On the Coevolution of Individualism and Institutions

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Abstract

To unravel the roots of the relationship between the Individualism-Collectivism dimension of culture (IC) and market-supporting institutions, we develop a micro-founded model in which the two interact and coevolve. IC and institutions are related indirectly, via social organization: Individuals settle either in the Market, an individualistic, interest-based organization, or in the Clan, a collectivistic, kinship-based organization. In a static model, the size of the Market positively depends on the strength of individualistic inclinations and on the quality of market-supporting institutions. In a dynamic model, where IC and institutions are endogenous, there exist up to two stable steady states, one with a predominately individualistic culture, high institutional quality and a large Market, and one with a completely collectivistic culture, no institutions and a desolate Market. The convergence to each steady state depends on initial conditions of IC. We conclude that contemporary IC and institutions exhibit path dependence and are thus related to the historical conditions in each region. Using institutional and historical data, we provide empirical evidence in support of our model. In addition, we apply the model to a specific historical case: the cultural and institutional divergence between China and Europe.

1 Introduction

The economic literature has highlighted the role of two factors that affected the process of development throughout history: culture and institutional structure.[1] Culture and institutions are not mutually exclusive: culture is instrumental for dealing with social dilemmas and for regulating the relations between individuals, just like institutions are (North; 1990; Greif; 1994, 2005). Hence, culture and institutions are intrinsically related. Moreover, culture and institutions may serve either as complements or as substitutes. For example, the institution of the Italian mafia has arguably developed as a substitute to the cultural trait of trust where it was lacking (Gambetta; 1988, 1996). On the other hand, the existence of trust among group members spurred the establishment of complementary institutions, like credit markets (Buggle and Durante; 2020). In the last decade, economists have paid increasing attention to the interplay and coevolution of culture and institutions.

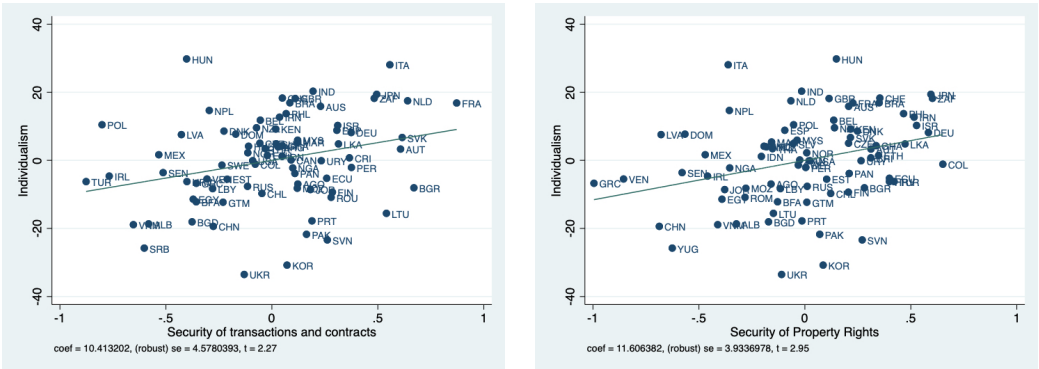
In this paper, we contribute to this growing literature by developing a micro-founded theoretical model to study the coevolution of a specific cultural trait and a specific set of institutions. In

[1] Culture is defined as "information capable of affecting individuals' behavior that they acquire from other members of their species through teaching, imitation, and other forms of social transmission" (Richerson and Boyd; 2005). Institutions, broadly defined, are mechanisms through which social choices are determined and implemented (see Acemoglu et al.; 2006). For studies that emphasized the role of culture see, for instance, Figlio et al. (2016); Alesina et al. (2013); Alesina and Giuliano (2015); Galor and Özak (2016). For studies that highlighted the role of institutions, see for example North (1990); Acemoglu et al. (2001, 2002); Acemoglu and Robinson (2012); Rodrik et al. (2004); Dell (2010).

particular, we focus on the individualism-collectivism cleavage (IC henceforth), and its relation to market-supporting institutions. The IC cultural cleavage is considered by social psychologists to be the most important dimension for classifying different cultures (Kashima and Kashima; 2003). While individualism puts emphasis on the intrinsic value of an individual and thus promotes independence and self-reliance, collectivism perceives the group as the fundamental unit and advocates social cohesion. The differences between individualistic and collectivistic societies have real behavioral implications (see Gorodnichenko and Roland; 2012, for a survey), as well as implications for various microeconomic and macroeconomic phenomena, such as economic development (Gorodnichenko and Roland; 2017; Davis; 2012) and occupational choices (Buggle; 2020). It is worth noting that Gorodnichenko and Roland (2017) also document the effect of IC on innovation, showing that individualistic countries have higher rates of patent publications. These phenomena, in turn, depend crucially on market-supporting institutions, such as the protection of property rights, the quality of the legal system, and economic freedom. Importantly, we think of these institutions as complementing individualism because they enable individuals to be self-reliant, thereby promoting individual economic activity.

