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Social Distance and Self-Enforcing Exchange

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Abstract

This paper models social distance as endogenous to the choices of individuals. I show that where government is absent, large numbers of socially heterogeneous agents can use social distance-reducing signals to capture the gains from widespread trade. Although traditional reputation mechanisms of multilateral punishment break down where large populations of socially diverse agents are involved, ex ante signaling can make widespread trade self-enforcing. Original documents from the thirteenth through fifteenth centuries left by traders participating in international trade via the *lex mercatoria* provide evidence for this mechanism.
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1 Introduction

Social distance poses the following dilemma for trade: As individuals venture beyond their small homogeneous social networks, uncertainty about potential trading partners' credibility rises. This uncertainty limits agents' ability to realize the gains from exchange. Since most of the gains from trade lie outside homogeneous social groups, agents face a severe predicament.

Government is usually called upon to reduce uncertainty so that socially distant agents can secure the gains from widespread exchange. However, in our less than perfect world, contracts are incomplete and costly to enforce, the legal system fails, and the state's eye cannot be everywhere all the time. Furthermore, as Fearon and Laitin point out, in "most places where ethnic groups intermingle, a well-functioning state and legal system do not exist." Nevertheless, interaction between socially distant individuals is commonplace and overwhelmingly peaceful (1996: 718).

Similarly, in the international arena—where parties to exchange are often significantly socially distant—formal police and legal systems are virtually non-existent (Benson 1989; Oye 1986; Plantey 1993). Nonetheless, international trade flourishes. In 2003 alone global exports of merchandise and commercial services exceeded $9 trillion (WTO 2004).[1] This is surprising since most economists consider formal enforcement necessary for individuals to capture the gains from widespread trade.

A burgeoning literature highlights the success of self-enforcing exchange relationships between socially homogeneous agents. Inside small, homogeneous social groups, where the social distance between actors is very short, individuals can rely upon reputation mechanisms of *ex post* enforcement to ensure cooperation despite the absence of government. The smallness and homogeneity of the group enables the effective flow of information about the past conduct of individuals' behavior between its members. If an agent cheats, this fact can be communicated throughout the rest of his group, which can punish the cheater by refusal to

[1] Recent evidence (Rose and Engel 2002) suggests that this growth is not due to regional trade zones like NAFTA or the EU. Rather, it is the product of growing extraregional international exchange (O'Loughlin and Anselin 1996).

exchange with him ever again. Provided that individuals are sufficiently patient, multilateral punishment creates cooperation. Important research by Greif (1989, 1993, 2002), Ellickson (1991), Bernstein (1992, 1996, 2001), Clay (1997), Landa (1994), Zerbe and Anderson (2001), and others provide evidence illustrating this claim.

However, almost no work has examined the ability of socially distant agents to trade peacefully without government.[2] On the contrary, the literature argues that large numbers of socially distant agents require government enforcement to capture the gains from exchange (see for example, Greif 1989, 2002; Landa 1994; and Zerbe and Anderson 2001).[3] When a sufficiently large number of diverse individuals are involved, it is argued, the reputation mechanism of multilateral punishment described above breaks down (in addition to those cited above, see also, Dixit 2003). Information about cheaters cannot be effectively communicated throughout large populations because their sheer size makes communication to each of their many members prohibitively costly or outright impossible.

When these members are socially distant the problem is even worse. Social distance makes the transmission of relevant information more difficult in two ways: First, it raises the cost of communication with others. Second, it makes it harder for individuals to converge upon social norms that stipulate what constitutes cheating and how cheating is to be punished.[4] Under these circumstances the threat of eternal boycott in the event of cheating is no longer credible and cooperation is undermined. Large numbers of socially distance agents therefore require government to realize the gains from trade.[5]

[2]Fearon and Laitin (1996) provide one notable exception. I should also note that an interesting strand of literature addresses the effectiveness of self-enforcing arrangements among agents with differing discount rates. See for instance, Fafchamps (2002). Of course, I am concerned with agent heterogeneity in a completely different sense.

[3]A related vein of literature points to the negative impact of agent heterogeneity on the provision of public goods and the quality of institutions. See, for example: Alesina and Spolaore (2003), Alesina and La Ferrara (2002, 2000), Alesina, Baqir, and Easterly (1999), Easterly and Levine (1997), Cutler, Elmendorf, and Zeckhauser (1993), and Goldin and Katz (1998).

[4]For a discussion of how social norms can be used by communities to enforce cooperation see Kandori (1992).

[5]Greif's (1994) discussion of Maghribi traders and Genoese traders is especially illustrative of this argument. The Maghribi traders' coalition constituted a small, socially homogeneous network within which informal mechanisms of *ex post* enforcement ensured cooperation. The informal nature of enforcement, however, limited exchange opportunities to those with other group members. In contrast, the presence of

This paper challenges this claim. I argue that where government is absent, large numbers of socially distant agents can and have captured the gains from widespread trade by making exchange agreements self-enforcing. Where multilateral punishment is not effective due to the number and social distance of individuals involved, agents employ *ex ante* signaling to make exchange self-enforcing.

Existing discussions of social distance in the self-enforcement literature treat the extent of homogeneity between individuals as exogenously determined and social distance between actors as fixed. However, a literature addressing the economics of identity led by Akerlof (1997) and Akerlof and Kranton (2000) points out that individuals can and do manipulate their social distance from others. Building on their insight, this paper treats social distance as a variable of choice, endogenously determined by actors themselves. Using this framework I construct a simple model to show how socially distant agents exchange despite the absence of government.

