheated them (the guild members) for most parameter values. Independent merchants, on the other hand, could be cheated with relative impunity, since the authorities would collude with the cheats except when constrained by the strong conditions of Proposition 2. This may, indeed, be one explanation for guild authorities accompanying traders at the Champagne fairs (as well as at the rival fair in England) – as documented by Verlinden (1963) and Wedemeyer Moore (1985). Indeed, Verlinden explicitly mentions that Italian traders' guilds – or "nations" – often represented these traders at their dealings with the Champagne fair authorities. The guild members' advantage arose from their ability to punish collusion by the fair authorities through a collective boycott – a more effective deterrent than any unilateral punishment could be. Fairs and guilds were mutually reinforcing institutions. Guilds increased the credibility of transactions at fairs. Fairs in turn protected guild members more religiously, increasing the incentives of merchants to join guilds. [Interestingly, according to Gelderblom (2005) merchant guilds declined at the same time as the Champagne and other concurrent trade fairs]. I do not, of course, claim that the organization of trading groups at the fairs into guilds or communities was solely an endogenous outcome of trying to solve the collusion problem.

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[11] From GMW (1994) it appears that it is reasonable to assume that if guilds implemented embargoes, they would announce them, if only as a co-ordinating device. GMW also explicitly refer to some embargoes (boycotts) as being "announced" (GMW page 755).

4.3 Modifications for the CRS case and a comparison

Turn now to punishments governed by CRS, with a defaulter's entire community punished and barred from future fairs until restitution was made. There is ample historical evidence that such punishments were often implemented at the fairs. The fact that merchant communities at the fairs had their own scribes, consuls and places of residence facilitated verification of communal identity, making it easier to implement CRS.

There are now two changes from section 4.2 in the incentives of the fair authorities to collude. First, detecting collusion would become easier. If the cheated merchant, any member of his guild, or his legal consul observed the defaulter's community at a future fair, they could infer that the fair had colluded. Such detection would now be very likely; I assume that the probability of detection would rise to 1.

As against this, if the fair authorities honestly implemented their punishment, they now stood to lose revenues from the defaulter's entire community, an amount dependent on the average attendance of this community at the Champagne fairs. Punishment might be easier, but it would be costlier to implement.

We now have

Proposition 5: *Let defaulters be punished through CRS, and let boycotts be publicly announced. Then if X members of the defaulter's community normally attend the Champagne fairs,*

(I) *a collusion-proof equilibrium exists subject to the conditions*

1.$H(M) + \underline{C}_g > \beta(N - M + G) > C_{N-M+G}+c$,

2. $\alpha(M) - H(M) + \varepsilon X< \delta\varepsilon M/(1-\delta)$.

(ii) *if* $X<\underline{X} = \delta M(1-p)/[1-\delta(1-p)]$, *collusion is easier to avoid with CRS than with individual punishments. If* $X > \underline{X}$, *individual punishments are more effective in deterring collusion.*

Proof: **(i)** Condition 1 is identical to condition 1 in Propositions 3 and 4. As long as it holds, guild merchants find it optimal to boycott the Champagne fair and switch to its rival if and only if it has been discovered colluding. Reverse extortion is also ruled out for the same reasons as in those propositions. Condition 2 however is different. The RHS of condition 2 reflects that if the fair colludes, it is now discovered with probability 1 and – since the guild that discovers collusion publicly announces its boycott – loses its fees from all M fair participants from the period after the discovery of collusion. The LHS captures the benefit of collusion to the fair. In addition to the term reflecting the cheating gain, which is the maximum bribe that the defaulter would be willing to offer, the LHS now has a new term. This reflects the revenues from the defaulter's guild, amounting to a total of εX. If the fair does not collude, it has to exclude the defaulter's guild and loses this revenue, while by colluding and secretly lifting its fair-ban, it gains these revenues. As long as condition 2 holds, however, the punishment to collusion for the fair authorities exceeds their benefits from it, and the collusion-proof equilibrium holds.