Figure 1 presents empirical evidence that individualism and the quality of market-supporting institutions are positively correlated. More precisely, partial correlations between individualism and two measures of institutional quality, contract enforcement (Panel A), and protection of property rights (Panel B) are presented in the figure. While the figure does not shed light on causality, the correlation between IC and institutions is shown to hold when controlling for a handful of geographic, historic and other characteristics of the countries in the sample.[2]

Figure 1: Individualism and Institution Quality



(A) (B)

The figures display the partial correlation between individualism and two measures of the quality of market-supporting institutions from the IPD data set: Security of Transactions and Contracts (Panel A) and Security of Property Rights (Panel B). The regressions account for regional fixed effects, geographical characteristics (absolute latitude, mean elevation, mean ruggedness, agricultural suitability, total length of coasts, and the minimal distance from either the coast or a major river), historical characteristics (years since the Neolithic revolution (ancestry adjusted), state antiquity, and colonial history).

The patterns shown in Figure 1 raise several questions: Does the correlation between individualism and the quality of market-supporting institutions reflect any causal relationships between the

[2]Data on institutions is taken from The IPD dataset (Bertho; 2013). The regressions account for regional fixed effects, geographical characteristics (absolute latitude, mean elevation, mean ruggedness, agricultural suitability, total length of coasts, and the minimal distance from either the coast or a major river), historical characteristics (years since the Neolithic revolution (ancestry adjusted), state antiquity, and colonial history).

two, and if so, what is the direction of causality? Is this correlation a contemporary phenomenon, or does it have its origins in the distant past? And if such historical origins exist, what are the mechanisms that perpetuate their effect for many generations?

To address these questions, we develop a theoretical framework in which IC and institutions interact and coevolve. Our fundamental premise is that the interaction between IC and institutions is indirect, through the channel of *social organization*. More specifically, following Greif and Tabellini (2017), we study an environment with two archetypal social organizations: the Market and the Clan. The market is a loose association of individuals established to allow them to pursue their personal interests. The clan is a cohesive social organization based on kinship ties. Building on this notion, we develop the model in three layers. In the first layer, the model is static, and culture (IC) and institutions are exogenously given. Individuals choose in which of the two social organizations to settle, and the decision depends on three components: The relative productivity in the market, the strength of individualistic inclinations, and quality of market-supporting institutions. We analyze the possible static equilibria in terms of the size of each social organization. Different equilibria may emerge, depending on the parameters, but all are characterized by a positive correlation between the size of the market and both the quality of market-supporting institutions and the strength of individualistic inclinations.

Institutions and culture, however, are intrinsically endogenous and tend to change over time, depending on the conditions prevailing in their environment. Thus, in the second and third layers of our model, we endogenize them one by one. We begin by endogenizing institutions, treating them as a club good: individuals who settle in the market are required to pay a fee in order to finance the ongoing operation of market-supporting institutions. In this part of the model, the size of the market and the quality of institutions are determined simultaneously, and the strength of the society's individualistic inclinations determine both of these equilibrium variables.

Finally, in the third layer of our model, we endogenize culture as well. More specifically, we postulate that the society's individualistic inclination is positively affected by the size of the market, because the more individuals settle in the market, the more legitimate it appears to prioritize one's personal interests over the clan's prosperity. However, unlike institutions, we think of culture as gradually changing over long periods of time. To capture this graduality, we assume that there exists a cultural drift, i.e., the contemporary cultural stance is affected also by the previous generation's culture. We thus make culture a state variable, which turns the static model of the first two layers into a dynamic one. Doing so allows us to study the coevolution of culture, institutions and social organization and to trace the society's dynamic trajectory.

The described dynamic system is characterized by a positive feedback loop: The more individualistic society is, the smaller is the clan, and the higher is the institutional quality. Better institutions increase the market, which in turn makes culture even more individualistic. The existence of a positive feedback loop suggests that convergence is a pivotal feature of the dynamic system, and opens up the possibility of separate dynamic trajectories for different societies.