In my model socially distant agents adopt degrees of homogeneity with outsiders they desire to trade with. Doing so signals their credibility to one another.[6] The use of social distance-reducing signals separates cheaters from cooperators, ensuring that in equilibrium only cooperators exchange. In extending the workability of self-enforcing arrangements to large numbers of socially distant individuals, I pick up where authors like Greif (1989, 1993, 2002), Landa (1994), and Zerbe and Anderson (2001) leave off.

My model is most closely connected to those of McElreath et al (2003) and Bowles and Gintis (2004).[7] Like these papers, this one does not rely upon social affinity to support cooperation through altruistic feelings among similar individuals. Instead I consider the role of social distance in supporting cooperation through its ability to alter the information structure of interaction between agents. Unlike these papers, however, this one considers the

formal enforcement in Genoa enabled the Genoese to trade with outsiders, yielding them greater gains from exchange.

[6]Posner's (1998) excellent work considers the implications of signaling for the legal system.

[7]This paper is also somewhat connected to Smith et al (2001), who use costly signaling to explain the evolution of cooperation among unrelated members of the same social group for the purpose of activities like hunting and gathering.

role of homogeneity in promoting cooperation between socially distant individuals rather than between members of the same homogeneous group. In other words, I model the process of endogenous homogenization that agents use to promote widespread trade by *including* outsiders in their networks of exchange rather than looking at how parochial groups use social differences to enhance the efficiency of intra-group relations by *excluding* outsiders. I share with Kranton (1996) and Greif (1993) a framework in which informal arrangements are responsible for creating cooperation between agents that face potential conflict. However, I differ from them in that my model examines the *ex ante* means that members of large, socially diverse populations use to avoid being cheated by outsiders instead of modeling how socially homogeneous agents use *ex post* punishment to create cooperation inside their small in-groups.

The remainder of this paper is organized as follows: Section 2 frames the endogeneity of social distance and using this framework presents a simple signaling model to illuminate how self-enforcing exchange among a large population of socially heterogeneous agents works. Section 3 considers the testable implications of my model. Section 4 examines historical evidence for the use of social distance-reducing signals to enable widespread trade where government is absent. I analyze original documents from the thirteenth through fifteenth centuries left by traders participating in international trade via the *lex mercatoria*. Section 5 concludes.

2 Signaling with Social Distance

2.1 Formally Defining the Degree of Homogeneity Between Individuals

To a great extent individuals can affect their position vis-à-vis others in social space. The reason for this is straightforward. Homogeneity is *multidimensional*. There are innumerable potential dimensions across which individuals may have commonality. For instance, two agents might share some of the same categories of belief, like religion or political persuasion. They may share appearance, such as the way they dress, or practices, like the medium of exchange they employ. Individuals might also share behavior, such as the way they greet strangers, the way they deal with colleagues, or the way they structure their contracts with others. Clearly some dimensions of homogeneity are more significant than others.[8] For instance, language may be a relatively significant dimension, while style of dress may be relatively insignificant.[9]

Homogeneity is also continuous. For each dimension of homogeneity, individuals may share various margins within that dimension. Consider the dimension of language.[10] If some individual has a complete understanding of English, and some other individual has, say, a five percent understanding of English, the two share marginal homogeneity over the dimension of language. Like with multidimensionality there are also innumerable margins of homogeneity over each dimension. Individuals need not completely share a dimension of homogeneity for there to be some commonality over this dimension.

Although some dimensions of homogeneity, for instance gender and ethnicity, are exogenously fixed for agents by nature, many others, for instance, religion, language, style, and customs, are not. It therefore makes sense to distinguish between the former, which I call unalterable dimensions, and the latter, which I call variable dimensions. Correspondingly, it is possible to distinguish between unalterable social distance (fixed social distance over a dimension of homogeneity that results from the unalterability of the dimension) and variable social distance (alterable social distance over a dimension of homogeneity that results from the dimension being variable). Unless otherwise noted, when I refer to dimensions and degrees of homogeneity or social distance in the discussion that follows, I am referring to

[8] The significance of various dimensions is largely determined by the context in which two strangers are interacting. For example, at a football game, the team one is cheering for may constitute a rather significant dimension of potential homogeneity with a stranger. Outside this context, however, an individuals' favorite team may be considered a relatively unimportant dimension of commonality.

[9] Rafaeli and Pratt (1993), however, find that in many cases dress does in fact constitute a significant dimension of homogeneity.

[10] Lazear (1999) examines the incentives of minority populations to adopt the language of majority populations as a means of enabling cooperative interaction.

their variable forms.

Before exploring how heterogeneous individuals use social-distance reducing signals to promote trade with one another, it is necessary to first formally define the *degree of homogeneity* between agents. For any two individuals, j and k, let $\mathbf{H}$ be an n-dimension vector of variable characteristics that j and k may share. Each of the potential dimensions of homogeneity between two individuals, h_i, compose the elements of $\mathbf{H}$ and go from h_1 to h_n. Since not all dimensions are equal, dimensions of homogeneity that compose $\mathbf{H}$ are weighted. Multiplying $\mathbf{H}$ by an $n \times n$ matrix of dimension weights where $0 \leq w_i \leq 1$, yields the weighted vector $\mathbf{H}$, $\mathbf{H}_w$. $\mathbf{H}_w$ is thus defined:

Definition 1 $\mathbf{H}_w = [w_1 \cdot\ h_1, w_2 \cdot h_2, ...w_n \cdot h_n], 0 \leq w_i \cdot h_i \leq 1$, *where* $w \cdot h \in \Re$, *a real number between and including* 0 *and* 1 *that describes the weighted fraction of margins of homogeneity between* j *and* k *over a dimension* h_i, *percentage normalized to* 1.

