Chapter 9 On the Origin of Distinct Institutional Trajectories: Cultural Beliefs and the Organization of Society

Societal organization—complexes of economic, legal, political, social, and moral institutions—is highly correlated with per capita income in contemporary societies: most developing countries are "collectivist," whereas the developed West is "individualist."[1] In collectivist societies the social structure is "segregated," in the sense that each individual interacts socially and economically mainly with members of a particular religious, ethnic, or familial group. Within these groups, contract enforcement is achieved through informal economic and social institutions. Little cooperation exists between members of different groups, but members of collectivist societies feel involved in the lives of other members of their group.

In individualistic societies, the social structure is "integrated," in the sense that economic transactions are conducted among people from different groups, and individuals frequently shift from one group to another. Contract enforcement is achieved mainly through specialized organizations, such as courts. Self-reliance is highly valued.

Sociologists and anthropologists believe that the organization of society reflects its culture, an important component of which is cultural beliefs. Cultural beliefs are the shared ideas and thoughts that govern interactions among individuals and between them, their gods, and other groups. Cultural beliefs differ from knowledge in that they are not empirically discovered or analytically proved. Cultural beliefs become identical and commonly known through the socialization process, by which culture is unified, maintained, and communicated.[2]

That cultural beliefs influence outcomes is intuitive, but formal examination of the relations between cultural beliefs and societal organization is subtle. If cultural beliefs are

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[1] All societies have both individualistic and collectivist elements; categorizing societies in this way is based on the relative importance of each. See Bellah et al. (1985), Reynolds and Norman (1988), and Triandis (1990), who also document the evidence regarding the correlation between societal organization and per capita income.

[2] On cultural beliefs in general, see, for example, Davis (1949, in particular pp. 52 ff., 192 ff) and Bandura (1971). On their importance in influencing institutional change, see Greif (1994a) and Nee and Ingram (1998).

defined arbitrarily, a variety of phenomena can be generated. How should cultural beliefs be restricted? What are the sources of cultural beliefs? Should cultural beliefs be considered rational? Do cultural beliefs influence the trajectory of institutional change?

The perspective developed in the previous chapters suggests the merit of using game-theoretic equilibrium analysis to analytically restrict the set of admissible cultural beliefs. Furthermore, we can study the impact of cultural heritage on institutional development by examining how particular cultural features exert coordination, inclusion, and refinement effects. The historical and game-theoretic analysis in this chapter supports this claim. It presents a historical and game-theoretical analysis of the relations between culture and societal organization by examining the cultural factors that have influenced the evolution of two pre-modern societies along distinct trajectories of societal organization. The analysis particularly indicates the importance of cultural beliefs in influencing selection among alternative institutions, in becoming an integral parts of the resulting institutions, and in directing subsequent organizational and institutional development. Culture is an important factor for determining societal organizations, influencing institutional development, and rendering inter-societal institutional borrowing challenging. At the same time, the behavior institutions generate, reproduces the culture that led to these institutions to being with.

The game-theoretic framework is useful in restricting the admissible set of cultural beliefs that capture individuals' expectations with respect to actions others will take in various contingencies. Because cultural beliefs are identical and commonly known, when each player plays his best response to these cultural beliefs, the set of permissible cultural beliefs is restricted to those that are self-enforcing. This subset of cultural beliefs can be formalized as a set of probability distributions over an equilibrium strategy combination. Each probability distribution reflects the expectation of a player with respect to the actions that will be taken on and off the path of play. In this regard, cultural beliefs do not differ from institutionalized beliefs in general (Chapter 5).

Although equilibrium analysis is used to restrict admissible cultural beliefs in a particular game, the analysis of their dynamic implications recognizes that they are attributes of individuals, not games or institutions. Due to the fundamental asymmetry between beliefs inherited from the

past and technologically feasible alternatives, cultural beliefs inherited from the past affect decisions in subsequent strategic situations. Past cultural beliefs provide focal points and coordinate expectations, thereby influencing equilibrium selection and the new institutions of which they become an integral part.

Furthermore, distinct cultural beliefs induce different trajectories of endogenous institutional change. Individuals attempt to improve their lot by reinforcing and refining institutions, particularly by establishing new organizations. These organizations, as already discussed, alter the relevant rules of the game by, for example, introducing a new player (the organization itself), changing the information available to players, or changing the payoffs associated with particular actions. The introduction of a new organization reflects an increase in the stock of knowledge, which may be the outcome of an intentional pursuit or unintentional experimentation.

A necessary condition for an intentional organizational change is that those able to initiate it expect to gain from it. Because their expectations depend on their cultural beliefs, different cultural beliefs lead to distinct trajectories of organizational development. The subsequent process of modifying and refining the new institutions further contributes to the distinctiveness of each trajectory. Once a specific organization is introduced, it influences the rules of subsequent games, leading to diverse paths of organizational and institutional development and hence to different societal organizations.

Diverse cultural beliefs can also lead to differential economic behavior toward individuals with various social characteristics, such as wealth or membership in a specific social group. For example, different cultural beliefs can imply different social patterns of economic interactions, each of which entails different dynamics of wealth distribution. Different cultural beliefs can also imply different relations between efficiency and profitability in intrasociety and intersociety economic interactions. Some cultural beliefs can render efficient intersociety relations unprofitable, leading to an economically inefficient social structure.

Various social patterns of economic interactions further affect societal organization by leading to distinct institutions based on social and moral propensities (see section 5.3). Frequent economic interactions between the same individuals entail social networks and relationships that

facilitate informal collective economic and social punishments for deviant behavior. Social and economic patterns of interactions also affect intrinsic motivation (motivation based on the utility derived from acting according to internalized norms). Intrinsic motivation seems to be universal, but different patterns of social and economic interactions lead to the development of distinctive normative systems; over time, individuals consider the behavior they follow to be the behavior they ought to follow. Different internalized norms, in turn, reinforce distinct behavior.

Chapter 8 has already lent support to the conjecture that cultural beliefs, norms, and organizations inherited from the past influence trajectories of institutional development. It exposed the interrelationships between Genoa's political institutions and its initial social structures and cultural beliefs. This chapter further substantiates this conjecture by presenting a comparative analysis of the relations between culture and societal organizations. It examines the cultural factors that led two premodern societies—the eleventh-century Maghribi traders from the Muslim world and the twelfth-century Genoese traders from the European (Latin) world—to evolve along distinct trajectories of societal organization.

The chapter models the agent-merchant transaction (Chapter 3) in order to examine the relations between culture and societal organization in the related multiple-equilibria game. It then demonstrates that differences in the institutions of the two societies and their dynamics can be consistently accounted for as reflecting diverse cultural beliefs and their dynamic implications. Past cultural beliefs regarding off-the-equilibrium-path behavior influenced institutional selection, became an integral part of the resulting institutions, affected various economic and social outcomes, influenced the dynamic of institutional change, and led to distinct organizational and contractual innovations. In this analysis, features that are usually invoked to explain distinct observed outcomes (social groups, social patterns of economic employment, the distribution of wealth, the availability of courts) are accounted for endogenously, as reflecting distinct underlying cultural beliefs.

The analysis further supports the thesis advanced in Chapter 7 that beliefs and the associated organizations (social structures) inherited from the past constitute initial conditions in processes leading to new institutions; exert environmental, coordination, and inclusion effects; become elements in the new institutions; and direct processes of institutional refinement,

innovation, and adoption. Societies advance along distinct institutional trajectories; they can fail to adopt the organization of more economically successful ones because the fundamental asymmetry between institutional elements inherited from the past and technologically feasible alternatives implies that the past, encapsulated in institutional elements, directs institutional dynamics.

Interestingly, the analysis reveals that the societal organization of traders from the Muslim world resembles modern collectivist societies, whereas that of the traders from the Latin world resembles contemporary individualistic societies. These findings suggest the theoretical and historical importance of culture in determining societal organizations, in leading to institutional path dependence, and in forestalling successful intersociety adoption of institutions.

Section 9.1 begins the analysis, providing relevant information on agency relationships among the Genoese and using the analytical framework developed in Chapter 3 to explore distinct possible institutions. Section 9.2 discusses the origin and manifestations of diverse cultural beliefs in the two societies and shows how they relate to different institutions; it argues that diverse beliefs led to distinct institutions in the two groups. Section 9.3 comparatively explores the relationships among cultural beliefs, social patterns of agency relations, and wealth distribution in the two societies. Sections 9.4 and 9.5 present the institutional, organizational, and contractual dynamics that each of the institutions and their cultural beliefs entailed.

9.1 Agency Relations and Cultural Beliefs

Overseas trade was central to Genoa's economy, as the maxim *genuensis ergo mercator* (Genoese, therefore merchant) suggests. In this sense, Genoese society was similar to that of the eleventh-century Maghribi traders. The Genoese and Maghribis operated in the same areas, had similar naval technology, and traded similar goods.

Like their Maghribi counterparts, Genoese merchants had much to gain from employing overseas agents. Doing so required supporting institutions, because agents can embezzle merchants' capital abroad. Without such institutions, merchants, anticipating opportunistic behavior, will not operate through agents, and mutually beneficial exchanges in agency service cannot be carried out. To surmount this commitment problem, an institution is needed through

which an agent can commit himself ex ante, before receiving the merchant's capital, to be honest ex post, after receiving the merchant's goods.