Accordingly, two stable steady states emerge, where the initial conditions of the society determine to which of these steady states the system converges. First, if the society is sufficiently individualistic to begin with, it will converge to an individualistic steady state, where the market is large, institutional quality is relatively high and society is predominately individualistic. Second, if the society is sufficiently collectivistic initially, it will converge to a steady state where all individuals reside only in the clan, institutions do not exist and society is completely collectivistic.

Our dynamic analysis reveals that the contemporary cultural stance is determined by the

preceding cultural stance and is thus path dependent: Societies that slightly differed in initial conditions may end up having large gaps in contemporary institutions, culture and developmental levels. Furthermore, the multiple steady states that emerge in our model are characterized by a positive correlation between IC and institutional quality. Hence, our model may provide a possible explanation to the patterns observed in the contemporary data (see Figure 1).

To substantiate our theoretical framework, we apply it to a specific historical case: the cultural, institutional and social divergence between Chinese and European civilizations. Our historical survey consists of three parts. In the first part, we survey the evidence of growing cultural differences between collectivistic China and individualistic Europe. These cultural differences gave rise to the emergence of distinct social organizations: cohesive, kinship-based organizations in China, and loose, interest-based ones in Europe. Thus, in the second part of the survey, we contrast between Chinese and European social organizations. Finally, in the third part, we show how the salience of kinship in China inhibited the development of formal institutions, while in Europe, interest-based organizations begat the formation of such institutions.

Such deep-rooted differences may affect contemporary culture and institutions. We provide empirical evidence that indeed these differences appear in the data today. Specifically, we measure market-supporting institutions (like the security of transactions and contracts) using data from the Institutional Profile Database (IPD). In line with our model, we consider two explanatory variables: historical levels of the relative productivity in the market (vs. the clan), and historical levels of individualism. To measure the former, we build on *The Rice Theory*, which suggests that societies that cultivated rice rather than wheat became more collectivistic, because rice cultivation, unlike wheat cultivation, requires individuals to cooperate and rely on each another (Talhelm et al.; 2014). For each country, we calculate the difference in the suitability to cultivate wheat and rice (wheat-rice suitability difference henceforth), adjusted to the ancestral origins of each country's residents. As a proxy for historical individualism, we use the Kinship Intensity Index (KII). This index captures how intense kinship ties were historically, where, as Schulz et al. (2019) show, intensive kinship ties also imply a more collectivistic culture, because each individual prioritizes the needs of the group over his own.

Our model predicts a positive relation between wheat-rice suitability difference and contemporary quality of market-supporting institutions, and a negative correlation between historical levels of collectivism (KII) and contemporary quality of market-supporting institutions. We test these predictions using the data described above, and a handful of geographic, ethnic and historical controls and regional fixed effects. Our findings confirm the two hypotheses. Moreover, we show that market-supporting institutions are more likely to be negatively correlated with historical levels of collectivism than other institutions. Finally, using data from the Ethnographic Atlas (Murdock; 1967), we provide empirical evidence in support of the mechanism described in our model. In particular, we show that wheat-rice suitability difference is positively correlated with historical levels of individualism and with political complexity, and negatively correlated with the salience of kinship ties.

2 Related literature

The present study is related to several distinct lines of research. Conceptually, it is directly related to the growing body of literature studying the relation between IC and economic variables, such as economic development, innovation and long-run growth (Davis; 2012; Kyriacou; 2016;

Gorodnichenko and Roland; 2017; Buggle; 2020). Despite the variation in the methods applied to establish causality, the studies reach similar conclusions. In particular, they show that individualism positively affects various measures of innovation, such as the number of scientific publications and patents, technological advancement and the choice of less routine-intensive jobs. Furthermore, they demonstrate that individualism is associated with higher levels of economic development. In most of these studies, the relation is robust to controlling for a variety of additional factors that are known to affect long-run economic growth.

One such important factor is institutional quality, whose effect on economic development has been the subject of extensive research (Acemoglu et al.; 2001; Rodrik et al.; 2004; Acemoglu et al.; 2005). Taking this into account, the studies on the relation between IC and economic development control for various institutional variables, including the protection of property rights, measures of corruption and bureaucratic efficiency. Gorodnichenko and Roland (2017) also examine the two-way causality between IC and institutions, concluding that though it runs in both directions, the effect of institutions on IC is much weaker. Kyriacou (2016) shows that individualism positively affects institutional quality, while its effect on economic development becomes insignificant when controlling for institutions. Putting it together, he contends that the effect of IC on economic development is predominantly indirect, via institutions.