When $w_i \cdot h_i = 0$, j and k are perfectly heterogeneous with respect to one another over dimension h_i. There are no margins of homogeneity between them over this dimension. When $w_i \cdot h_i = 1$, j and k are perfectly homogeneous with respect to one another over dimension h_i. When, say, $h_i \cdot w_i = .6$, there is 60 percent marginal homogeneity over dimension h_i.

There is some function f that maps the n-dimension vector $\mathbf{H}_w$ to a single real number, $f : \Re^n \rightarrow \Re$. $\overline{H}$ is therefore defined by the function

Definition 2 $f(\mathbf{H}_w) = \overline{H} = \frac{1}{n}\sum_{i=1}^{n} w_i \cdot h_i = \frac{(w_1 \cdot h_1)+(w_2 \cdot h_2)+...(w_n \cdot h_n)}{n}, 0 \leq \overline{H} \leq 1$,*where* $\overline{H}$ *is a single real number that describes the total degree of homogeneity between* j *and* k, *percentage normalized to* 1.

When $\overline{H} = 0$, j and k are completely heterogeneous with respect to one another. There is zero degree of homogeneity between them. When $\overline{H} = 1$, j and k are completely homogeneous with respect to one another. When $0 < \overline{H} < 1$, j and k share some (less than complete) degree of homogeneity.

2.2 A Simple Signaling Model

To see the role that variable social distance plays in enabling widespread trade I use a simple signaling game. I model the situation in which there are only two distinct social groups, P and Q. Each group is comprised of n individuals, p and q, respectively. Where $P = \{p_1, p_2, ...p_n\}$, let $p = p_i \in P$ and where $Q = \{q_1, q_2, ...q_n\}$, let $q = q_i \in Q$. Suppose the members of each group are completely heterogeneous with respect to the members of the other group and are highly homogeneous with respect to the members of their own. In other words, let $\overline{H} = 0$ for any p and q, and $\overline{H} \approx 1$ for any p and p and for any q and q.

If multilateral punishment can sustain cooperation among the members of the combined population $2n$, then the problem I aim to overcome is already solved. The point, however, is to explain the emergence of cooperation in the case in which the population is too large and diverse for multilateral punishment to work. Assume then that the combined population of both groups $2n$ is too large to permit the effective flow of information about individuals' histories throughout it, making multilateral punishment ineffective for inter-group interactions.

Large population size and significant population heterogeneity, however, do not impinge the flow of information about traders' past conduct *within* an in-group since in-group members are relatively few (n) and socially close ($\overline{H} \approx 1$). Information about cheaters can thus be spread inside a group, but not outside its bounds where increased population and social heterogeneity prevent this. In other words, if any q cheats any p, each member of P becomes aware of this, but no member of Q does. Multilateral punishment is therefore effective inside each social group, but only involves foregoing trade opportunities with the members of the social group one cheated and not the members of the other.

Although this partial multilateral punishment cannot create the same level of cooperation as full-scale multilateral punishment (involving the entire population $2n$), it can secure some. Sufficiently patient agents who value the discounted stream of indefinite future trades with the members of the group their trading partner is part of more than the one-shot payoff of cheating will cooperate. Sufficiently impatient agents will not.[11]

My concern is not with this standard application of the "folk theorem" but rather with how socially distant individuals confronted with this limited punishment capability (owing to the size and diversity of the population) can overcome the uncertainty inherent in interacting with anonymous outsiders who may be patient but may also be impatient, and thus prone to one-off cheating.[12] I therefore assume that the members of an in-group multilaterally punish those who cheat any of their members by never trading with them again, but rather than examining this mechanism of *ex post* enforcement, my analysis deals with how individuals who are part of a large, socially heterogeneous population overcome the fear of interacting with outsiders and being cheated in the first place.

I consider the simple two-person case where only one member of the large, socially heterogeneous population who I call p, interacts with one other member, who I call q. This is done to simplify the analysis, however the model can be extended without problem to include the interactions of many ps with many qs. Let there be mutual gains from trade, r, between p and q and assume that q always initiates an exchange relationship with p. Furthermore, it is common knowledge that q can be one of two types: a cooperator, t_1, or a cheater, t_2, and that Ψ proportion of the population of q's are cooperators and $1 - \Psi$ of the population of qs are cheaters. Cheaters have been endowed by nature with excessively high discount rates (i.e., they are impatient) and always defraud their exchange partners who lie outside their group. Cooperators, on the other hand, have been endowed by nature with very low discount rates (i.e., they are patient) and always trade peacefully with those who are outside their group.

[11] What "sufficiently" means depends upon the parameters of the repeated game that is being modeled. *Ceteris paribus*, where the payoff from cooperation relative to cheating is higher (for instance, where agents forego relatively more trade by cheating, as they do when the entire population of individuals $2n$, rather than just the members of one social group, refuse future trade in the event of cheating), less patience is required to achieve cooperation. Typically, where δ is agents' discount factor and $\delta \in (0,1)$, θ is the one-period payoff from cooperation and β is the one-period payoff from cheating where $\beta > \theta$, agents with discount rates that satisfy: $\delta \geq \frac{\beta}{\theta+\beta}$ will cooperate while those with discount rates that do not will cheat. In this example, a "sufficiently" patient agent is one whose discount factor satisfies the inequality.

[12] Posner (1998) takes a similar tact in his discussion of signaling, politics and the law.