(ii) We now compare individual punishment with CRS to determine their relative effectiveness in deterring collusion. The parallel to condition 2 in this Proposition is equation (9) in the individual punishment case. Canceling common terms, we see that condition 2 here is a weaker condition than equation (9) if and only if

$$\varepsilon X < \delta\varepsilon M/(1-\delta)\ [1- p/\{1- \delta(1-p)\}]$$

or

$$X < \delta M(1-p)/[1-\delta(1-p)]=\underline{X} \qquad (10)$$

Thus while CRS is more effective than individualized punishment in deterring collusion when the defaulter's community is not too large, it is less effective when the defaulter's community is larger than a threshold $\underline{X}$. ***QED***

Greif (2004) provides evidence that CRS became increasingly less popular as communities grew. While he offers other explanations for the declining effectiveness of CRS in large communities – such as the ability of members of a defaulter's community to lie more easily about their communal identity , rendering the community ban ineffective – my results provide an additional reason. If the defaulter's community is large, banning it from the fairs was too costly to be credible for the fair authorities, who would face powerful temptations to collude. This would then enhance merchants' incentives to campaign for a switch to individual, rather than community, liability; it would also create incentives for the fair authorities themselves to adopt individualized punishment in the interests of enhancing their credibility (as in the Flanders fair's assurance to foreign merchants from 1253 onwards of exemption from fair-debts for which they were not the principal debtors or guarantors (Ogilvie 2011, p. 277-78)).

4.4 Other Outcomes?

Propositions 3,4 and 5 demonstrate that a collusion-proof equilibrium can be supported in my model. This is in contrast to Proposition 1 which shows that no collusion-proof equilibrium can exist for MNW's model when the latter is extended to allow for collusion. However, can an equilibrium exist in my model with both fairs functioning in the presence of a small level of collusion? I show that the answer is negative. Collusion cannot be sustained in equilibrium; merchants would quickly choose to boycott both fairs and the fairs would break down.

Proposition 6: *Let boycotts be publicly announced as in Corollary 1. No equilibrium can then be sustained with both fairs functioning in the presence of some small level of collusion.*

Proof: Suppose to the contrary that there is an equilibrium in which a proportion $\gamma<1$ of the participants at each fair colludes with the fair authorities, while the rest do not.[12] However, a trader at a fair, say Champagne, does not know whether his match is planning to be honest or to cheat and collude. Accordingly, his expected stage payoff from acting honestly is

$$E(h) = -\gamma\theta + (1-\gamma)H(M)$$

while his expected payoff from cheating is

$$E(c) = (1-\gamma)\alpha\,(M)$$

Therefore, his expected stage gains from cheating are

$$\kappa= (1-\gamma)[\alpha\,(M)-H(M)] + \gamma\theta \qquad (11)$$

This is also the maximum bribe that the Champagne fair authorities can extract from a single colluder. Bribes are extracted from a total of γM colluders at the Champagne fairs. This bribe income must exceed the fair authorities' discounted future losses in the event of detection for collusion to take place. Now, write the term on the RHS of (9)[13] as

$$p\delta\varepsilon M/(1-\delta)][1-\delta(1-p)] = \lambda(p)\ \delta\varepsilon M/(1-\delta) = \lambda(p)\mu$$

As the Champagne fair authorities' bribe income must exceed their discounted future losses in the event of detection, we must have

$$\gamma M\kappa > \lambda(p)\mu \qquad (12)$$

Now, consider the incentives of the $\gamma M+1^{th}$ trader. He would obtain expected stage cheating gains of κ by cheating and would therefore be willing to cheat and offer a bribe up to κ. Moreover, this would increase the fair authorities' bribe income, boosting the LHS of (12), without affecting the RHS. Therefore, if it is profitable for γM merchants to collude with the fair authorities, it is also profitable for $\gamma M+1$ merchants to do so. Since γ is arbitrary, collusion expands until every one at the fairs is colluding. In this event merchants expect the stage game

[12] This proportion does not have to be equal across the two fairs.