A distinct strand of the literature focuses exclusively on the relation between IC and institutions. Tanzi (1994) argues that corruption and in-group favoritism are more likely to take root in collectivistic societies, since such societies value loyalty to one's group more than they value the universal moral principles of integrity and impartiality. Greif (1994, 2006c) considers the relation between IC and the contract enforcement mechanisms that were developed to support impersonal exchange. In collectivistic societies, individuals mostly interact with their group members, and contract enforcement hinges upon the strength of in-group ties and the collectivistic norms of loyalty and reciprocity. Individualistic societies, on the other hand, lack solid social infrastructure and use formal rules, procedures and institutions to enforce contracts. The more recent, empirical contributions (Nikolaev and Salahodjaev; 2017; Gorodnichenko and Roland; 2021) seem to support these theories, showing that individualism is associated with more democratic institutions, higher levels of executive constraint, lower risk of expropriation and a better protection of property rights.

The above-mentioned studies have established a cogent line of research on the cultural determinants of institutions, but they regard IC as an exogenous and invariable factor. Our paper complements the literature, introducing a theoretical model in which we endogenize both IC and institutions and explore their interaction and coevolution. We argue that the two are related indirectly, through their interaction with the social organization of the society. More specifically, what explains the observed correlation between individualism and well-functioning institutions is their positive relation to the market: A larger market makes culture more individualistic and improves the market-supporting institutions, and these in turn contribute to the further expansion of the market. An example of the reverse case is provided in Chen et al. (2020), who document a negative effect of clans on the development of financial institutions in China.

Our study contributes also to the growing literature on the coevolution of culture and institutions. Tabellini (2008) considers the cultural dimension of the scope of moral behavior (distinguishing between generalized and limited morality), and its interaction with contract enforcement institutions and the scope of the market. In a probabilistic voting model, Persson and Tabellini (2021) study the coevolution of civic political culture and the quality of judicial institutions, which both serve to inhibit rent extraction by the incumbent. Since in both models, the variable that captures

institutional quality is binary, they may account only for abrupt institutional transitions, but not for institutional evolution, as we do in this paper. A generic model of the coevolution of culture and institutions is developed in Bisin and Verdier (2017), who then apply it to study a few specific cases of interest. In a subsequent paper, Bisin et al. (2021) further develop this generic model to explore the divergence between the theocratic Muslim world and the increasingly secular West. They postulate that a society's religiosity (the cultural variable) and the political power of the clergy (the institutional variable) serve as complements and give rise to a positive feedback loop. Bisin and Verdier (2017) and Bisin et al. (2021) model institutional evolution as a top-down process, where institutions are determined by a central planner to maximize the society's welfare. Such an approach seems less convincing in the context of the medieval period, where political power was relatively decentralized.[3] In our paper, therefore, institutions form and evolve in a bottom-up process, and are not determined by a central authority.

A more general, informal, apparatus for studying the coevolution of culture and institutions is suggested in Acemoglu and Robinson (2021a). In that paper, "politics" play the same role as the one played by social organization in our own model, i.e. the role of the channel through which culture affects institutions.[4] In an ensuing paper, Acemoglu and Robinson (2021b) apply this apparatus to study the interplay between culture and the equilibrium balance of power between state and society.

The most closely related paper to ours is Greif and Tabellini (2017), who link the scope of moral behavior to the formation of distinct social organizations in China and Europe. More specifically, they argue that the prevalence of limited morality in China gave rise to the formation of clans, whereas Europe's generalized morality led to the formation of corporations (markets in our terminology). These social organizations then reinforced the existing cultural values, creating thereby a positive feedback loop.

Although we build on a theoretical framework similar to that of Greif and Tabellini (2017), we diverge from their study in several ways. At the micro level, we contend that the difference between the clan and the market lies in the degree of economic and social independence individuals possess. Based on this premise, we show that the more talented individuals are more inclined to rely on themselves and thus settle in the market, while the less talented individuals prefer the clan. At the macro level, we focus on the cultural dimension of IC, which we think better explains the cultural underpinnings of both social organization and institutions.