I assume that all ps are cooperators. This assumption is obviously unrealistic as is the assumption that q exclusively initiates inter-group trade with p and p does not initiate trade with q as well. The model could be modified to include both p and q as initiators of exchange relationships and to include the presence of cheaters and cooperators in both groups P and Q. The basic insight gained by doing this, however, is the same under the simplifying assumptions I employ. I therefore leave aside these modifications, which unnecessarily complicate the analysis.

Per the discussion above, the total degree of homogeneity between p and q is measured by $\overline{H}$, and $\overline{H}$ is subject to individual choice by q. Nature (N) moves first and selects q's type, t, where $t = t_1$ (cooperator) with probability Ψ, and $t = t_2$ with probability $1 - \Psi$. q privately observes his type, t_1 or t_2, and selects a degree of homogeneity, $\overline{H} \geq 0$, with p. p observes $\overline{H}$ and on the basis of $\overline{H}$ updates his beliefs about whether q is type t_1 or t_2. His updated beliefs determine whether or not he will trade with q.[13]

I assume that $\overline{H}$ satisfies two important criteria that make it an effective signal of q's credibility in exchange. First, $\overline{H}$ is observable. Attributes of q that p shares, for instance what religion q practices, what language he speaks, how q dresses, etc. can be learned by p. Second, $\overline{H}$ satisfies the single-crossing property that allows for information-revealing equilibria in signaling games. Stated plainly, it costs q more to create homogeneity with p over such dimensions if he is a cheater than it costs him if he is a cooperator.

The reason for this assumption is straightforward. The payoff from creating some degree of homogeneity with an outsider is long term. In other words, the costs of investing in "homogeneity capital" with an outsider are only recouped through repeated play over time. Cheaters, however, have higher discount rates than cooperators. Because they discount the gains from future exchange more heavily than cooperators, cheaters find it relatively

[13] In a richer version of this model q's type would lie somewhere on a continuum of credibility. On one end of this continuum q always cheats. On the other he cooperates all the time. In between, he cheats sometimes and cooperates others to varying extents. p would respond to various observed levels of $\overline{H}$ with q with a willingness to engage in various levels of exchange with q, resulting in various payoffs. To simply the discussion, however, I make q's type binary and p's decision about what level of exchange to engage in with q binary as well. Thus upon observing $\overline{H}$, p updates his beliefs and either trades with q or does not.

more costly to invest in creating some degree of homogeneity with an outsider, the value of which will only be recouped sometime down the road. Following this logic, the more impatient the cheater, the more costly he finds the investment. If the cost of creating some degree of homogeneity is high enough (specifically, if this cost is greater than the one-period payoff from cheating), cheaters will not do so. Only cooperators will adopt this degree of homogeneity, thus this signal can be successfully used to determine a sender's credibility.

Observing his social distance from q is costly for p, ξ, where $0 \leq \xi \leq r\Psi$. ξ is bounded this way because the cost of observation can never be negative and because p will never consider even the possibility of exchange with q if the cost of observing $\overline{H}$ is greater than the expected benefit of observing $\overline{H}$. For values of $\xi > r\Psi$, p's expected payoff of interacting with q is negative. Since we are interested in the case in which mutual gains from inter-group trade exist, we restrict ξ in such a way that p does at least no worse by contemplating inter-group trade than he would do if he did not entertain this possibility at all (and thus did not play the game we are interested in analyzing).

Within this range, ξ's size depends upon the ease with which p can observe q's degree of homogeneity with respect to himself. The ease of observability depends on the dimension(s) of homogeneity adopted by q to signal his credibility. For instance, where q creates a degree of homogeneity with p by adopting p's daily hygiene routine (if q were somehow able to come to know this), ξ would likely be relatively high. It stands to reason that for p, establishing this fact would not come cheaply. On the other hand, where, for example, q creates some degree of homogeneity with p by adopting p's language, ξ would likely be relatively low. The fact that q speaks p's language is easy for p to observe.

If p trades with q and q is a cooperator, q receives r, the sum of the discounted value of indefinite future trades for patient agents, and p receives $r - \xi$. If p trades with q and q is a cheater, q receives z, the one-shot payoff of cheating, and p receives $-z - \xi$. If p does not trade with q, p receives $-\xi$ and q receives 0, where $r > z > 0$. To effectively screen q, p is looking for some degree of homogeneity that q would adopt if he were cooperative but not adopt if he were a cheater. Let c be the cost of adopting some degree of homogeneity $\overline{H}$, where c may be either monetary or psychic and c is increasing in $\overline{H}$ such that: $dc/d\overline{H} > 0$ and $d^2c/d\overline{H}^2 > 0$, $c(0) = 0$ and $c(1) = r$. The degree of homogeneity with q that p is looking for to determine if q is cooperative or a cheater is therefore easy to tabulate. p is looking for some $\overline{H}$, $\overline{H}^*$, where $\overline{H}^*$costs $c > z$. No q, regardless of type, will adopt any $\overline{H}$ with cost $c > r$. Therefore, p is looking for some $0 < \overline{H}^* < 1$ with cost $r > c > z$. Figure 1 depicts this game.