Historical records indicate that the Genoese had institutions that enabled agents to commit themselves ex ante to be honest ex post. The Genoese employed agents extensively and established agency relationships outside the family. The first Genoese historical source reflecting agency relations, the cartulary of Giovanni Scriba (1154–64), contains 612 trade-related contracts. These documents reveal that only about 5 percent of total trade investment did not entail agency relations and only about 6 percent of the funds sent abroad through agents was entrusted to family members.[3]

Cartularies and the contracts they contain may overstate the extent of trade conducted through agency relationships and understate agency relationships outside the family. Other, unbiased sources are needed to confirm what they reveal. Fortunately, we have such a source. A document from 1174 lists all the Genoese traders in Constantinople in 1162, the value of the goods each brought to trade, and the owner of the capital. It indicates that merchants invested about 76 percent of their capital through overseas agents and that only about 30 percent of all capital sent by merchants was handled by agents who were family members.[4]

To compare the institutions that prevailed among the Maghribis and the Genoese, I build on the model presented in Chapter 3. This model considers an economy in which there are M merchants and A agents, where $M < A$, and all merchants and agents live an infinite number of periods. Agents have a time discount factor δ, and an unemployed agent receives a per period reservation utility of $\bar{w} \geq 0$. In each period, an agent can be hired by only one merchant, and a merchant can employ only one agent. Matching is random, but a merchant can restrict the

[3] Later cartularies (Ob 1186, 1190; gg 1200–11, ls 1203) show that at the end of the twelfth century, about 16 percent of agency relations involved family members. Two individuals are considered to be family members if the contract mentions that they are relatives, if they have the same surname (unless the surname indicates a place of birth or occupation), or if there is any evidence (such as a marriage contract) indicating they were relatives. I have traced the genealogy of all the families mentioned in GS based on Belgrano (1873) and all available twelfth century cartularies.

[4] For a Latin transcription of this list, see Bertolotto (1896, pp. 389–397).

matching to a subset of the unemployed agents containing agents who, according to the information available to the merchant, have previously taken particular sequences of actions.[5]

A merchant who does not hire an agent receives a payoff of $\kappa > 0$. The gross gain from cooperation is γ. A merchant who hires an agent decides what wage ($W \geq 0$) to offer the agent. An employed agent can decide whether to be honest or to cheat. If he is honest, the merchant's payoff is $\gamma - W$, and the agent's payoff is W. If the agent cheats, his payoff is $\alpha > 0$ and the merchant's payoff is $\gamma - \alpha$. It is assumed that $\gamma > \kappa + \bar{w}$ (cooperation is efficient); $\gamma > \alpha > \bar{w}$ (cheating entails a loss, and an agent prefers cheating over receiving his reservation utility); and $\kappa > \gamma - \alpha$ (a merchant prefers not to hire an agent and receive κ over being cheated). After the allocation of the payoffs, each merchant can decide whether to terminate his relations with his agent. There is a probability τ, however, that a merchant is forced to terminate agency relations due to exogenous factors such as wars.

Suppose that the history of the game is common knowledge. What is the minimum (symmetric) wage offered by all merchants for which an agent's best response is to be honest, given that he will be fired if he cheats and rehired if he is honest (unless forced separation occurs)? Determining this wage requires fully specifying the merchants' strategies. To analyze the impact of different strategies in the same framework, however, the analysis initially focuses on probabilities that are a function of the strategies themselves.

Denote an unemployed agent who was honest in the last period he was employed as an *honest agent*, and let h_h be the probability that he will be hired in the current period. Denote as an unemployed agent whoever cheated in the past as a *cheater*, and let h_c be the probability that he will be hired in the current period. Proposition 9.1 specifies the minimum wage that supports honesty.

Proposition 9.1. Assume that $\delta \in (0, 1)$ and $h_c < 1$. The *optimal wage*, the lowest wage for which an agent's best response is to be honest, is $W^* = w(\delta, h_h, h_c, \tau, \bar{w}, \alpha) > \bar{w}$, and w is monotonically decreasing in δ and h_h and monotonically increasing in h_c, τ, $\bar{w}$ and α. (This proposition is identical to proposition 3.1 and for the proof, see annex 3.1 in Chapter 3.)

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[5] What follows assumes that the probability of rematching with the same agent equals zero for all practical purposes.

A merchant induces honesty by offering the carrot of a wage higher than the agent's reservation utility and the stick of terminating their relations. For a high enough wage, the difference between the present value of the lifetime expected utility of an unemployed and an employed agent is higher than what an agent can gain from cheating in one period. Hence the agent's best response is to be honest. The minimum wage that ensures honesty decreases in factors that increase the lifetime expected utility of an honest agent relative to that of a cheater (δ and h_h) and increases in factors that increase the relative lifetime expected utility of a cheater (h_c, τ, $\bar{\bar{w}}$, α).

How can differences between collectivist and individualistic societies manifest themselves in agency relations? Intuitively, in a collectivist society everyone is expected to respond to whatever transpires between any merchant and agent;[6] in an individualistic society this may well not be the case. Two strategy combinations formalize this difference: the individualistic and the collectivist (multilateral) strategies. In each strategy a merchant hires, for a wage W^*, an unemployed agent, whom he rehires as long as cheating or forced separation does not occur. Under the individualistic strategy, a merchant randomly hires an unemployed agent. Under the collectivist strategy, a merchant never employs a cheater and randomly hires only from among the unemployed agents who have never cheated. An agent's strategy is to be honest if and only if he is offered at least W^*. Each of these strategies is a subgame perfect equilibrium, as established in proposition 9.2.

Proposition 9.2. Assume that under both the individualistic and the collectivist strategy combinations $\gamma - \kappa \geq W^*$ (although note that W^* is lower under the collectivist strategy). Then each strategy combination is a subgame perfect equilibrium of the one-sided prisoner's dilemma game. (The proof appears in annex 9.1.)

The individualistic strategy is a subgame perfect equilibrium, because merchants are not expected to take into account the agent's past behavior when making hiring decisions. Hence each merchant perceives the probability that an unemployed agent who cheated in the past will be hired to be equal to the probability that an unemployed honest agent will be hired. By proposition 9.1 this implies that each merchant is indifferent between hiring a cheater and hiring an honest agent.

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[6]Timur Kuran has suggest that it may better to refer to such beliefs as *communalist*.

(As discussed later, when the decision to acquire information is endogenous, in an individualistic equilibrium the merchant would not have the related information.)

Under a collectivist equilibrium, because each merchant expects others not to employ a cheater, the perceived probability of being hired is lower for a cheater than for an honest agent. By proposition 9.1, this implies that a higher wage is required to keep a cheater honest. The merchant thus strictly prefers hiring an honest agent. The merchant's expectations are self-enforcing: although cheating conveys no information about future behavior, the agent's strategy does not call for cheating any merchant who violates the collective punishment, and merchants do not "punish" any merchant who hires a cheater.

This analysis so far assumes that the history of the game is common knowledge. In fact, acquiring and transmitting information during the late medieval period was costly. The model should thus incorporate a merchant's decisions to acquire information. Merchants gathered information by belonging to informal information-sharing networks. Suppose, therefore, that a merchant can either "invest" or "not invest" in "getting attached" to a network before the game begins and that his action is common knowledge. Investing requires paying Δ each period, in return for which the merchant learns the private histories of all the merchants who also invested. If he does not pay Δ each period, he knows only his own history. Intuitively, under the individualistic equilibrium, history has no value, because an agent's wage does not depend on it. Hence no merchant will invest in information. In contrast, under the collectivist equilibrium, history has value, since the optimal wage is a function of an agent's history. Merchants will invest, because an agent who cheated in the past will cheat if hired and paid the equilibrium wage. Although on the equilibrium path cheating never occurs, merchants are motivated to invest, because this action is common knowledge and a merchant who does not invest is cheated if he pays W^*. This intuition is verified in proposition 9.3.

Proposition 9.3: W^*_{-i} is the minimum wage that merchant i has to pay his agent if only he does not invest. W^*_c is the equilibrium wage under the collectivist strategy in the full information game. If the merchant invests, the collectivist strategy is an equilibrium if and only if $W^*_{-i} - W^*_c \geq \Delta$. Not Invest and the individualist strategy is an equilibrium, whereas Invest and the individualist strategy is not an equilibrium. (The proof is by inspection.)

In the real world, information is often incomplete. Some agents may have an unobservable "bad" attribute and thus be more likely to cheat. The analysis here holds when the proportion of bad types is high or low. Under a collectivist equilibrium, incomplete information reinforces investment in information. Under an individualistic equilibrium, the value of information may still be zero (if the proportion of bad types is high), or it may be insufficient to induce investment in information (if the proportion of bad types is low). In the intermediate case, demand for information would be lower in the individualistic society than in the collectivist society. This analysis thus relies on the complete information model, which highlights the role of expectations with respect to actions and ignores the potentially important expectations with respect to types.

The preceding analysis relates two institutions and different cultural beliefs—that is, different expectations with respect to actions that will be taken off the path of play. In an individualistic equilibrium, players are expected to be indifferent; in a collectivist equilibrium, players are expected to respond to whatever transpires between others. Because these cultural beliefs correspond to an equilibrium, they are self-enforcing, and each entails a different wage, enforcement institution (second-party versus third-party enforcement), and investment in information.

On the equilibrium path, individualistic and collectivist cultural beliefs entail the same actions with respect to agents: merchants randomly hire unemployed agents, and agents never cheat. Assuming perfect monitoring allows us to concentrate on cultural beliefs concerning actions that never actually transpire, thereby emphasizing the institutional and other implications of diverse expectations regarding actions (rather than the actions themselves). The analysis in section 9.2 identifies cultural beliefs with probability distributions over the off-the-path-of-play portion of a strategy combination generating an observed path of play. Historically, it is not feasible to distinguish between cultural beliefs relating to on-the-path and off-the-path of play, as imperfect monitoring is a likely cause of the observed punishment phases. For this reason, no attempt to do so is made here.[7]

[7] For a discussion of imperfect monitoring models, see appendix A. The fact that under imperfect monitoring, agents will be punished on the equilibrium path does not qualitatively alter the results presented here.