Last but not least, our study relates also to the literature regarding the origins of IC, and its persistent effect on human behaviour and economic development. Some provided empirical evidence that societies that used technologies requiring social cooperation in growing food for survival are more collectivistic today (Talhelm et al.; 2014; Ang; 2019; Buggle; 2020). Other geographic factors that have supposedly affected the contemporary cultural cleavage of IC include rainfall variation (Davis; 2012), the prevalence of infectious diseases (Nikolaev and Salahodjaev; 2016) and the time passed since the Neolithic Revolution (Olsson and Paik; 2016). Others focus on the role of kinship ties in the development of collectivism (Enke; 2019), or the demise of

[3] See, e.g., Bloch et al. (2014) for a detailed account of the political fragmentation in medieval Europe.

[4] Rather than IC, Acemoglu and Robinson (2021a) define a new dichotomy, between "hardwired" and "fluid" cultures, where the former are the ones that mitigate institutional change. They further note that despite this disadvantage, hardwired cultures have an advantage when it comes to coordination among the individuals who share the same culture. However, to us it makes more sense to associate this advantage with collectivism (as in, e.g., Greif; 1994) rather than with hardwiredness, because if, for example, the values held by the hardwired culture are purely individualistic ("do only what's good for you"), then this hardwiredness will most likely inhibit rather than promote coordination.

kinship ties as the result of the Church's family policies, as a triggering force for the emergence of individualism (Schulz et al.; 2019). Similarly, some studies emphasize the role of the mode of production, hunting-gathering vs. agriculture, and its interplay with the emergence of property rights (Bowles and Choi; 2019). One question that lefts open is related to the mechanism, which makes IC – and its effect on economic development – so persistent, even after its hypothesized origins become nonessential for the functioning of the economy. Why, for instance, collectivistic societies do not become more individualistic once irrigation ceases to play a pivotal role in production? Our model provides a possible explanation for this puzzle: Collectivistic societies developed different institutions throughout history, which further entrenched collectivism, making it highly immune to change.

3 A Model of Cultural and Institutional Coevolution

3.1 The Static Model

3.1.1 Preliminaries

Consider a society consisting of a continuum of risk-neutral individuals, normalized to unity. Individuals are heterogeneous in their innate ability. This ability, to which we occasionally refer as "talent", reflects the individual's productivity. For simplicity, we assume that ability is uniformly distributed (that is, $a \sim U[0,1]$).

Following Greif and Tabellini (2017), we assume that there exist two types of social organizations: a market and a clan. Each organization is characterized by a distinct social setup, which underlies its economic and cultural attributes, as described in detail below. At the beginning of life, the individual chooses in which organization to settle - the clan or the market - and by doing so, in which economic activity to engage. The cardinal difference between the two economic activities is in the degree of independence the individual possesses. In the market he works independently and produces his own income, whereas in the clan, he engages in a joint work, and thus depends on others in producing it. For simplicity, we assume that in both locations the individual consumes his whole income.

Income in the market depends positively on three components: the individual's ability, the quality of (market-supporting) institutions operating there, and the productivity of the market. Let us elaborate on each. First, since the individual produces his income alone, income is a function of his own ability only. Second, income in the market is a function of the quality of institutions operating there, denoted by $X \in [0,1]$. A natural interpretation is that these are institutions that protect the individual's property rights. Then, X could capture the probability that the individual gets to enjoy the fruits of his economic activity in the market. For now, the quality of institutions is exogenously given, but it will be endogenized in Subsection 3.1.4. Third, income in the market depends on its relative productivity with respect to the clan, as captured by the parameter $\lambda > 0$. Putting it together, the income of individual i in the market is given by

$$I^{i,\mathcal{M}} = \lambda X a^i, \tag{1}$$

where the superscript $\mathcal{M}$ denotes the market.

Income in the clan is produced collectively: all individuals who settle in the clan engage in a collective (joint) activity. The output of this activity is then equally shared by the clan's inhabitants.

Let $\mathcal{C}$ denote the share of individuals who settle in the clan and engage in the collective activity, and let $|\mathcal{C}| \in [0,1]$ denote the size (cardinality) of this share. The income of individual i in the clan is given by

$$I^{i,\mathcal{C}} = \frac{\int_{j\in\mathcal{C}} a^j dj}{|\mathcal{C}|}. \tag{2}$$

The numerator is the total output produced within the clan. It is the sum of the abilities of all individuals participating in the collective activity. The output is then shared among these individuals, hence the division by $|\mathcal{C}|$.[5]

This specification of the economic activity in the clan emphasizes its collectivistic nature in two ways: first, the individual is obliged to contribute to the prosperity of the whole clan, not only to his own welfare. Second, the yields of the joint work are shared equally by all individuals living in the clan, regardless of their relative contribution to the total output.