[13] (9) is the relevant constraint because we are back to considering individual-based punishments. For community-based ones, the term $\lambda(p)$ on the RHS of (12) would be replaced by 1.

“cheat” payoff of 0 from attending the fair, and will credibly opt to stay home instead. Therefore the fairs continuing to function with a small amount of collusion is not an equilibrium. ***QED***

Here I assume that the probability of the fair authorities’ being detected in collusion does not change with the number of colluding merchants. For example, this will be the case where the detection probabilities by individual merchants are perfectly correlated. It is also the case under CRS. However, it is also possible that the probability of detection rises with the number of colluders; this case is dealt with in Appendix A. As long as the detection probability does not rise too fast with the number of colluders, collusion can be ruled out in equilibrium.

Over the long period in which the fairs did exist smoothly, the collusion-proof equilibrium rather than the “disintegration” outcome appears to have been in operation and was thus the outcome of interest. We may still wonder, however, if it is a matter of luck whether we obtain the collusion-proof equilibrium or the outcome where collusion becomes universal and the fairs disintegrate. In Appendix Result 1, I show that this potential multiplicity between collusion-proof equilibrium and disintegration/breakdown can vanish once one allows for the fact that the probability of the fair authorities being detected in collusion can go up with the number of colluders. I obtain conditions under which the “breakdown” outcome cannot occur within the parameter zone supporting the collusion-proof equilibrium – which is then the unique outcome within the specified parameter zone.

5. Remarks

5.1 Alternative Solution Strategies

I have sought to devise a collusion-proof equilibrium of the fairs which uses the presence of rivals. Are there alternative mechanisms that yield collusion-proof equilibria? One possible approach would be to try to exploit the fact that the “fair authorities” consisted of several people who could conceivably function independently, providing checks for each others’ misdemeanours. Such detection could then lead to a deterrent punishment for collusion. While intriguing, I have chosen not to follow this route in this paper. Partly this is because having multiple layers of monitors still leaves the question open of monitoring these layers. What is to prevent one fair warden from accepting a bribe to overlook collusion by another? Nor is it intuitively clear how the detection mechanism would work. Therefore, I have chosen to focus instead on a solution where detection and punishment are left to the traders themselves.

Another possible approach could be to ask whether a minimal number of changes to the original MNW model could result in a collusion-proof equilibrium. For example, suppose that we take the original MNW model and in addition to allowing collusion, we relax MNW's informational assumptions and allow traders to observe other traders' appeals where they complain to the LM of being cheated. Even though observing that an appeal has been brought against a trader does not in itself signal collusion between the cheat and the LM, it is possible that an appeal be construed by observing traders as evidence of cheating. If these traders then withdrew from the fair, the LM's revenues would drop. Therefore, could the LM be induced to reduce the probability of this occurrence by taking a strong stand against engaging in collusion, hoping that this would also discourage would-be cheats?

Again, while this route is intriguing, I have avoided it for two reasons. First, one of my objectives is to build a more historically accurate picture that incorporates important elements in medieval trade like self-governed communities and competing fairs. Secondly, even if traders in MNW's framework were allowed to observe appeals brought by other traders, this would not necessarily cause them to withdraw from the fair. An appeal indicates a difference of opinion about whether cheating has occurred in a particular bilateral transaction, but does not prove that it did. A trader might make a mistake and think that he has been cheated when he has not. Even if traders could also observe the LM's judgment, and if the complaints were deemed valid by the LM, they would not expect attending the fairs to become unprofitable as long as cheats made restitution. However, following through on each individual case of cheating to check if the cheats made restitution to the cheated parties imposes very strong informational requirements on the information available to individual merchants. As highlighted in the introduction, the informational requirements of my own alternative model are weaker.

5.2 Other Issues

In this sub-section, I discuss various questions related to my model and results. First, is there any historical record of collusion for the Champagne fair or the other concurrent trade fairs? Secondly, what if the authorities in the other fair tried to collude? Thirdly, could a guild co-ordinate to collectively collude with the Champagne fair authorities, and could this change the nature of the results? The answers to these questions are interrelated and I provide answers to each question in turn.