9.2 The Origin and Manifestations of Diverse Cultural Beliefs among the Maghribis and the Genoese

Are there historical reasons to believe that the Maghribis and the Genoese held diverse cultural beliefs? The historical records provide no reason to believe that a particular theory of equilibrium selection is relevant in this case. They do indicate, however, that cultural "focal points," as well as social and political events in the early development of these societies, were probably instrumental in shaping different cultural beliefs and the related equilibria in these groups.

By the time the Maghribis began trading in the Mediterranean (early in the eleventh century) and the Genoese began trading (toward the end of that century), they had internalized different cultures and were in the midst of different social and political processes. Their cultural heritage and the nature of these processes suggest that the natural focal point was a collectivist equilibrium for the Maghribis and an individualistic equilibrium for the Genoese.

The Maghribis were *mustarbin*, non-Muslims who adopted the values of the Muslim society, including the view that they were members of the same *umma*. The term, which is translated as *nation*, is derived from the word *umm* (mother). It reflects the basic value of mutual responsibility among members of that society (Cahen 1990.) Each member of the *umma* has a fundamental duty to personally “righting wrong” done by any member of the community (e.g., B. Lewis 1991; Cook 2003). The Muslim tradition attributes to Muhammad the statement that “whoever sees a wrong, and is able to put it right with his hand, let him do so; if he can’t, then with his tongue; if he can’t, then with his heart, and that is the bare minimum of faith” (Cook 2003, p. 4).

The Maghribis were also part of the Jewish community, which shared the idea that all the people of Israel were responsible for one another. During the late medieval period, the idea of the centrality of a community of equal members was prominent in both the Muslim and Jewish societies. Indeed, the “congregational forms of religious organization became the template for the newly forming Muslim religious communities” (Lapidus 1989, p. 120). As is common among immigrant groups, the Maghribis, who migrated from Iraq to Tunisia, retained social ties that enabled them to transmit the information required to support a collectivist equilibrium. The

associated collectivist cultural beliefs in turn encouraged the Maghribis to retain their affiliation with this information network.

By the time the Genoese began trading, they had already internalized different cultures and were in the midst of different social and political processes. Evidence regarding Western individualism dates from before the late medieval period. Europe had a long individualistic tradition, which some scholars have traced to the ancient world. They argued that Ancient Greek literature and Western novels celebrate the individual, in contrast to Eastern novels, which celebrate "doing one's duty" (E.g., Hsu 1983). Whatever the origin of individualism, by 1200 Europe "had already discovered the individual," according to Morris (1972).[8]

In the medieval period, the individual, rather than his social group, was at the center of Christian theology.[9] Chapter 8 already discussed how the church fostered the decline of large scale, kin-based social structures. It advanced the creation of "a new society based not on the family but on the individual, whose salvation, like his original loss of innocence, was personal and private" (D. Hughes 1974, p. 61; see Matthew 10:35-6, 4:21-2, 8:21-2, 2: 47-50, 23: 8-9.) In Catholicism praying requires a priest, in Judaism, it requires a sufficient number of cobelievers. In Islam, praying in the company of others is considered more meritorious, and praying with the congregation is mandatory for the noon prayer on Friday, the Muslim holy day. During the twelfth century, the confession, long confined to the monastic world, became widespread among Christian laypeople.[10]

Individual and bilateral relations were also at the center of twelfth-century feudal culture, of which Genoa was an integral part. The feudal world was based on contractual, hierarchical

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[8] Macfarlane (1978) developed a method for quantifying individualism during this period based on land market transactions. He found that England was even more individualistic in the thirteenth century than previously assumed although French and Hoyle (2003) recently qualified his findings.

[9] Although medieval Christianity did not lack collectivist elements, such elements were simply less important than in Islam. On relative levels of individualism and collectivism in contemporary societies, see Bellah and others 1985, Reynolds and Norman 1988, and Triandis 1990.

[10] For a general discussion and survey of the literature, see Gurevich (1995). See also Bloch (1961, vol. 1, pp. 106–108). On Muslim prayer, see Qur'an (62/7).

relations that defined the obligations of one individual to another.[11] It was a world in which material and political conditions were not based on the general obligations of individuals toward their larger community but on the well-defined obligations of individuals to their lord. Even battles were not fought between armies per se but between individual knights within armies (Gurevich 1995, pp. 178–180).

Legal developments also reflect distinct cultural beliefs in late medieval Muslim and Christian societies. In Europe, the appropriateness of customary law was challenged, and eventually marginalized, on the grounds that the customs might be wrong. In contrast, according to the dominant jurisprudential theory of (Sunni) Islam, the consensus of the community was recognized as a legitimate source of law.[12]

Indeed, although clans were central to Genoa's politics, the contract through which the Genoese established their commune around 1096 was a contract between individuals, not clans. Treaties between Genoa and other political units were signed by as many as 1,000 members of the commune rather than by only the consuls or clan leaders. After the establishment of the *podesteria,* the number of Genoese active in trade rose dramatically. Instead of the few dozen traders previously active in each trade center abroad, hundreds of Genoese were trading by the end of the twelfth century. At the same time, Genoa experienced a high level of immigration. In the absence of appropriate social networks for information transmission beyond clan boundaries and among the multiple families of newcomers, an individualistic equilibrium was likely to be selected.[13] Once it was, individualistic cultural beliefs discouraged investment in information. In the absence of a coordinating mechanism, a switch to a collectivist equilibrium was unlikely.

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[11] Paradoxically, the individualistic obligation inherent in Christianity also called for anonymous contributions to charity, which the Genoese made. See the discussion in Epstein (1996, particularly pp. 91–94, 112–120, 129–130).

[12] See, for example, Bloch (1961, vol. 1, pp. 113–116) and Rippin (1994, pp. 80–81).

[13] No society is purely individualistic. In Genoa information about agents probably circulated among families and clans. In some families only one member invested in trade, suggesting that he may have been investing on behalf of others. It is nevertheless notable that in the cartulary of Giovanni Scriba, even members of the same family are found constantly to hire different agents.

Collectivist cultural beliefs were a focal point among the Maghribis, and individualistic cultural beliefs were a focal point among the Genoese. Does the historical evidence indicate the existence of the related institutions? Was there high investment in information and collective punishment among the Maghribis and low investment in information and individualistic punishment among the Genoese?

The Maghribis shared information and practiced collective punishment (see Chapter 3). In contrast, the Genoese tried to conceal information. According to Lopez (1943, p. 168), the "individualistic, taciturn, and reserved Genoese" were not "talkative" about their businesses and were even "jealous of their business secrets." For example, when, in 1291, the Vivaldi brothers attempted to sail from Genoa directly to the Far East, their commercial agreements were drawn for trade in "Majorca, even for the Byzantine Empire" (p. 169). Genoa's historical records are not explicit about the nature of punishment, but they suggest the lack of collective punishment and informal communication (Lopez 1943, p. 180, and de Roover 1965, pp. 88-9).

Cultural factors that coordinated expectations and social and political factors that slightly altered the relevant games in the formative period seem to have directed the Maghribis and the Genoese toward different institutions. As the related cultural beliefs were a part of the institutional framework of each group, they determined the costs and benefits of various actions and hence efficiency. For example, because collectivist cultural beliefs reduce the optimal wage, they can sustain cooperation in situations in which individualistic cultural beliefs cannot sustain them (Greif 1993; Chapter 3). Even if each member of the society recognizes the inefficiency caused by individualistic cultural beliefs, a unilateral move by an individual or a (relatively) small group would not induce a change. Because expectations about expectations are difficult to alter, cultural beliefs can make Pareto-inferior institutions and outcomes self-enforcing. More generally, cultural beliefs influence the motivation and ability to introduce various changes.

9.3 Cultural Beliefs, Social Patterns of Agency Relations, and the Distribution of Wealth

What are the implications of different cultural beliefs for social patterns of economic relations and the dynamics of wealth distribution? Can different cultural beliefs manifest themselves in distinct

social structures? Examining this issue requires extending the theoretical analysis to allow each merchant to serve as an agent for another merchant.

In this extended game, two social patterns of agency relations and associated dynamic patterns of wealth distribution can emerge. The first is a vertical social structure, in which merchants find it optimal to hire and therefore employ only agents; individuals thus function as either merchants or agents. The second is a horizontal social structure, in which merchants employ only other merchants, and individuals function as agents and merchants, providing and receiving agency services. What are the relations between cultural beliefs and these social patterns of agency relations?

Under collectivist cultural beliefs, traders have information about everyone's past conduct. Their strategies can therefore be conditional on this information. Accordingly, the collectivist cultural beliefs are redefined to include the expectations that merchants will not retaliate against an agent who cheats a merchant who has cheated any other merchant. The historical evidence indicates that the Maghribis shared such expectations.[14]

It is now possible to examine the relations between cultural beliefs and social patterns of agency relations. Intuitively, under collectivist cultural beliefs, a merchant's capital functions as a bond that reduces the optimal wage required to keep him honest. If a merchant cheats while acting as an agent, he is no longer able to hire agents under the threat of collective punishment. Hence cheating by a merchant while he functions as an agent reduces the future rate of return on his capital. This implies that a merchant who had cheated while acting as an agent has to bear a cost that an agent (who cannot act as a merchant) would not have to bear. Hence a lower wage is required to keep a merchant honest, and each merchant is motivated to hire another merchant as his agent, leading to a horizontal social structure.