3 Equilibria

The equilibrium concept in this dynamic game of incomplete information is perfect Bayesian. To find the equilibria we must check for separating and pooling equilibria. I consider only equilibria in pure strategies. Checking for these is straightforward. Let $\mu(t_i \mid \alpha)$ be the probability that p assigns to type i after observing action α. The only beliefs p can hold consistent with Bayes' rule involve assigning a probability of 1 to q being a cooperator (t_1) after observing $\overline{H} \geq \overline{H}^*$ and assigning a probability of 1 to q being a cheater (t_2) after observing $\overline{H} < \overline{H}^*$. This results from the fact that choosing $\overline{H} \geq \overline{H}^*$ is a strictly dominated strategy for qs of type t_2. If a separating equilibrium exists it must therefore involve t_1 choosing $\overline{H} \geq \overline{H}^*$ and t_2 choosing $\overline{H} < \overline{H}^*$. That is,

$$\sigma_q(t) = \begin{Bmatrix} \overline{H} \geq \overline{H}^* \text{ if } t = t_1 \\ \overline{H} < \overline{H}^* \text{ if } t = t_2 \end{Bmatrix}.$$

Proposition 1 *The separating equilibrium of the game in Figure 1 has the following profile:*

$$\sigma_q(t) = \begin{Bmatrix} \overline{H} \geq \overline{H}^* \textit{ if } t = t_1 \\ \overline{H} < \overline{H}^* \textit{ if } t = t_2 \end{Bmatrix}$$

$$\sigma_p(\alpha_q, \mu(\alpha_q)) = \begin{Bmatrix} \textit{Trade if } \alpha_q = \overline{H} \geq \overline{H}^* \\ \sim \textit{Trade if } \alpha_q = \overline{H} < \overline{H}^* \end{Bmatrix}$$

and

$$\mu(\alpha_q) = \begin{pmatrix} \mu(t_1 \mid \overline{H} \geq \overline{H}^*) \\ \mu(t_1 \mid \overline{H} < \overline{H}^*) \end{pmatrix} = \begin{pmatrix} 1 \\ 0 \end{pmatrix}.$$

Proof. See Appendix A.[14] ■

The equilibrium profile in Proposition 1 actually characterizes an infinite number of separating equilibria in which an infinite number of degrees of homogeneity may be adopted by both cheaters and cooperators in equilibrium. Cooperators may choose any $\overline{H}$ where $1 > \overline{H} \geq \overline{H}^*$. Cheaters may choose any $\overline{H}$ where $0 \leq \overline{H} < \overline{H}^*$. This multitude of separating equilibria results from a failure to restrict p's beliefs off the equilibrium path. If we require that p have reasonable beliefs out of equilibrium, then the set of separating equilibria is reduced to one.

Proposition 2 *Requiring p to hold reasonable out of equilibrium beliefs restricts the set of separating equilibria in the game from Figure 1 to a unique equilibrium in which t_1 chooses $\overline{H} = \overline{H}^*$ and t_2 chooses $\overline{H} = 0$.*

Proof. Imagine, for instance, that a cooperative q adopts some degree of homogeneity with p, Θ, where $1 > \Theta > \overline{H}^*$. To sustain Θ as the equilibrium degree of homogeneity adopted by cooperative qs, p must assign a positive probability to any q with $\overline{H} < \Theta$ being a cheater. However, consider any degree of homogeneity $\Omega \in [\overline{H}^*, \Theta)$. A cheater q could never earn more by adopting any degree of homogeneity $\overline{H} \geq \overline{H}^*$, no matter what p believes about his type after observing this. The only reasonable belief that p can have after observing a degree of homogeneity $\Omega \geq \overline{H}^*$ is therefore $\mu(t_1) = 1$. If this is true, the payoff of adopting Ω must be $r - c$. This experiment could be performed again for some degree of homogeneity $\Phi \in [\overline{H}^*, \Omega)$. Since adopting more than $\overline{H}^*$ degrees of homogeneity is more costly but produces no offsetting benefit, the only degree of homogeneity that can be chosen by cooperative qs in a separating equilibrium that involves reasonable beliefs is $\overline{H} = \overline{H}^*$. Similarly, since choosing $\overline{H} \geq \overline{H}^*$ is strictly dominated for cheater qs and adopting $\overline{H}^* > \overline{H} > 0$ is more costly than adopting $\overline{H} = 0$ but yields no offsetting benefit, the only degree of homogeneity that can be

[14] This proof is adapted from Ellison (2002).

chosen by cheater qs in a separating equilibrium that involves reasonable beliefs is $\overline{H} = 0$.[15]

■

It is equally easy to show that there are no pooling equilibria in this game. There are two possibilities here: all qs choose $\overline{H} < \overline{H}^*$ and all qs choose $\overline{H} \geq \overline{H}^*$. The second possibility can be quickly excluded because choosing $\overline{H} \geq \overline{H}^*$ is strictly dominated by choosing $\overline{H} < \overline{H}^*$ for type t_2 qs. The deviation of type t_2 qs in this case thus prevents it from being a pooling equilibrium. If a pooling equilibrium exists then, it must involve both types of q choosing $\overline{H} < \overline{H}^*$; that is,

$$\sigma_q(t) = \begin{Bmatrix} \overline{H} < \overline{H}^* \text{ if } t = t_1 \\ \overline{H} < \overline{H}^* \text{ if } t = t_2 \end{Bmatrix}.$$

Proposition 3 $\sigma_q(t) = \left\{ \begin{smallmatrix} \overline{H} < \overline{H}^* & \text{if } t = t_1 \\ \overline{H} < \overline{H}^* & \text{if } t = t_2 \end{smallmatrix} \right\}$ *cannot constitute an equilibrium of the game from Figure 1 where p is required to have reasonable beliefs out of equilibrium.*

Proof. Since choosing $\overline{H} \geq \overline{H}^*$ is strictly dominated for qs who are cheaters (t_2), it is not reasonable for p to assign a positive probability to q being a cheater (t_2) if he observes $\overline{H} \geq \overline{H}^*$. If q is cooperative (t_1) he can therefore earn more by deviating from this strategy and adopting a degree of homogeneity with p, $\overline{H} = \overline{H}^*$, reestablishing the separating equilibrium from Proposition 2. ■

The unique equilibrium of this game is therefore the one described in Proposition 2. In equilibrium, q, if cooperative, chooses $\overline{H} = \overline{H}^*$ and p and q exchange, and q, if a cheater, chooses $\overline{H} = 0$ and they do not exchange. The gains from inter-group exchange are therefore exhausted making this equilibrium socially efficient.