In choosing which organization to join, the individual has two guiding considerations. Besides the common postulate of deriving utility from consumption, we also assume that the utility function contains a socio-physiological (and also culture-dependent) component. The incorporation of such a non-material component (alongside a material one) is common in the cultural-economics literature (e.g., Tabellini; 2008). It emphasizes the important role of social considerations in shaping the individual's behavior. Here we postulate that individuals living in the clan enjoy contributing to its welfare, and more so the more collectivistic their culture is. This is because the clan is not just a locus of economic activity, providing individuals with income, but also a source of social identity and collective pride. Clan members thus feel committed to its prosperity and enjoy contributing to it.

We denote the individualistic inclination of the society by $\theta \in [0,1]$.[6] The more individualistic society is (higher θ), the weaker is the individual's commitment to the clan. We endogenize this parameter in Subsection 3.2. Formally, the utility of individual i is given by

$$U^i = c^i + d(1-\theta) \tag{3}$$

where c^i is the consumption (which, as noted, is assumed to equal the income) of individual i; and d is an indicator function that equals 1 if the individual chooses to settle in the clan and 0 if he chooses to settle in the market.

3.1.2 Static equilibria

Having defined the individual's utility function, we can now find the share of individuals who settle in the clan in equilibrium. Note that within a continuum of players, the individual's actions do not affect others, so individuals are not strategic. On the other hand, the individual's decision does depend on what others do. $|\mathcal{C}|$ is hence the equilibrium outcome in the simultaneous game, in which each individual chooses where to settle.

Corner equilibria We begin by discussing the two corner equilibria, where all individuals settle in the same place.

[5] Note that the main results our model generates would remain qualitatively unchanged even if we assumed that individuals in the clan share only a fraction of their income, while keeping the rest for themselves.

[6] There are two common ways to model culture: either as the share of individuals holding a specific value (Bisin and Verdier; 2001; Tabellini; 2008), or as a parameter capturing the society's cultural stance (Davis; 2012). For the sake of simplicity, we adopt the latter approach.

Proposition 1. *(i) If $\theta = 1$ and $X \geq \frac{1}{\lambda}$, there exists an equilibrium in which $|\mathcal{C}| = 0$. (ii) If $X \leq \frac{1.5-\theta}{\lambda}$ there exists an equilibrium in which $|\mathcal{C}| = 1$.*

Proof. See appendix A. ■

Part (i) of the proposition states that an equilibrium in which all individuals settle in the market exists (only) if culture is completely individualistic and institutional quality is above a specific threshold. The intuition is straightforward: in a desolate clan ($|\mathcal{C}| = 0$), under a completely individualistic culture ($\theta = 1$), the individual derives utility only from consumption, which in this case equals his own ability.[7] He then weighs it against his prospective consumption in the market, which depends on the institutional quality therein. If institutions function well enough, he chooses to settle in the market, indicating that $|\mathcal{C}| = 0$ constitutes an equilibrium outcome of the game. Note that if instead $\theta < 1$, $|\mathcal{C}|$ would never equal exactly 0, because individuals with a sufficiently low ability would prefer to settle in the clan, where they can always gain the socio-physiological utility, $1 - \theta$.

Part (ii) of the proposition characterizes the mirror case: An equilibrium in which all individuals settle in the clan exists if institutional quality is below a specific threshold. In such a case, the prospective consumption in the market is so small, that even the most talented individuals prefer to stay in the clan. Note that the more individualistic the society is (i.e., the higher θ is), the less attractive the clan becomes and the lower is the upper bound of institutional quality required to sustain the equilibrium.