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[14] The words of a Tunisian merchant who was accused, in 1041-42, of cheating exemplify that if an agent who had been accused of cheating were to receive agency services from other Maghribi traders, his agents could cheat him without being subject to community retaliation. That merchant complains that when it became known that he had cheated, "people became agitated and hostile to [me] and whoever owed [me money] conspired to keep it from [me]" Bodl. MS Heb a 2 f. 17, Sect. D, Goitein (1973: 104). See also Greif (1989).

This is not the case under individualistic cultural beliefs. In this case, past cheating does not reduce the rate of return on a merchant's capital. But having capital to invest de facto increases a merchant's reservation utility relative to that of an agent, thereby increasing the wage required to keep him honest. Merchants are discouraged from hiring other merchants as their agents, leading to a vertical social structure.

To see this formally, consider the optimal wage required to ensure the honesty of a merchant who functions as an agent (under the assumption that each merchant is risk-neutral and has the discount factor δ). If a merchant is always honest, the present value of his lifetime expected utility is the sum of the present value of his expected utility from being an agent, V_h^a, plus the present value of his expected utility from being a merchant, $(\gamma - W^*)/(1 - \delta)$. That is, $V_h^a + (\gamma - W^*)/(1 - \delta)$. If this merchant cheats while providing agency services, the present value of his expected utility from being an agent is the sum of his current gain from cheating, α, plus the lifetime expected utility of a cheater V_c^a. In addition, he receives $\gamma - W^*$ from being a merchant in the current period plus the present value of the future periods' expected utility from being a merchant who had cheated, V_c^m. Hence the present value of his lifetime expected utility is $\alpha + \gamma - W^* + V_c^m + V_c^a$. For a merchant to be honest when providing agency services, he should not be able to gain from one period of cheating, that is, it must be that $V_h^a + (\gamma - W^*)/(1 - \delta) \geq \alpha + \gamma - W^* + V_c^m + V_c^a$. For a person who can act only as an agent and is not a merchant, the equivalent honesty condition is $V_h^a \geq \alpha + V_c^a$.

These honesty conditions enable us to examine the relations between different cultural beliefs and hiring decisions. Under collectivist cultural beliefs, a merchant who cheated in the past can no longer rely on collective punishment to deter his agent from cheating him and therefore has to pay a higher wage to keep him honest. This implies that under a collectivist strategy, a merchant's lifetime expected utility from being a merchant decreases if he cheats when acting as an agent (that is, $(\gamma - W^*)/(1 - \delta) > \gamma - W^* + V_c^m$). Since, everything else being equal, an agent's honesty condition is $V_h^a \geq \alpha + V_c^a$, a merchant strictly prefers to employ another merchant as his agent.

In contrast, under individualistic cultural beliefs, a merchant who cheats while providing agency services does not have to pay his agents more in the future - that is, $(\gamma - W^*)/(1 - \delta) = \gamma -$

$W^* + V_c^m$. Hence, everything else being equal, a merchant is not motivated to employ another merchant.

This analysis does not take into account that it is likely that a merchant's reservation utility is higher than that of an agent. If the higher reservation utility is merely a reflection of the merchants' investment in trade, it encourages the employment of merchants under collectivist cultural beliefs but discourages their employment under individualistic cultural beliefs. If the merchants' higher reservation utility is unrelated to investment in trade, it increases the optimal wage required to keep them honest, independent of any cultural beliefs.

Merchants' capital thus serves as a bond that encourages their employment under collectivist cultural beliefs. Merchants' higher reservation utilities, however, discourage their employment under individualistic cultural beliefs (and possibly collectivist cultural beliefs). Hence, under individualistic cultural beliefs a society reaches a vertical social structure for a larger set of initial conditions than under collectivist cultural beliefs, whereas under collectivist cultural beliefs a society reaches a horizontal social structure for a larger set of initial conditions than under individualistic cultural beliefs.

Different social structures among the Maghribis and the Genoese are indeed evident. The Maghribi traders were, by and large, merchants who invested in trade through horizontal agency relations. Each trader served as an agent for several merchants while receiving agency services from them or other traders. Sedentary traders served as agents for those who traveled and vice versa; wealthy merchants served as agents for poorer ones and vice versa.

Traders did not belong to a "merchant class" or an "agent class." The extent to which the Maghribis' social structure was horizontal can be quantified by examining what can be referred to as agency measure. *Agency measure* is defined as the number of times a trader operated as an agent divided by the number of times a trader operated as either a merchant or an agent. It equals one if the trader was only an agent, zero if he was only a merchant, and some intermediate value if he was both a merchant and an agent. In 175 letters written by Maghribi traders, in which 652 agency relations are reflected, 119 traders appear more than once and almost 70 percent of them have an

agency measure between zero and one. The more times a trader appears in the documents, the more likely he is to have an intermediate agency measure.[15]

The horizontal social structure of the Maghribis is also reflected in the forms of business associations through which they established agency relations. They mainly used partnership and "formal friendship." In a partnership, two or more traders invested capital and labor in a joint venture, sharing the profit in proportion to their capital investment. In "formal friendship," two traders operating in different trade centers provided each other with agency services without pecuniary compensation.[16]

In contrast, agency relations among the Genoese traders were vertical. Wealthy merchants who rarely (if ever) functioned as agents hired relatively poor agents who rarely (if ever) functioned as merchants (de Roover 1965, p. 51). "As a rule," Genoese agents in the twelfth century were "not men of great wealth or of high position" (Byrne 1916–17, p. 159). Only 21 percent of the 190 trader families mentioned more than once in the cartulary of Giovanni Scriba (1155–64) have an agency measure between zero and one, and these traders accounted for just 11 percent of the value of trade.

The vertical character of the Genoese social structure is also reflected in the forms of business associations through which agency relations were established. Particularly from the end of the twelfth century, the Genoese used mainly *commenda* contracts, in which one party usually

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[15] This measure was calculated for all the letters available regarding trade with Sicily and the area within contemporary Israel during the mid-eleventh century and the trade of Naharay ben Nissim (Michael 1965; Gil 1983a, 1983b; Greif 1985; Ben-Sasson 1991). The nature of the sources precludes calculating a value-based agency measure for the Maghribis.

[16] See discussion in Maimonides (1951, p. 220); Goitein (1967, pp. 164-69, 173, 183); Stillman (1970, p. 388), Gil (1983b, vol. 1, pp. 200ff.). Goitein (1964, p. 316) concludes that about half of the business dealings reflected in the geniza are formal friendships. The Maghribis referred to such partnership as "*shirka*" ("partnership" in Arabic) or *shuthafuth* ("partnership" in Hebrew); "kh*u*lta" ("mixing" in Arabic), "*kis wahid*" ("one purse" in Arabic), "*baynana*" ("between us" in Arabic) or "*lilwasat*" ("into the midst" in Arabic). Formal friendship is "*suhba*" (companionship in Arabic), "*sadaqa*" (friendship and charity in Arabic), or "*bida'a*" (goods in Arabic). The term "*bida'a*" also appears in Muslim juridical literature, see Udovitch (1970, pp. 101 ff., 134).

provided capital and the other provided labor, in the form of traveling and transacting overseas.[17] The difference in forms of business associations between the two merchant groups does not reflect different knowledge. Members of both group were familiar with the same types of contracts and neither was legally, politically, or morally barred from using them (Krueger 1962).[18]

Diverse cultural beliefs not only affect social patterns of economic interactions, they also lead to diverse dynamics of wealth distribution. Everything else equal, a vertical society provides better opportunity for upward mobility to wealthless individuals (in a partial equilibrium framework). Since under individualistic cultural beliefs, an agent's ability to commit is negatively related to his wealth, wealthless individuals are better able to capture the rent (above the reservation utility) available to agents. In a horizontal society, wealthless individuals are not able to capture this rent, since under collectivist cultural beliefs the ability to commit is positively related to one's wealth.

The historical sources are mute with respect to the dynamics of wealth distribution among the Maghribis, but the Genoese sources reflect a dynamic of wealth distribution that is consistent with the theoretical prediction. Wealth transfer is reflected in a declining concentration of trade investment and the increase over time of trade investment made by commoners. The cartulary of

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[17] Between 1155 and 1164, 80 percent of investment (by value) through agents utilized *societas* contracts, in which the agent contributed a third of the capital (Giovanni Scriba.) Later cartularies reflect a shift to the *commenda* contract. The shift was completed in Genoa by 1216, when only 2 of the 299 (trade-related) contracts that have survived were *societas* contracts (Krueger 1962, p. 421). Krueger conjectures that the change in the form of business association reflects the increasing role of relatively poor individuals as merchants. Yet examining all the cartularies from 1200 to 1226 reveals that *societas* contracts represented only 6 percent of the contracts entered into by the families that dominated Genoa's commerce and politics in the mid-twelfth century (the Ventus, della Volta, Castro, Filardus, Mallonus, Spinula, Ususmaris, and de Albericis) (see Lanfrancus [1202–26] and Giovanni de Guiberto [1200–11]). In subsequent centuries changes in wealth distribution and other factors seems to have blurred the clear distinction between agents and merchants in Genoa. The situation in the twelfth century is therefore particularly revealing. In Jewish law, the term for the commenda is "`*eseq*" (Maimonides 1951, pp. 299-30; Goitein 1967, pp. 169-80). The Arabic term is *"qirad"* and "*mud*ā*raba*" (Udovitch 1970). Although we lack good measures, the *mud*ā*raba* was probably widely used in the Islamic world for various purposes. For a Jewish commenda reflected in the *geniza*, see Oxford MS Heb. b.11, f.8, Mann 1970, vol. 2, pp. 29-30.

[18] For a general discussion, see de Roover (1965); Goitein (1973: 11 ff.) Gil (1983b, vol. 1, pp. 216 ff.); and Greif (1989). For a discussion of knowledge, see Lieber (1968) and Greif (1989).