4 Testable Implications

This model delivers at least three testable predictions. First, it predicts that where government is absent, socially heterogeneous agents will use social distance-reducing signals to

[15] This proof is similar to Mas-Colell et al (1995).

enable inter-group trade. Historical evidence for this is considered in the next section. Obviously, where the gains of such exchange are larger (and thus the gains from cheating are larger too), the degree of homogeneity required between agents to make possible cooperation will be larger and thus more costly as well.

Second, the model tells us something specific about the particular form of social distance-reducing signals that individuals are likely to use. As I noted in Section 2, there are innumerable potential dimensions of homogeneity that agents may use to signal credibility. Although most dimensions of homogeneity are easily observable, some are easier to observe than others. As ξ gets larger, p's payoff from trading with q falls; the unique gains from inter-group trade shrink when it is more costly to observe $\overline{H}$. *Ceteris paribus*, we should therefore expect agents to signal using those dimensions of homogeneity that are easier and thus cheaper to observe. Concretely, this means that dimensions such as language, religion, manners, business customs, and dress, which are cheaply observable, will be more prominently employed as signals than dimensions that involve personal tastes and private habits, which could in principle serve as degrees of homogeneity between two agents, but tend to be more difficult and therefore more costly to observe.

In other words, those dimensions of homogeneity that have some "public" element to them (e.g., how you greet someone) in that they are there "for all to see" will tend to be used as signals, while those that are exclusively or predominantly private, and thus for the most part only observed by the individual and those she is close to, will not be used. It should therefore not be surprising that while individuals are often more inclined to interact with those who share the same religion, they are not (at least under normal circumstances) so inclined to interact more with those who have the same color carpet in their homes as they do. This prediction is corroborated by the historical evidence I consider in the next section in which *public* dimensions of homogeneity are adopted by individuals to enable trade with outsiders.

Third, the model suggests that social distance-reducing signals are focal signals for enabling *inter-group* trade. In other words, these signals are privileged over other costly behaviors that could in principle be used to separate high and low types when individuals from different social groups are involved. The reason for this is simple: Where individuals are socially homogeneous, there is little room for social distance-reducing signals to play a role in conveying credibility. Adopting the behaviors and practices of someone you are already like is not costly. Adopting the behaviors and practices of someone unlike you, however, is, which makes adopting degrees of homogeneity with an outsider a signal of the sender's credibility. Social distance-reducing signals are therefore uniquely suited to inter-group interactions. When members of disparate social groups are involved we should therefore expect to see social distance-reducing signals used to facilitate cooperation.

Some types of signals also create a greater likelihood of repeated interactions than others. Repeated interactions are desirable–especially when government is absent–because they build trust, reinforcing successful relationships and serving as the basis for further exchange. Degrees of homogeneity such as religious practice foster repeated interaction by their nature. Adopting the same religious practices as an outsider, for instance, may mean that you will encounter this person in church each week. For this reason also, social distance-reducing signals are focal for inter-group interactions.

5 Historical Evidence

This section briefly considers some historical evidence for the operation of the signaling mechanism described in Section 2. It analyzes original documents from the thirteenth through fifteenth centuries left by merchants engaged in international trade under the *lex mercatoria* or law merchant.[16] The material presented below is intended to be illustrative of how social distance-reducing signaling facilitated inter-group trade in the medieval period rather than a demonstration that this was the only informal mechanism operating to enable exchange under the medieval law merchant. It clearly was not. For instance, as Greif et al (1994) have

[16] All quotes below come from the translation in Lopez and Raymond (1990).

pointed out, merchant guilds were also among those informal institutions used to facilitate medieval trade. Milgrom et al (1990) point to the presence of yet another informal arrangement that contributed to the growth of medieval exchange. Signaling with homogeneity should be considered one of multiple informal institutions supporting this exchange, which was particularly important in facilitating inter-group trade.

The law merchant is a complex polycentric system of customary law. It arose from the desire of socially distant traders in the late eleventh century to engage in cross-cultural exchange. In the absence of formal enforcement, this custom-based system relied on private arbitration (merchant courts) for resolving disputes. Between the early twelfth and late sixteenth centuries, virtually all European trade between heterogeneous agents operated on this basis with great success.

Traders engaged in international commerce under this informal system faced the opportunity to exchange with outsiders from many different social groups. So, as a merchant from Naples in 1458 writes, individuals needed to "'adapt oneself to the circumstance"' to be successful in trade (Cotrugli 1573: fol. 25v.-29r.). Frequently this involved adopting the manners and disposition of the outsiders one desired to trade with.

For instance, according to the merchant above, in order to "enjoy as much reputation or credit" as needed to facilitate exchange, "merchants must not have the fierce manners of husky men-at-arms, nor must they have the soft manners of jesters and comedians, but they must be serious in speaking, walking, and in all actions" (Cotrugli 1573: fol. 64v.-66v.). In this way, homogeneity over the dimension of "manners" signaled trustworthiness that enabled inter-group trade.