First, collusion does not occur in equilibrium in the model subject to the conditions specified. However, the threats which deter collusion are well known to every one, and knowledge of these threats serves to sustain the no-collusion equilibrium. Collusion could occur if the conditions needed to sustain this equilibrium failed. The historical record does contain instances of collusion by fair authorities, however, these instances were extremely rare. The single instance I have been able to find of collusion at the Champagne fair is from Benton and Bisson (1991). According to them, Hugues de Chaumont, a guard at the Champagne fair wardens' court was found guilty of "peculation" (accepting bribes) in 1306[14]. Although evidence is too sketchy to draw definitive conclusions, it is interesting that by this time the Champagne fair was generating less revenue for exogenous reasons (according to Halphen (1964) the revenues generated by the fair of St John at Troyes – one of the cycle of fairs constituting the Champagne fairs – were on a downward trend from 1296, falling from 1375 livres in 1296 to 250 livres by 1320. For the Champagne fairs as a whole, revenues fell from 8383 livres in 1296 to 1760 by 1310 (Edwards and Ogilvie 2012, Table 1). Around this time, the Champagne fairs also became less attractive to merchants; they were first abandoned by the Genoese and then by the Venetian merchants (Halphen 1964). Merchants switched to rival fairs like the Flemish fairs, the fair at Chalon-sur-Saone – in Burgundy – and fairs at Frankfurt and Brabant (Dobson 2000)). In terms of my model, the decline in the revenues and the profitability of the Champagne fairs would correspond to a reduction in ε and in $H(M)$, both of which, from Propositions 3 to 5, would make a collusion-proof equilibrium less likely. The rarity of instances of collusion in the historical record, moreover, is consistent with the supposition that the Champagne fairs were for most of their existence profitable enough to support a no-collusion equilibrium.

The second question is partly answered by my showing that both fairs could not continue to flourish with some level of collusion going on in each. However, throughout the presentation of the collusion-proof equilibrium, merchants operate on the principle that a fair is "honest until reported guilty" – whether the "guilt" is established by detection of collusion or reports from guild members as described above. This is a justifiable belief in a model in which cheating is simply not worthwhile in equilibrium. A merchant who is currently attending the Champagne fair has no experience of the rival and therefore assumes the rival acts honestly at the time of making the switch. Of course, an exactly similar analysis could be applied to merchants at the

[14] *Olim* III, 207.

rival fair.[15] We are considering (and providing conditions to rule out) possible *unilateral* deviations from an equilibrium where both the Champagne and the rival fair act honestly. Therefore, at one time we must consider collusion by only *one* fair. When the merchants attending the colluding fair think of a switch to the other, the other fair is assumed *not* to be deviating from honest behavior.

Thirdly, the possibility of a collective collusion between members of a guild and the Champagne fair authorities is considered in section 4.3 with reference to CRS. Of course, carrying this possibility to an extreme, we could ask what would happen if *all* guilds in *all* fairs attempted to collude with their relevant fair authorities. In this case, trade would break down as no merchant would foresee being able to gain anything by attending either fair – the universal collusion/ breakdown outcome considered in section 4.4. Clearly, this did not represent historical reality, at least for the period of the fairs' existence.

The Propositions of Section 4 assume the existence of the Champagne fairs and the presence at them of some members of a guild. This is because the existence of the fairs is a historical fact and in any case not the focus of my interest. However, for the sake of completeness, I explore the conditions for their existence in Appendix *C*.