Giovanni Scriba (1155-64) reveals that trade was concentrated largely in the hands of a few noble families, with less than 10 percent of the merchants investing 70 percent of the total. In the cartulary of Oberto Scriba (1186), reflects a decline in the share of the top families with 10 percent of the them investing less than 60 percent of the total. In 1376 the number of commoners who paid customs in Genoa exceeded the number of nobles (295 versus 279), and nobles accounted for just 64 percent of the total invested (Kedar 1976, pp. 51–52).[19] That agency relations contributed to shifting wealth distribution is reflected in the affairs of Ansaldo Baialardo, who was hired by the noble Genoese merchant Ingo do Volta in 1156. Between 1156 and 1158, Ansaldo sailed abroad as Ingo's agent. By investing only his retained earnings, he accumulated 142 lire, more than three and half the cost of a house at the time.[20]

The growing wealth of commoners is indirectly reflected in the political history of Genoa, as suggested in chapter 8. A relative increase in the wealth of a subgroup within a society is likely to lead it to demand a greater say in political matters. Hence as wealth distribution changes, attempts to change the political organization of the society are likely to be made. This was indeed the case in Genoa: the *popolo* revolted against the nobility during the thirteenth century, changing the political organization of Genoa to reflect and protect their growing wealth (Vitale 1955).[21]

9.4 Transcending the Boundaries of the Game: Segregated and Integrated Societies

Over time the merchant-agent game faced by the Maghribis and the Genoese changed for reasons exogenous to each merchant. Following various military and political changes in the Mediterranean, both groups had the opportunity to expand their trade to areas previously inaccessible to them (A. R. Lewis 1951; chapter 8). Commercially, both groups responded

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[19] De Roover (1965) argues that agency relations in Italy facilitated the transfer of wealth. The year 1376 is the only year for which, to the best of my knowledge, data are available in the secondary literature. Chapter 8 points to a complementary process; patronage reflecting inter-clan conflict also shifted wealth distribution in Genoa.

[20] On Ansaldo, see de Roover (1965, pp. 51–52). On the cost of a house, see Giovanni di Guiberto (1200–11), No. 260, 261.

[21] In Venice, however, this has not been the case due to the lesser reliance on reputation mechanism. (Chapter 8.)

similarly, expanding their trade to encompass the area that spanned from Spain to Constantinople. From the perspective of institutional analysis, however, their responses differed. The Genoese responded in an "integrated" manner, whereas the Maghribis responded in a "segregated" manner.

The Maghribis expanded their trade by employing other Maghribis as agents. As chapter 3 discusses, they emigrated from North Africa to other trade centers; for generations the descendants of these emigrants cooperated with the descendants of other Maghribis. This segregated response was not a result of the Maghribis' status as a religious minority, as they did not establish agency relations with other Jewish traders, even when such relations were (ignoring agency cost) perceived by the Maghribi traders as very profitable. That this segregation is endogenous is reflected in the Maghribis' later history: when, toward the end of the twelfth century, they were forced due to political reasons to cease trading, they integrated with the larger Jewish communities.

The Genoese also responded to the new opportunities by emigrating, and their cartularies document the dominance of agency relations with other Genoese. But although the cartularies were written in Genoa and are hence biased toward reflecting agency relations among Genoese, they nevertheless clearly indicate the establishment of agency relations between Genoese and non-Genoese. In the cartulary of the Genoese Giovanni Scriba (1155–64), for example, at least 18 percent of all funds sent abroad through agents were sent to or carried by non-Genoese.[22]

The rationale behind the different responses by the Maghribis and the Genoese to the same exogenous change in the rules of the game becomes clear once one considers the impact of cultural beliefs on equilibrium selection. The change altered the basic model in a specific manner. As trade with more remote trade centers became possible, a merchant could either hire an agent from his own economy who would sail or move abroad or he could hire an agent native to the other trade center. Inter-economy agency relations are likely to be more efficient than intra-economy agency relations, since they enhance commercial flexibility; a native agent would not need to emigrate and would also likely possess a better knowledge of local conditions.

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[22] For non-Genoese in other cartularies, see Oberto Scriba (1186, No. 9, 38); Oberto Scriba (1190, No. 138, 139); Guglielmo Cassinese (1190–92: No. 418, 1325); and Lanfranco 1202–26: No. 524). The ease of hiring a non-Genoese is reflected in the fact that they were used to circumvent a politically unfavorable situation in Sicily (Abulafia 1977, p. 201 ff.).

In deciding whether to establish inter-economy agency relations, however, a merchant's concern is profitability, not efficiency. The relations between efficiency and profitability are influenced by cultural beliefs that crystallize before inter-economy agency relations become possible. Individualistic cultural beliefs lead to an "integrated" society in which inter-economy agency relations are established if they are efficient. Collectivist cultural beliefs create a wedge between efficient and profitable agency relations, leading to a "segregated" society in which efficient inter-economy agency relations are not established. Whenever uncertainty exists about whether collectivist or individualistic cultural beliefs will be practiced in inter-economy agency relations, these (more efficient) agency relations become less profitable to collectivist merchants, since agents' wages increase.

To see why this is the case, suppose that two identical economies, within which either individualistic or collectivist cultural beliefs prevail, become a joint economy in which players can identify members of their previous economy but inter-economy agency relations are possible. What will the patterns of hiring agents in the joint economy be, as a function of the players' cultural beliefs? (For ease of presentation, I assume that past actions are common knowledge. Letting players invest in information greatly strengthens the results presented below.)

Intuitively, when players project their cultural beliefs on the new game—that is, when their expectations concerning others' actions in the postchange game are the prechange expectations—these prechange cultural beliefs constitute the initial conditions for a dynamic adjustment process. For example, if the prechange economies were collectivist, players expect each merchant to hire agents from his own economy, and they expect that merchants of the same economy will retaliate against an agent who has cheated one of them. Yet the prechange cultural beliefs are insufficient to calculate best responses in the postchange game. They do not stipulate a complete strategy for a player, since the same prechange behavior implies off-the-path-of-play situations in the postchange game that did not exist before. For example, the prechange cultural beliefs do not specify how merchants from one economy would react to actions taken by an agent from their economy in inter-economy agency relations. As the others' strategies are not specified, a player cannot find his best response.

To find his best response, a merchant has to form expectations about the response of the merchants from the other economy to actions taken in inter-economy agency relations. Although the merchants from the agent's economy can be expected to respond in various ways, two responses predominate. Given any agent's action in inter-economy agency relations, the merchants from the agent's economy can regard him either as one who cheated one of them or as one who did not cheat one of them. For example, in a collectivist economy, merchants may consider an agent who cheated in inter-economy agency relations as a cheater subject to collective retaliation, or they may ignore his cheating. Nothing in the prechange cultural beliefs indicates which of these responses will be selected for each action. Accordingly, the best that can be done analytically is to assume that in inter-economy agency relations any probability distribution over these two responses is possible.[23] Considering the prechange cultural beliefs and any such probability distributions as initial conditions allows us to examine the merchants' best response (while not imposing any differences between the prechange economies apart from their cultural beliefs).

What would merchants' best response be as a function of their cultural beliefs? Assume initially that there is no efficiency gain from inter-economy agency relations. Intuitively, when inter-economy agency relations become possible between two collectivist economies, the initial cultural beliefs specify collective punishment in intra-economy agency relations. If there is doubt over whether collective punishment also governs inter-economy agency relations, the optimal wage is higher in inter-economy agency relations than in intra-economy relations. It is higher because the uncertainty about collective punishment in inter-economy relations reduces the probability that an agent who cheats in such relations will be punished, which, as established in proposition 9.1, increases the optimal wage. As the merchants' cost of establishing inter-economy agency relations is higher than the cost of establishing intra-economy agency relations, only intra-economy agency relations will be initiated, and segregation will result. If inter-economy agency relations are more efficient, merchants will initiate them only if the efficiency gains are sufficiently large.

This analysis does not hold when inter-economy agency relations become possible between two individualistic economies. Although similar uncertainty is likely to exist, the optimal inter-

[23] This probability distribution can also be thought of as reflecting a merchant's uncertainty regarding the agent's expectations concerning the responses of merchants from the agents' economy.

economy and intra-economy wages are the same. Individualistic cultural beliefs make this uncertainty irrelevant for determining the optimal wage. Hence any efficiency gains from inter-economy agency relations will motivate merchants to establish them.

Proposition 9.4, which requires some additional definitions, formalizes the analysis. A joint economy is *segregated* if, given the initial conditions, merchants from each economy strictly prefer to hire agents from their own economy. It is *integrated* if, given the initial conditions, merchants from at least one economy are indifferent with respect to the original economy of their agents. Denote a merchant from economy s by M^s and by A^t an agent from economy t, where $s, t \in \{K, J\}$. Denote by μ the perceived probability that merchants from economy s will consider an A^s last employed by M^t as a cheater if he cheated when employed by M^t. Denote by η the perceived probability that merchants from economy s will consider an A^s, last employed by M^t, as a cheater if he was honest when employed by M^t.

Proposition 9.4. Suppose that inter-economy agency relations do not entail efficiency gains and that the two economies are identical in their parameters. If the prechange economies are collectivist, the joint economy is segregated for any $\mu \in [0,1)$ and $\eta \in (0, 1]$ and integrated only if $\mu = 1$ and $\eta = 0$. If the prechange economies are individualistic, the joint economy is integrated for $\mu \in [0,1]$ and $\eta \in [0,1]$. (The proof appears in the annex.)