Appearance was also important in signaling credibility to outsiders. For instance, a merchant writing from Florence sometime in the early fourteenth century advises traders to "Wear modest colors, be humble, [and] be dull in appearance . . ." (Frescobaldi early fourteenth century).[17] His advice suggests that traders created a degree homogeneity over

[17] Contained in Sapori (1947: 642).

dimensions like dress and manners as signals of credibility to enable exchange with outsiders.

A merchant writing in 1288 cites the importance of appearance as well, but adds customs to the list of important dimensions to adopt. Speaking about Milan he observes that "its natives . . . have the peculiarity of being rather tall, jovial in appearance, and quite friendly, not deceitful, still less malicious in dealing with people from outside their town, and because of this they also are more highly considered abroad than others . . . They live decently, orderly, and magnificently; they use clothing that does them honor . . . good-humored in customs and way of life . . ." (Riva 1288).[18] This merchant is clear that these dimensions of homogeneity were decisive in outsiders' evaluations of Milan citizens' credibility and suitability in exchange.

A number of other dimensions of homogeneity served as the basis for signaling credibility among heterogeneous medieval merchants as well. For example, writing in Florence at the beginning of the fourteenth century, Dino Compagni's poetry points to the importance of homogeneity over two particular dimensions in enabling inter-group trade. The successful merchant, he writes, will be "Genial in greeting without complaints" and "He will be worthier if he goes to church" (Compagni end of thirteenth century).[19]

Shared manners and religious practice signaled credibility to outsiders, making possible exchange. Traders adopted the language of outsiders towards this end too. For instance, a trader writing between 846 and 886 writes: "The merchants speak Arabic, Persian, Roman, Frankish, Spanish, and Slavonic" to enable exchange with foreign traders (al-Qasim 846-866).[20]

A merchant practice guide written in Florence between 1310 and 1340 provides particularly striking evidence of the operation the mechanism described above. This guide is explicit about how traders marginally adopted dimensions of homogeneity with the outsiders they desired to exchange with. In a telling passage, it imparts advice to Western traders who

[18] Contained in Novati (1898: 67-114).

[19] Contained in Del Lungo (1879-1887: 389).

[20] From de Goeje's translation (1889: 114-116).

desire to exchange with the Chinese. Advising the Western trader, the passage reads: "First, it is advisable for him to let his beard grow long and not shave. And at Tana he should furnish himself with dragomans[21] . . . And besides dragomans he ought to take along at least two good manservants who know the Cumanic tongue well. And if the merchant wishes to take along from Tana any woman with him . . . he will be regarded as a man of higher condition than if he does not take one" (Pegolotti between 1310 and 1340).[22]

Perhaps most significantly, traders' voluntary submission to the business and arbitration practices embodied in the *lex mercatoria* created an important degree of homogeneity between them as well. For instance, traders voluntarily adopted: certain media of exchange (Uzzano 1442),[23] notaries (Lopez 1976: 108), standardized weights and measures (Unknown (b) after 1345: 49-50), standardized units of account, witnesses to contract (North 1990: 121, 129), and membership in transnational trading associations and guilds (Berman 1983: 342). Dimensions of homogeneity besides those under the rubric of the law merchant were used to enable inter-group trade as well. For instance, intermarriage, citizenship in multiple countries (Lopez 1976: 67, 63), and religious affiliation (Berman 1983: 346) were also used for this purpose.

In each of the instances considered above, *public* degrees of homogeneity were used by socially distant traders as signals of credibility. The reason that social-distance reducing signals evolved along these dimensions and not others, as discussed in Section 3, is implied by the model considered in Section 2. Recall that p's payoff from inter-group trade with q when q is cooperative is: $r - \xi$, where ξ is p's cost of observing $\overline{H}$. Because of this, *ceteris paribus*, signals that are cheaper to observe will be preferred over those that are more costly to observe. And since dimensions of homogeneity that have a public element to them–for instance, language, appearance and business practices–are cheaper to observe, they tended to be used as signals for inter-group trade under the *lex mercatoria* instead of private dimensions

[21] "Dragomans" is the medieval term for guides in Eastern regions.

[22] Contained in Evans (1936: 21-23).

[23] Contained in Ventura (1776: 151-152).

that are also costly but more difficult to observe.

6 Conclusion

This paper's analysis leads to three conclusions: First, self-enforcing arrangements for securing cooperation among agents are robust. In addition to homogeneous individuals, socially distant agents can also rely upon these arrangements to peacefully exchange where government is absent. By filtering out agents who pose a threat for cooperation, *ex ante* signaling can eliminate the uncertainty and fear that individuals face when interacting with those who lie outside their social networks.

Second, the standard appraisal of government's role in enabling agents to capture the gains from widespread exchange is overly optimistic. Socially distant agents can and have captured these gains without government via the mechanism I described. This suggests that the importance of formal enforcement in securing peaceful trade has been overstated, even where social distance between agents is significant.

Third, conventional wisdom's estimation of social heterogeneity's impact on economic growth is over-pessimistic. If socially distant agents can and have captured the gains from inter-group trade without the state, there is little reason to believe that social heterogeneity, *per se*, is responsible for retarding economic development as some have suggested (see for example, Alesina, Baqir and Easterly (1999) and Easterly and Levine (1997)).[24] The operation of the mechanism considered here points to the spontaneous emergence of informal arrangements to solve problems between actors where central direction is lacking. This observation should strengthen our confidence in the ability of individuals to overcome obstacles (like the problem of social distance), which might otherwise impinge progress.