6. Discussion

In his Nobel lecture on "guarding the guardians", Hurwicz emphasizes the relevance of this issue, particularly in government and law enforcement. While not explicitly modeling collusion and extortion, he mentions various possibilities, of which the most pessimistic is the possibility of an infinite regress of corrupt guardians – those guarding the guardians (second-order guardians) would be corrupt, as would the guardians guarding them (third-order guardians) and so on. In such a scenario, "implementation" of desirable outcomes would be impossible. However, if higher-order guardians are principled, implementation is possible. He also mentions the possibility of a "closed circle" where those being guarded by the first-order guardians also become guardians of some higher order. In Hurwicz's terms, therefore, merchants in my model have two orders – order 0 (since they are the ones being monitored by the Champagne authorities) and also order 2 – since they can punish the fair authorities for collusion – thus closing the circle. Unlike Hurwicz, though, I have emphasized competition between "first-order guardians" (fairs). Moreover, I have shown that it suffices for a certain mass of the "guarded" to

[15] See Appendix B for parallel conditions ruling out collusion and extortion at the rival fair.

become aware of the “first-order guardian”’s collusion: even if the rest are unaware, the network effects in the model ensure that their self-interest coincides with punishing the colluding fair. Hurwicz begins his lecture with Juvenal’s problem: how does one trust guards to guard one’s wife? My solution, in the case where misdemeanors are verifiable ex post, is for Juvenal and some of his friends to form an association whose members black-list any guard against whom a single associate alleges misdemeanor: all members replace the errant guard by a competing guard – so, in all probability, will non-members. In an additional twist, the kind of extortion I have considered is not the usual kind, where a corrupt “guardian” extorts from those he guards: rather, I consider reverse extortion where the “guarded” may exploit their power as “higher-order guardians” to extort from first-order guardians, and show when this can be ruled out.

My model suggests that a combination of competition between different monitors and the presence of a collective organization among the principals which could initiate a collective switch to the competitor if the monitor were detected in collusion by a single member of the organization, could effectively support a collusion-free equilibrium. In addition, extortion from the monitor could also be ruled out due to considerations of subgame perfection. My specific case also includes network effects (ie principals benefit more by patronizing a monitor with a larger number of clients). Among other types of monitors, similar network effects may perhaps be relevant to credit rating agencies, or even external auditors: firms would want to use the services of the auditor or the rating agency whose word the investors would trust the most. This would imply greater demand for the services of a monitor with an established reputation, and a large existing clientele is surely one basis for such a reputation.

7. Conclusion

My purpose in this paper has been to examine how an important informal law enforcement institution, the Champagne fairs, could have survived in the face of incentives to collude, in the context of informal monitors’ vulnerability to collusion, extortion (including “reverse” extortion) and conditions under which such vulnerability would be reduced. Collusion was undetectable in MNW’s model, and therefore there was no inbuilt mechanism to deter the LM from engaging in collusive behavior. We have seen that a simple extension of MNW’s model fails to explain collusion-proofness. To achieve my objective of modeling how the fairs could have survived despite opportunities to collude, I have developed a different model partly aimed at narrowing the gap between the “theoretical LM” and the “actual LM”. When we consider the way in which collusion actually took place at these fairs, it is not hard to conceive of mechanisms which would allow it to be detected. Moreover, I introduce two other institutions into the picture: a competing fair, and a merchant guild which could organize collective boycotts. I derive conditions under which a transgression against one trader by the LM would lead to a collective boycott from which no one guild member would want to deviate. While my assumptions do not require the merchants' guilds/communities to have exercised coercive power, a different assumption that fair authorities faced diminishing returns in the number of fair attendees would have required that these communities exercise coercive power – as in GMW – to ensure that no one deviated from the collective boycott. This highlights the fact that while my main conclusions point to the complementarities between fairs and guilds, the importance of formal institutions capable of coercion cannot be denied. My model incorporates the importance of network effects at fairs, showing how the presence of a rival fair would have encouraged even merchants outside the guild to abandon the colluding fair. Network effects also enhance individual merchants' incentives to inform their guild members of the fair authorities' collusion. Finally, my conclusions hold whether cheats at fairs were punished individually or through CRS, and I obtain some interesting results about the relative efficacies of the two in bolstering the credibility of the fairs.