When inter-economy agency relations become possible between a collectivist and an individualistic economy, a collectivist merchant will not initiate inter-economy agency relations, regardless of the uncertainty regarding the individualistic merchants' responses.[24] The wage the merchant has to pay to keep the agent honest is higher than the wage in the collectivist economy, since the collectivist economy's wage is lower than the individualistic economy's wage. Hence collectivist cultural beliefs create a wedge between efficient and profitable agency relations, and inter-economy agency relations will be initiated by collectivist merchants only if the efficiency gains are high enough.

In contrast, because the collectivist economy's wage is lower, individualistic merchants may find it optimal to establish inter-economy relations, even if such relations do not imply efficiency

[24] To focus on the asymmetry in responses due to diverse cultural beliefs, I ignore the possible implications of vertical and horizontal social structures on agents' reservation utility.

gains, thereby inducing (asymmetric) integration. To see why, consider the uncertainty regarding the collectivist merchants' responses that most decreases the profitability of inter-economy relations. Suppose that the collectivist merchant would not impose a collective punishment on a cheater ($\mu = 0$) but would impose punishment on an agent who was honest in inter-economy relations ($\eta = 1$). The expectation that collectivist merchants would not collectively punish a cheater in inter-economy relations cannot by itself (that is, when $\eta = \mu = 0$) decrease the profitability of inter-economy relations enough to prevent integration. This implies that if a collectivist agent who was employed by an individualistic merchant becomes unemployed, his lifetime expected utility equals that of any unemployed collectivist agent. The wage in the individualistic economy is more than that required to keep the agent honest, since the lifetime expected utility of an unemployed collectivist agent is lower than that of an individualistic agent. Hence it is profitable for an individualistic merchant to hire a collectivist agent.

If collectivist merchants are also expected to consider an agent who was honest in inter-economy agency relations to be a cheater ($\eta > 0$), the wage that has to be paid to a collectivist agent by an individualistic merchant increases further. An unemployed collectivist agent who was honest in inter-economy agency relations has a lower lifetime expected utility than other unemployed collectivist agents. Hence a higher wage (than when $\eta = 0$) is required to induce honesty. Integration may still follow, since an honest agent will become unemployed only in the future. Thus these expected responses by the collectivist merchants will forestall inter-economy agency relations only if the agent's time discount factor is high enough.

Individualistic (but not collectivist) merchants are likely to induce integration. They may find it profitable to initiate inter-economy agency relations even without efficiency gains, regardless of uncertainty about the collectivist merchants' responses. Segregation can result, however, if the expected response of the collectivist merchants erects "barriers to exit" for collectivist agents.[25] Furthermore, since integration increases the wage in the collectivist economy, collectivist merchants may strive to use social or political actions to try to prevent inter-economy

[25] If integration is sequential and a collectivist agent who had been hired by an individualistic merchant "joins" the pool of individualistic agents, these expectations and the decrease in the number of collectivist agents may lead to a new equilibrium in which the two economies differ in size.

agency relations. Proposition 9.5 establishes the necessary and sufficient conditions for integration and segregation.

Proposition 9.5. (a) For any $\mu \in [0,1]$ and $\eta \in [0,1]$, a collectivist merchant will not initiate inter-economy agency relations. (b) A sufficient condition for integration is $\mu \geq \eta$. A necessary condition is $\mu + (1 - \delta)(V_h^{u,I} - \mu V_c^{u,c} - (1 - \mu)V_h^{u,c})/\delta\tau(V_h^{u,c} - V_c^{u,c}) \geq \eta$. (Superscript c [or I] means a collectivist [individualistic] economy.) (c) A necessary condition for segregation is $\mu < \eta$. If μ is close enough to zero and η close enough to one, then $\exists\, \delta \in (0,1), s.t. \forall\, \delta \geq \tilde{\delta}$ the economy is segregated. (The proof appears in the annex.)

The preceding analysis reveals the relations between different cultural beliefs, the endogenous emergence of segregation and integration, and economic efficiency. Pareto-inferior segregation may prevail because of the structure of expectations and the absence of a mechanism able to alter them in a manner that makes this alteration common knowledge. Thus the extent of trade expansion of a collectivist society is limited by the initial expectations regrading the boundaries of the society. Different cultural beliefs determine the direction of trade expansion, as individualistic merchants are likely to penetrate collectivist societies but collectivist merchants are not likely to penetrate individualistic societies. Indeed, during the period under consideration, trade expansion was based on the penetration of the Muslim world by merchants from the Latin world. As discussed in the next section, segregation and integration influence the relations between individuals and their society and hence affect the evolution of organizations that govern collective actions and facilitate exchange.

9.5 Transcending the Boundaries of the Game: Organizational Evolution

Among the Maghribis, collectivist cultural beliefs led to a collectivist society with economic self-enforcing collective punishment, horizontal agency relations, segregation, and an in-group social communication network. In a collectivist society, the credible threat of informal collective economic punishment can induce individuals to forgo "improper" behavior. Suppose, for example, that every Maghribi expects every other Maghribi to consider a specific behavior "improper" and punishable in the same manner as cheating in agency relations. This punishment is self-enforcing, for the same reason that self-enforcing collective punishment in agency relations is self-enforcing.

It is feasible, because there is a network for information transmission. This punishment is likely to be reinforced by social and moral enforcement mechanisms that, as discussed above, emerge as a result of frequent economic interactions within a small segregated group. To make the threat of collective punishment credible, expectations need to be coordinated by defining what constitutes "improper" behavior. In a collectivist society, this coordination is likely to be based on informal mechanisms, such as customs and oral tradition.

Among the Genoese, individualistic cultural beliefs led to an individualistic society with a vertical and integrated social structure, a relatively low level of communication, and no economic self-enforcing collective punishment. In such a society, a relatively low level of informal economic enforcement can be achieved, because of the absence of economic self-enforcing collective punishment and networks for information transmission. Furthermore, the integrated social structure and the low level of communication hinder social and moral enforcement mechanisms. To support collective actions and facilitate exchange, an individualistic society needs to develop formal—legal and political—enforcement organizations. A formal legal code is likely to be required to facilitate exchange by coordinating expectations and enhancing the deterrence effect of formal organizations.

During the period under consideration, both the Genoese and the Maghribis were establishing self-governance systems. The Maghribis emigrated to and operated within the Fatimid Caliphate, in which "the administration of their own affairs was left to themselves" (Goitein 1971, p. 1). Genoa had just been incorporated into a city and liberated de facto from the rule of the Holy Roman Empire.[26] Hence both groups were in a position to devise their own form of authority and jurisdiction but their responses differ. The Maghribis did not develop formal organizations to support collective actions and exchange and they seem not to have used the ones available to them; the Genoese developed such organizations.

Despite the existence of a well-developed Jewish communal court system (and an access to the Muslim legal system), the Maghribis entered contracts informally, used or adopted an informal code of conduct, and attempted to resolve disputes informally (see Goitein 1967; Greif 1989,

[26] Chapter 8 and see evidence on this particular point in *Annali* (vol. I, 1162) and the discussion in Airaldi (1986) and Vitale (1955).

1993.) In contrast, during the twelfth century the Genoese ceased to use the ancient custom of entering contracts by a handshake, developing an extensive legal system for registering and enforcing contracts. The customary contract law that governed the relations between Genoese traders was codified, as permanent courts were established (Vitale 1955). After 1194 to a large extent the law was in the hands of the *podestà* and his judges.

In an individualistic society, agents are not expected to be subject to collective punishment. An agent who embezzled goods would not be recruited by the cheated merchant again, but he could become a merchant himself, hiring agents under the same conditions as the merchant he had cheated. Hence agency relations can be established only if agents' wages are so high that everyone prefers being an agent to a merchant. In other words, for agents to be employed, merchants have to pay them all the profit and part of the capital. Clearly, there cannot be an equilibrium at such a wage. Thus for agency relations to be established in an individualistic society, an external mechanism—such as a legal system backed by the state—is needed to limit agents' ability to embezzle merchants' capital. A legal system complements an institution based on individualistic cultural beliefs; it does not replace the associated bilateral reputation institution. Where a legal system has only a limited ability to restrict cheating (from misreporting profit expenses, for example), a reputation mechanism still has to be used. The extensive writing of agency contracts suggests that this was indeed the case among the Genoese.

The relations between cultural beliefs and organizational development are reflected not only in these general processes but also in organizations that served specific economic aims. For example, in medieval trade the need for enforcement organizations to support collective action was likely to manifest itself in relations between traders and rulers (chapter 4). As long as the number of traders was low, the relatively high value to the ruler of each trader's future trade was sufficient to motivate the ruler to respect the trader’s rights. When the number of traders was large, this was no longer the case. One way in which protection could be provided at the higher volume of trade would be for a sufficiently large number of traders to respond—in the form of a trade embargo—to transgressions by the ruler against any trader. Once an embargo is declared, however, some traders can benefit from ignoring it and selling their goods in the prohibited area in times of shortage. Some enforcement mechanism is required to ensure that each trader will respect a collective

decision to impose an embargo. In collectivist societies one would expect that informal enforcement mechanisms would be sufficient to ensure traders' compliance with embargo decisions. In individualistic societies one would expect organizations specializing in embargo enforcement to emerge.

The historical evidence on the Maghribis and the Genoese is consistent with this prediction. Among the Maghribis compliance was ensured through informal means. After the Muslim ruler of Sicily abused the rights of some Maghribi traders, the Maghribis responded by imposing, circa 1050, an embargo on Sicily. The embargo was organized informally. Maymun ben Khalpha wrote a letter to Naharay ben Nissim of Fustat (old Cairo) from Palermo (Sicily) in which he informed Naharay about the tax increase and asked him to "hold the hands of our friends [the Maghribi traders] not to send to Sicily even one dirham [a low-value coin]." Indeed, the Maghribis sailed to Tunisia instead of to Sicily; a year later the tax was abolished.[27] There is no evidence that compliance was supported by any formal enforcement organization, although the Maghribis could have used the Jewish court system or a communal organization to enforce the embargo.