Finally, the framework presented here provides an alternative to the conventional approach to homogeneity in the self-enforcement literature, which treats social distance as

[24] In fact, as Easterly's (2001) recent work suggests, the presence of effective institutions (for instance, secure property rights) completely eliminates the negative impact of ethnic fractionalization on economic growth found in earlier studies (for instance, Easterly and Levine 1997).

fixed and exogenously determined. In contrast, my analysis views social distance as endogenous to the choices of actors who may manipulate social distance for their purposes. It therefore helps to explain why we often observe individuals adopting the behaviors and customs of those they desire to interact with and why individuals typically trust those who are like them over certain dimensions more than they trust those who are not.

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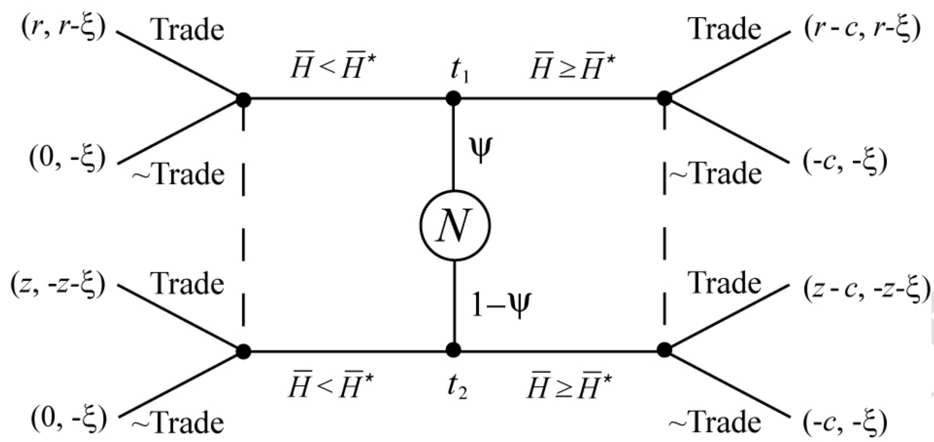

Figure 1. Social Distance-Reducing Signaling Game

A Appendix

PROOF OF PROPOSITION 1:

Using Bayes' rule, we get $\mu(t_1 \mid \overline{H} \geq \overline{H}^*) = 1$ and $\mu(t_1 \mid \overline{H} < \overline{H}^*) = 0$, and $\mu(t_2 \mid \overline{H} \geq \overline{H}^*) = 0$ and $\mu(t_2 \mid \overline{H} < \overline{H}^*) = 1$. When q chooses $\overline{H} \geq \overline{H}^*$, p's expected payoff from choosing to trade and not to trade respectively is therefore:

$$EU_p\ (\text{Trade}, \overline{H} \geq \overline{H}^*) = \mu(t_1 \mid \overline{H} \geq \overline{H}^*) \cdot U_p(\text{Trade}, \overline{H} \geq \overline{H}; t_1) + \\ \mu(t_2 \mid \overline{H} \geq \overline{H}^*) \cdot U_p(\text{Trade}, \overline{H} \geq \overline{H}^*; t_2) = r - \xi.$$

and

$$EU_p(\sim\text{Trade}, \overline{H} \geq \overline{H}^*) = \mu(t_1 \mid \overline{H} \geq \overline{H}^*) \cdot U_p(\sim\text{Trade}, \overline{H} \geq \overline{H}^*; t_1) + \\ \mu(t_2 \mid \overline{H} \geq \overline{H}^*) \cdot U_p(\sim\text{Trade}, \overline{H} \geq \overline{H}^*; t_2) = -\xi.$$

Therefore, p's best response (BR_p) to q choosing $\overline{H} \geq \overline{H}^*$ is to Trade. That is, $BR_p(\overline{H} \geq \overline{H}^*) = \text{Trade}$.

And when q chooses $\overline{H} < \overline{H}^*$:

$$EU_p(\text{Trade}, \overline{H} < \overline{H}^*) = \mu(t_1 \mid \overline{H} < \overline{H}^*) \cdot U_p(\text{Trade}, \overline{H} < \overline{H}^*; t_1) + \\ \mu(t_2 \mid \overline{H} < \overline{H}^*) \cdot U_p(\text{Trade}, \overline{H} < \overline{H}^*; t_2) = -z - \xi.$$

and

$$EU_p(\sim\text{Trade}, \overline{H} < \overline{H}^*) = \mu(t_1 \mid \overline{H} < \overline{H}^*) \cdot U_p(\sim\text{Trade}, \overline{H} < \overline{H}^*; t_1) + \\ \mu(t_2 \mid \overline{H} < \overline{H}^*) \cdot U_p(\sim\text{Trade}, \overline{H} < \overline{H}^*; t_2) = -\xi.$$

Therefore, $BR_p(\overline{H} < \overline{H}^*) = \sim\text{Trade}$.

It is easy to check that this is an equilibrium by verifying that it is never in the interest of q to deviate from the assigned strategy. We already know that a q of type t_2 (a cheater) will not deviate because for him $\overline{H} < \overline{H}^*$ strictly dominates $\overline{H} \geq \overline{H}^*$. What about a q of type t_1? Along the equilibrium path he receives $U_q(\overline{H} \geq \overline{H}^*, \text{Trade}; t_1) = r - c$. If he deviated and chose $\overline{H} < \overline{H}^*$ instead, consistent with the beliefs specified above, p would assume that he was a cheater and therefore not trade with him, yielding an inferior payoff of 0. Therefore, q has no incentive to deviate from the prescribed strategy.