Appendix A: Uniqueness

The results in the text have shown that in my model two possible outcomes could arise, in only one of which – the collusion-proof equilibrium - the fairs would exist. In the second outcome, collusion would become universal causing the fairs to break down. However, I have not demonstrated that the collusion-proof equilibrium and the breakdown outcome necessarily occur in disjoint parameter zones. Here, I derive sufficient conditions under which this is so. I now explicitly allow for the fact that the probability of being detected in collusion can rise with the number of traders that the fair authority colludes with. Let $p(\gamma M)$ denote the probability of collusion being detected when the fair is attempting to collude with γM merchants. We will have $p(\gamma M)>p(1)$ for $\gamma M>1$ provided a cheated merchant's discovery of the merchant who had cheated him at a future fair is not perfectly correlated with a similar discovery made by a different merchant. As an example, the two discoveries could in fact be completely independent; with two collusions, then, we would have $p(2) = 1- (1-p(1))^2$.

Appendix Result 1: *Let the probability of the fair authority's being detected in collusion rise with the number of collusions. Then, if this probability of being detected is rising neither too slowly nor too fast with the number of collusions,and if boycotts are publicly announced,*

(a) *Proposition 6 continues to hold; no equilibrium in which the fairs function with a small amount of collusion is sustainable.*

(b) *The collusion-proof equilibrium is unique in the parameter space that supports it. Breakdowns can only occur outside this parameter space.*

Proof: **(a)** The inequality (12) in the text required for the fair authorities to want to collude with γM traders is now replaced by

$$\gamma M\kappa > \lambda(p(\gamma M))\mu \tag{A1}$$

We can check that $\lambda'(p)>0$, $\lambda''(p) <0$. The $\gamma M+1^{th}$ trader's incentives to collude remain as before. Now, as long as

$$\lambda'(p(\gamma M)) < \kappa/ \mu$$

the marginal increase in the probability of detection from colluding with an additional trader is outweighed by the additional bribe income from colluding with an additional trader. Therefore, the fair authority colludes with an additional trader. Given the concavity of $\lambda(p)$, and noting that $\kappa\geq \min[\theta, \alpha(M)-H(M)]$, a sufficient condition for this to hold for all γ is

$$\lambda'(p(1)) < \min[\theta, \alpha(M)-H(M)] / \mu \tag{A2}$$

Given A2 an equilibrium with a limited amount of collusion will never exist; as in the text, collusion becomes universal and traders opt to stay home. This is the breakdown outcome.

(b) One of the conditions supporting the collusion-proof equilibrium of Proposition 4 was

$$\alpha(M)-H(M) < \lambda(p(1))\mu \tag{A3}$$

(Given our new notation, this is identical to condition 9). However, from part (a), a breakdown can only occur if (A1) holds for some $0<\gamma\leq 1$. Now, if $\alpha(M)-H(M)>\theta$, κ cannot exceed $\alpha(M)-H(M)$, while if $\alpha(M)-H(M)<\theta$, the maximum value κ can take on is θ. If

$$\lambda(p(\gamma M))/ \lambda(p(1)) > \gamma M\kappa/[\alpha(M)-H(M)] \tag{A4}$$

then (A1) can only hold when (A3) does not, that is, (A1) implies

$$\alpha(M)-H(M) > \lambda(p(1))\mu \tag{A5}$$

A sufficient condition for (A4) to hold is

$$\lambda(p(\gamma M))/\lambda(p(1)) > \gamma M \max[1, \theta/\{\alpha(M)-H(M)\}] \quad \text{(A6)}$$

Thus (A6) is a sufficient condition for breakdown to be impossible in the parameter zone supporting the collusion-proof equilibrium. Coupled with part (a), (A2) and (A6) together suffice to ensure uniqueness in the parameter zone supporting the collusion-proof equilibrium. ***QED***