In sharp contrast, as we have seen in chapter 4, in Genoa a formal enforcement organization worked to make the threat of collective retaliation credible. After the authorities declared a commercial embargo (*devetum*) on a particular locality, any merchant found there was subject to legal prosecution.

The history of the modern bill of lading provides another example of the development of formal organizations and distinct contractual forms among the Genoese but not the Maghribis. This bill combined an earlier version of the bill of lading with a so-called bill of advice. The original bill of lading was the ship's scribe's receipt for the goods the merchant deposited on the ship. This receipt was sent by the merchant to his overseas agent, who then claimed the goods on the basis of the scribe's signature. The bill of advice was sent after the ship arrived at its destination by the ship's scribe to the consignee, who did not come to claim the goods. The bill of lading and the bill of advice surmounted an organizational problem related to the shipping of goods abroad.

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[27] DK # 22, a, ll. 29–31, b, ll. 3–5, Gil (1983a: 97–106); TS 10 J 12, f. 26, a, ll. 18–20, Michael (1965, Vol. II, p. 85).

The earliest known European bill of lading and letter of advice date from the 1390s and relate to the trade of Genoa. In contrast, the Maghribi traders hardly ever used bills of lading, although the device was known to them.[28] Why did the Genoese advance the use of the bill and the Maghribis abandon it? The Maghribis rejected the bill because they had solved the related organizational problem using their informal collective enforcement mechanism. Maghribis entrusted their goods to other Maghribis traveling on board the ship that carried their merchandise. To exemplify this, consider a letter sent early in the eleventh century by Ephraim, son of Isma'il from Alexandria, to Ibn 'Awkal, a prominent merchant who lived in Fustat (old Cairo). Ephraim mentions the names of the men on four different ships entrusted "to watch carefully the 70 bales and one *barqalu* [containing the goods] until they will deliver them safely into the hands of Khalaf son of Ya'qub."[29]

Instead of solving the organizational problem between the merchant and the ship's operator, the Maghribis circumvented it. This fact is forcefully illustrated in a letter sent from Sicily in 1057. It describes what happened to loads of merchandise whose covers were torn during a voyage. After the ship arrived in port, the operator of the ship started to steal the merchandise. The writer of the letter remarked that "unless my brother had been there to collect [the goods], nothing that belonged to our friends [the Maghribi traders] would have been collected."[30] The letter makes clear that the ship's operator did not consider himself—and the traders did not consider him—responsible for protecting the goods. Similarly, if goods of unknown ownership were unloaded from the ship, or if the ship did not reach its destination, it was not the captain but the Maghribi traders who took care of their fellow traders' goods.[31] The Genoese traders, lacking an equivalent informal enforcement mechanism, could not rely on fellow traders. They solved the organizational problem associated

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[28] For information on Genoa, see Bensa (1925). For the use of the bill of lading by the Maghribi traders and possible bias in the historical records, see Goitein (1973, p. 305 ff.).

[29] TS 13 J 17, f. 3. Goitein (1973, p. 313). On the generality of this practice, see Goitein (1967).

[30] Bodl. MS Heb. c28, f. 61, a, ll. 12–14, Gil 1983a: 126–133.

[31] See, for example, Bodl. MS Heb., c28, f. 61, a, ll. 9–17, Gil 1983a: 126–133.

with shipping goods by using bills of lading, letters of advice, and the legal responsibility they entail.

The differences between collectivist and individualistic societies are also likely to manifest themselves in the development of organizations related to agency relations. Proposition 9.1 established that the more likely it is that there will be future relations between a specific agent and merchant, the less that merchant has to pay his agent. (A reduction in the probability of forced separation, σ, reduces the optimal wage.) The magnitude of this reduction is a function of cultural beliefs, because the gains from reducing the probability of forced separation depend on the probabilities that a cheater and an honest agent will be rehired. The lower the probability that a cheater will be rehired and the higher the probability that an honest agent will be rehired, the lower the gain from changing the probability of forced separation. Furthermore, when an unemployed honest agent is rehired with probability one, the gain from changing the probability of forced separation is zero.[32]

Collectivist cultural beliefs and the resulting segregation and collective punishment increase, possibly to one, the probability that an honest agent will be rehired. These factors are likely to reduce to zero the probability that a cheater will be rehired. Thus under collectivist beliefs and segregation, a merchant's incentive to reduce the probability of forced separation is marginal, or even absent. In contrast, under individualistic cultural beliefs and the resulting integration and second-party punishment, merchants are motivated to establish an organization that reduces the likelihood of forced separation.

The evolution of family relations and business organization among the Maghribis and the Genoese suggests that the Genoese, but not the Maghribis, introduced an organization that changed the probability of forced separation. When the Maghribi and the Genoese merchants first began trading in the Mediterranean, it was common in both groups for a trader's son to start operating independently during his father's lifetime. The father would typically help the son until the son was

[32] Formally, $\partial^2 W(.)/\partial h_c d\sigma > 0$ (for $\beta > h_c$), $\partial^2 W(.)/\partial h_h \partial\sigma < 0$, and $\partial W/\partial\sigma = 0$ when $h_h = 1$.

able to operate on his own. After the father's death, his estate was divided among his heirs and his business dissolved.[33]

Later development of family relations and business organization, however, differ substantially. During the thirteenth century, the Genoese traders adopted the family firm, the essence of which was a permanent partnership with unlimited and joint liability. This organization preserved family wealth undivided under one ownership, with the trader's son joining the family firm.[34] The Maghribi traders, who had been active in trade at least as long as the Genoese, did not establish a similar organization.

Why did the two societies develop differently in this regard? Given the collectivist cultural beliefs of the Maghribis and the resulting segregation, collective punishment, and horizontal relations, a merchant could not gain much by introducing an organization that reduced the likelihood of forced separation. Among the Genoese traders, individualistic cultural beliefs motivated merchants to increase the security of the employment they offered their agents. The family firm seems to have been the manifestation of this desire. In the Genoese family firm, several traders combined their capital to form an organization with an infinite life span and a lower probability of bankruptcy. Agency relationships were now with the organization rather than with individual merchants.[35]

These historical examples suggest that collectivist and individualistic cultural beliefs are likely to motivate the introduction of different organizations. Once an organization is introduced, it is likely to lead to other organizational innovations (through learning and experimentation) as existing organizations direct responses to subsequent contractual problems. For example, the organizational "macroinvention" of the family firm led to organizational "microinventions" among the Italians. Family firms began to sell shares to nonfamily members. The capital of the Bardi Company consisted of 58 shares: six members of the family owned the majority of the shares, five

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[33] On the Maghribis, see Goitein (1967, p. 180 ff.) and Gil (1983b, vol. 1, p. 215 ff.). On the Genoese, see Giovanni Scriba (236, 575, 1047) for father's help and Giovanni Scriba (946) for a will.

[34] See de Roover (1965, p. 70, ff.) and Rosenberg and Birdzell (1986, pp. 123–124).

[35] Additional theoretical and historical work is required to establish whether and how the family firm achieved a level of commitment greater than that of each of its members.

outsiders owned the rest. In 1312 the capital of the Peruzzi Company was distributed among eight members of the family and nine outsiders. In 1331 the Peruzzi family lost control of the company when more than half the capital belonged to outsiders (de Roover 1963, pp. 77–78; see additional examples in de Roover 1965). Tradable shares required a suitable market, which led to the development of "stock markets." The separation between ownership and control introduced by the family firm led to the introduction of organizations and procedures able to surmount the related contractual problems, such as improvement in information-transmission techniques, accounting procedures, and the incentive scheme provided to agents.

9.6 Concluding Comments

The Maghribis and the Genoese were constrained by the same technology and environment, and they faced the same organizational problems. But their different cultural heritages and political and social histories gave rise to different cultural beliefs. Theoretically, their distinct cultural beliefs are sufficient to account for the diverse institutional trajectories of the two groups. Cultural beliefs may thus have had a lasting impact despite their temporary nature. The analysis demonstrates how the interactions between institutions, exogenous changes, and the process of organizational innovation govern the historical development of institutions and the related economic, political, legal and organizational developments.

Collectivist cultural beliefs constituted part of the Maghribis' collective enforcement mechanism and induced investment in information, segregation, horizontal economic interactions, and a stable pattern of wealth distribution. The endogenous partition of society restricted economic and social interactions to a small group and facilitated in-group communication and economic and social collective punishments. Collectivist cultural beliefs led to institutions based on the group's ability to use economic, social, and, most likely, moral sanctions against deviants.

Individualistic cultural beliefs constituted a part of the Genoese' second-party enforcement mechanism. These beliefs induced a low level of communication, a vertical social structure, economic and social integration, and the transfer of wealth to the relatively poor. These manifestations of individualistic cultural beliefs weakened the dependence of each individual on any group, limiting the ability of each group to use economic, social, and moral sanctions against

individual members. Individualistic cultural beliefs led to institutions based on legal, political, and (second-party) economic organizations for enforcement and coordination.

Each of the two systems has different efficiency implications. The collectivist system is more efficient in supporting intra-economy agency relations and requires less costly formal organizations (such as law courts), but it restricts efficient inter-economy agency relations. The individualistic system does not restrict inter-economy agency relations, but it is less efficient in supporting intra-economy relations and requires costly formal organizations.

Each system also entails different patterns of wealth distribution, each of which is likely to have different efficiency implications. This implies that the relative efficiency of individualistic and collectivist systems depends on the magnitude of the relevant parameters. Although the Italians eventually drove the Muslim traders out of the Mediterranean, the historical records do not allow the relative efficiency of the two systems to be tested. Furthermore, as the comparison between Genoa and Venice highlights, different outcomes are possible given the same cultural heritage.

Yet, it is intriguing to note that the Maghribis' institutions resemble those of contemporary underdeveloped countries, whereas the Genoese institutions resemble the developed West, suggesting that the individualistic system may have been more efficient in the long run. The analysis presented here enables conjecturing about the possible long-run benefits of the individualistic system. To the extent that the division of labor is a necessary condition for long-run sustained economic growth, formal enforcement institutions that support anonymous exchange facilitate economic development. Individualistic cultural beliefs foster the development of such institutions, enabling society to capture these efficiency gains. An individualistic society also entails less social pressure to conform to social norms of behavior, thus fostering initiative and innovation. Indeed, Genoa was well known among the Italian city-states for its individualism, and it was a leader in commercial initiative and innovation.

Although further historical research is needed to substantiate the importance of individualism, the analysis here highlights the importance of cultural heritage, particularly cultural beliefs and organizations (social structures), in leading to particular institutional elements thereby making institutional trajectories—and hence economic growth—a historical process. The capacity of an institution to change is thus a function of its history, particularly because uncoordinated,

cultural, beliefs about what others believe are difficult to change, organizations reflect the cultural beliefs that lead to their adoption, and these organizations and cultural beliefs influence the historical evolution of strategic situations and institutions.

Annex 9.1

Proposition 9.1. *Proof:* See the proof of proposition 1 in chapter 3.

Proposition 9.2. *Proof*: Under both strategies the merchants act in accordance with the strategy assumed in proposition 9.1.[36] Under the individualistic strategy, $h_c = h_h > 0$ while under the collectivist strategy $h_h > 0$ and $h_c = 0$ after every history. Hence proposition 1 holds, and given W^* an agent cannot do better by deviating. This implies that on the equilibrium path a merchant's strategy is a best response.

The only nontrivial part of the proof regarding off-the-path-of-play events is verifying the optimality of the merchant's hiring procedures after cheating under the collectivist strategy. Denote the probability that a cheater (honest agent) will be hired by h_c^c (h_h^c) under the collectivist strategy. Under this strategy h_c^c equals zero (since a cheater is not expected to be rehired), but h_h^c equals $\tau M/(A - (1 - \tau)M) > 0$ along the equilibrium path (since an honest agent will be hired in the future). According to proposition 1, the optimal wage for a cheater is $W^*_c = w(., h_h^c = 0, h_c^c = 0)$, and the optimal wage for an honest agent is $W^*_h = w(., h_h^c > 0, h_c^c = 0)$. Since the function w decreases in h_h, $W^*_c > W^*_h$, implying that a merchant strictly prefers to hire an agent who has always been honest rather than an agent who has cheated. Firing a cheater and hiring only from the pool of honest agents is thus optimal for the merchant. This implies that in another off-the-path-of-play event in which a merchant does not fire an agent who cheated him, there is no wage at which it is profitable for the merchant to employ the agent. The merchant should pay the agent at least W^*_c, implying that even if this agent is honest, the best response of the merchant is to fire him in the next period. Hence for any $W \neq \alpha$, the agent's best response is to cheat. Q.E.D.

***Proposition 9.4. Proof*:** The first subscript or superscript in what follow denotes the merchant's economy and the second the agent's economy. For any $\mu \in [0,1]$ and $\eta \in [0,1]$, the implications of the corresponding beliefs with respect to the probability of future employment of A_t last employed by M_s are as follows: $h_c^{s,t}(\mu) = \mu h_c^{t,t} + (1 - \mu)h_h^{t,t}$ is the probability that A_t will be

[36] For technical reasons, I assume that if a merchant offers W = 0 employment is de facto not taking place and the merchant receives κ and the agent receives ϕ_u; , the collectivist strategy also calls for ignoring cheating by more than one agent and under the individualistic strategy in the off-the-path-of-play event in which a merchant did not fire an agent who cheated him, the agent's strategy specifies cheating for every wage and the merchant's strategy specifies offering W = 0.

hired if he is a cheater; $h_h^{s,t}(\eta) = \eta h_c^{t,t} + (1 - \eta)h_h^{t,t}$ is the probability that A_t will be hired if he is honest. Denote by $W^*_{s,t}$ the optimal wage that M_s pays A_t, $s \in \{K, J\}$, $t \in \{K, J\}$. Suppose that an unemployed agent from economy s was last employed by a merchant from economy t, and denote by $h_i^{t,s}$ the probability that this agent will be rehired if he took action I when he was last employed, where I is either h for honest or c for cheat. Assume that the two economies are collectivist. Taking the prechange paths of play and cultural beliefs as given, will a merchant hire an agent from the other economy? Clearly, M_s will not hire A_t if $W^*_{s,t} > W^*_{s,s}$, that is, if M_s has to pay A_t more than he has to pay to A_s to keep him honest. Given the cultural beliefs, the symmetry of the two economies, and the collective strategy held in each of them, it follows that

$$\eta h_c^{t,t} + (1 - \eta)h_h^{t,t} = h_h^{s,t} < h_h^{s,s} \; \forall \; \eta \in (0,1]. \qquad *$$

$$\mu h_c^{t,t} + (1 - \delta)h_h^{t,t} = h_c^{s,t} > h_c^{s,s} \; \forall \; \mu \in [0,1). \qquad **$$

Inequality (**) states that if A_t may not be punished by the merchants from economy t for having cheated M_s, then the perceived probability that he is hired after cheating M_s is higher than the probability that an agent from economy s is hired. Simply stated, after cheating M_s, A_t has an employment option not available to A_s, namely, to be hired by merchants from his own economy.

Proposition 9.2 established that the function w increases in h_c and decreases in h_h. Thus for s = K and t = J: $W^*_{s,t} = w(h_h^{s,t}, h_c^{s,t}) > w(h_h^{s,s}, h_c^{s,s}) = W^*_{s,s} \; \forall \; \mu \in [0,1), \eta \in (0,1]$.
By symmetry the same result holds for s = J and t = K. The best response of a merchant from one economy is never to hire an agent from the other economy unless $\mu = 1$ and $\eta = 0$. If this condition does not hold, the joint economy is a segregated one in which merchants from one economy hire only agents from their own economy and play the collectivist strategy with respect to them.

Assume now that two individualistic economies interact. Following the line of argument above and using the fact that $h_h^{s,s} = h_c^{s,s}$ in individualistic economies, it is easy to demonstrate that within each economy a merchant is indifferent between hiring an agent from his own economy and hiring one from the other economy, since the optimal wage (W^*) of an agent is identical. (Clearly, this assumes that the number of P and A in each economy is "large.") If all the merchants are indifferent (and hence may as well hire randomly from both economies), the joint economy is an integrated one in which an individualistic strategy is played. Q.E.D.

Proposition 9.5. Proof: Suppose that economy s is collectivist and t is individualistic. (a) A^t who cheated M^s will be rehired with probability $h_c^{s,t} = \mu h_c^{t,t} + (1 - \delta)h_h^{t,t} > h_c^{s,s}\ \forall\ \mu \in [0,1]$. A^t who was honest when employed by M^s will be rehired with probability $h_h^{s,t} = \eta h_c^{t,t} + (1 - \eta)h_h^{t,t}$, which is equal to $h_h^{s,s}\ \forall\ \eta \in [0,1]$. Since W^{*c} (the collectivist society wage) is lower than the wage offered in the individualistic society, $\forall\ \mu \in [0,1]$, $\eta \in [0,1]$, $h_c^{s,t} > h_c^{s,s}$ and $h_h^{s,t} = h_h^{s,s}$, a wage higher than W^{*c} is required to keep the agent honest. (b) The minimum wage for which $A^{t,s}$ is honest is W^* s.t. $(W^* + \delta\tau V_h^u)/(1 - \delta + \delta\tau) = \alpha + V_c^u$, where the superscript u represents unemployed, $V_h^u = \eta V_c^{u,c} + (1 - \eta)V_h^{u,c}$, $V_c^u = \mu V_c^{u,c} + (1 - \mu)V_h^{u,c}$. The minimum wage for which $A^{t,t}$ is honest is $W^{*,I}$ s.t. $(W^{*,I} + \delta\tau V_h^{u,I})/(1 - \delta(1 - \tau)) = \alpha + V_c^{u,I}$. $W^{*,I} - W^* = (1 - \delta)[V_h^{u,I} - V_c^u] + \delta\tau(\mu - \eta)[V_h^{u,c} - V_c^{u,c}]$. All the terms in $W^{*,I} - W^*$ are positive except for $(\mu - \eta)$. Integration occurs if and only if $W^{*,I} - W^* \geq 0$, implying the sufficient and necessary conditions. (c) The necessary condition follows directly from the analysis in (b). Continuity implies that to prove the sufficient condition, it is enough to consider $\mu = 0$ and $\eta = 1$. From (b), $W^{*,I} - W^* \geq 0$ if and only if $[1 - \delta(1 - \tau)][V_c^{u,I} - V_h^{u,c}] \geq \delta\tau[V_h^{u,I} - V_h^u]$. Since $V_c^{u,I} - V_h^{u,c} < V_h^{u,I} - V_h^u\ \forall\ \delta$ and the limit of $(1 - \delta + \tau\delta)/\delta\tau$ equals 1 as δ goes to 1, $\exists\ \delta \in (0, 1)$, s.t. $\forall\ \delta \geq \tilde{\delta}$, the inequality above fails to hold. Q.E.D.