Appendix B: Ruling out Collusion and Reverse Extortion at the rival fair

Here, I reconstruct the conditions of Proposition 3 for the rival fair. For simplicity, assume that the rival fair's revenues also depended on the number of merchants (N-M) attending it, with $R(N-M) = \varepsilon(N-M)$. Now, consider collusion by the rival fair authorities, and its detection by a merchant, G of whose guild members were attending the rival fair. If members do not switch, they fear getting the stage game payoff of 0 per period. On the other hand, if the whole guild switches to Champagne, each trader expects to gain a payoff of H(M+G) there. Moreover, taking into account the cost of complaining to his guild*,* even the trader with the highest preference for the rival fair would be willing to make the switch, provided.

$$H(M+G)-c > -C_1 \quad \text{(A7)}$$

Meanwhile, if the rival fair authorities were *honest,* it should not be in any individual guild member's interest to initiate a collective switch to the Champagne fair. This would suffice to rule out extortion by making all extortion threats empty. This condition is given by

$$\beta(N-M) - H(M+G) > C_{N-M} \quad \text{(A8)}$$

To understand this condition, note that the trader who has the *least preference* for the rival fair gets a payoff of $\beta(N-M) - C_{N-M}$ by remaining at the rival fair when the rival fair authorities are honest. This trader can expect to get H(M+G) if he manages to get his guild to switch to the Champagne fair via a false complaint against the rival fair authorities. In addition if he does so he also has to bear the complaining cost c. Thus (A8) ensures that it is not in his individual interest to lodge such a false complaint. (A8) also ensures that the guild does not collectively extort from the rival fair even if it is honest ; if (A8) holds, a collective switch is not subgame perfect not being in the individual interest of any of the guild members.

(A7) and (A8) imply that, for the rival fair, the parallel to condition 1 in Proposition 3 is

$$\beta(N-M) - C_{N-M} > H(M+G) > c-C_1 \quad \text{(A9)}$$

while condition 2 – the condition that ensures that the expected loss in revenue from the guild merchants outweighs the gains from collusion – is the same as in the text.

Appendix C*: *The Existence of the Champagne Fairs and of a Competing Fair.

Consider inequality (4) in the text:

$$\beta(n) - H(N - n + 1) > C_n$$

The left hand side of (4) is increasing in n. As the number of traders at the rival fair increases and the number at Champagne falls, the rival fair becomes increasingly profitable relative to Champagne (not accounting for merchant specific costs). By construction, the RHS is also increasing in n. Plot both LHS and RHS against n (the number of merchants choosing the rival fair). Consider the class of functions where there exists a unique number, M, such that:

(a) $\beta(n) - H(N - n + 1) > C_n$ for $n < N - M$

(b) $\beta(n) - H(N - n + 1) < C_n$ for $n > N - M$

For this class of functions there is a unique intersection between the LHS and the RHS of (4), such that in equilibrium M merchants go to the Champagne fair, while N - M go to the rival fair. On the other hand, if $\beta(n) - H(N - n + 1) > C_n$ for all $n < N$, the Champagne fairs will not exist, while if $\beta(n) - H(N - n + 1) < C_n$ for all $n < N$, the competing fair will not.

There is of course the possibility that there will be multiple intersections between the LHS and RHS. We first look at the case where the number of intersections is 2 (this can be generalized to any case with an even number of intersections). We now have

(a)$\beta(n)-H(N-n+1)>C_n$ for $n<N-M$ *and* for $n>N^*$

(b)$\beta(n)-H(N-n+1)<C_n$ for $N^*>n>N-M$

However the second intersection is an unstable one : if more than N* merchants went to the rival fair, n would jump all the way to N and the Champagne fair would not exist while if the number dropped below N*, it would fall to N – M and we would revert to the first intersection. The earlier equilibrium with M merchants at Champagne and N-M at the rival fair is stable. Given that the Champagne fair did exist and in fact had a historical first mover advantage relative to other fairs, this is the equilibrium that was relevant.

If there is an odd number of intersections, the analysis remains the same: initial co-ordination is at a stable equilibrium, presumably the one with a large number of merchants attending the Champagne fair, since it was the dominant medieval fair. Subject to the conditions stated in Propositions 3 to 5, this equilibrium would remain robust to collusion and extortion.

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