Interior equilibrium For some values of θ and X, there exists also an interior equilibrium, in which individuals settle in both the market and the clan. To formally obtain $|\mathcal{C}|$ in this equilibrium, we first have to explain which individuals settle in each organization. We state the following:

Lemma 1. *There exists an interior equilibrium. In this equilibrium there exists an individual i who derives the same utility from settling in either location. That is, $U^{i,\mathcal{M}} = U^{i,\mathcal{C}}$.*

Proof. See appendix A. ■

Proposition 2. *Let a^* denote the talent of individual i who satisfies $U^{i,\mathcal{M}} = U^{i,\mathcal{C}}$. Individuals whose talent is below a^* settle in the clan, whereas individuals whose talent is above a^* settle in the market. That is, in the interior equilibrium, $|\mathcal{C}| = a^*$.*

Proof. See appendix A. ■

Individual ($i : a^i = a^*$) divides the society in two: the less talented individuals, who settle in the clan, and the more talented ones, who settle in the market. Intuitively, the more talented the individual is, the more he can achieve from independent work and the higher is his opportunity cost of settling in the clan, engaging in a collective activity and sharing its output.

Given this result, we can rewrite the utility the individual gets if he chooses to settle in the clan, in the case of the interior equilibrium:

$$U^{i,\mathcal{C}}_{|\mathcal{C}|=a^*} = \frac{\int_0^{a^*} a^j dj}{a^*} + 1 - \theta = 0.5a^* + 1 - \theta \tag{4}$$

[7] Note that income in the clan equals the average ability of its residents. Therefore, when all individuals settle in the market, one individual who would move to the clan would receive there an income that equals his own ability, and this income would be fully consumed.

The new formulation allows us to find $|\mathcal{C}|$ in the interior equilibrium and obtain the necessary conditions for its existence. Given that in the interior equilibrium, individual $(i : a^i = a^*)$ satisfies $U^{i,\mathcal{M}} = U^{i,\mathcal{C}}$, we get

$$\lambda X a^* = 0.5a^* + 1 - \theta \tag{5}$$

and thus

$$|\mathcal{C}| = a^* = \frac{1-\theta}{\lambda X - 0.5} \tag{6}$$

The interior equilibrium, $|\mathcal{C}| \in (0,1)$, exists for $X > \frac{1.5-\theta}{\lambda}$ and $\theta < 1$. Recall that Proposition 1 part (ii) states that a corner equilibrium in which $|\mathcal{C}| = 1$ exists if $X \leq \frac{1.5-\theta}{\lambda}$. That is, this corner equilibrium and the interior equilibrium are mutually exclusive.

The expression presented in Equation 6 shows the effect that culture and institutions have on the size of each organization in equilibrium. Specifically, it holds that

$$\text{sign}\left(\frac{\partial a^*(\theta, X, \lambda)}{\partial X}\right) = \text{sign}\left(\frac{\partial a^*(\theta, X, \lambda)}{\partial \theta}\right) = \text{sign}\left(\frac{\partial a^*(\theta, X, \lambda)}{\partial \lambda}\right) = -1 \tag{7}$$

Institutional quality, X, the individualistic inclination, θ, and the relative productivity in the market, λ, all positively affect the relative size of the market. While the latter relation is straightforward, the effect of institutions and culture on social organization calls for an explanation. The more developed institutions are, the more likely it is that the individual gets to enjoy the fruits of the economic activity in the market and hence the higher is the expected income produced there. As mentioned earlier, well-functioning institutions are more likely to successfully protect property rights, making the market safer and attracting more individuals to settle there.

The effect of culture on social organization in the interior equilibrium is related to the clan, not to the market. More specifically, stronger individualistic inclinations reduce the socio-psychological benefit of contributing to the clan's welfare. The less committed individuals feel to contribute to the clan, and the greater emphasis they put on their personal interests in deciding where to settle, the more easily they abandon the clan.

3.1.3 Equilibrium mapping

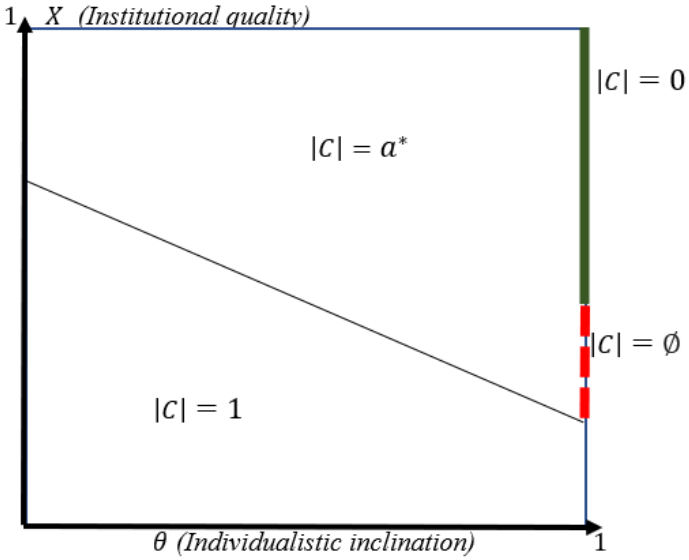
Summarizing propositions 1 and 2, we present, for each pair of (θ, X), the size of clan in equilibrium:

$$|\mathcal{C}| = \begin{cases} \{1\} & \text{if } X < \frac{1.5-\theta}{\lambda} \\ \{a^*\} & \text{if } X \geq \frac{1.5-\theta}{\lambda} \text{ and } \theta < 1 \\ \{0\} & \text{if } X \geq \frac{1}{\lambda} \text{ and } \theta = 1 \\ \emptyset & \text{if } X \in \left(\frac{1}{2\lambda}, \frac{1}{\lambda}\right) \text{ and } \theta = 1 \end{cases} \tag{8}$$

Note that there is a specific range where culture is completely individualistic and institutions function partially ($\theta = 1$ and $X \in \left(\frac{1}{2\lambda}, \frac{1}{\lambda}\right)$), in which no equilibrium in pure strategies exists. This is a peculiar case, however, that does not affect the main results the model generates.

Figure 2 presents the equilibrium mapping graphically.

Figure 2: Equilibrium Mapping



The figure shows, for each combination of the individualistic inclination of the group (θ) and the quality of institutions (X), which size of the clan ($|\mathcal{C}|$) is supported in equilibrium, as described in Equation 8. When moving from the bottom-left corner to the upper-right one, the size of the clan that is supported in equilibrium decreases, reflecting the positive correlation between the size of the market and both the quality of institutions and the strength of individualistic inclinations.

The figure reveals a pattern of a positive correlation between the size of the market and both the quality of institutions and the strength of individualistic inclinations.

3.1.4 Endogenous institutions

In this subsection, we endogenize institutional quality, X, making it an equilibrium variable.[8] We model institutions as a club good: each individual who settles in the market must pay a fee τ to support their ongoing operation.[9] We assume that the collection of the fees is characterized by some inefficiency (a "deadweight loss"), so that the higher the fee is, the larger is the loss incurred (i.e., the "deadweight loss" grows at an increasing rate, like in Hamilton (1986)). To keep things simple, we specify a square root function for the collected fee. Formally, institutional quality is given by the following equation:

$$X = \sqrt{\tau}(1 - |\mathcal{C}|) \tag{9}$$

Institutional quality is thus linear in the size of the market but concave in the fee. Since it is bounded from above by 1, and is the product of two components, we additionally assume that $\tau \in [0, 1]$.[10]

Given that institutions are now a function of the size of the market, we have to once again obtain $|\mathcal{C}|$ in equilibrium. As in Subsection 3.1.2, we distinguish between the corner and the interior equilibria, beginning with the former.

[8] This approach is prevalent in the literature. See, for instance, Persson and Tabellini (2021).

[9] Here τ is exogenously given. In Appendix B we consider the case in which τ is endogenously determined by the individuals who settle in the market.

[10] Note that $\mathcal{C} \in [0, 1]$ by its definition.

Proposition 3. *(i) An equilibrium in which $|\mathcal{C}| = 0$ does not exist. (ii) For any θ, there exists an equilibrium in which $|\mathcal{C}| = 1$.*

Proof. See appendix A. ■

Unlike in the case with exogenous institutions (see Proposition 1), here there is no equilibrium in which all individuals settle in the market ($|\mathcal{C}| = 0$). What accounts for the difference between the two cases is the market's fee: the least talented individuals, who in any case gain nothing from settling in the market, would always prefer to settle in the clan and avoid paying the fee. Thus, an equilibrium in which all individuals settle in the market does not the exist. By contrast, an equilibrium in which all individuals settle in the clan ($|\mathcal{C}| = 1$) exists for any θ. This stems from the fact that institutional quality depends on what individuals do. If all of them settle in the clan, institutions are not established, precluding a potential deviation to the market and rendering $|\mathcal{C}| = 1$ an equilibrium of the game.

Turning to the interior equilibria of the game, recall that, by Proposition 2, $|\mathcal{C}| = a^*$. Since here institutions are endogenous, we modify Equation 5 as follows:

$$\lambda\sqrt{\tau}(1 - a^*)a^* - \tau = 0.5a^* + 1 - \theta \tag{10}$$

Solving for a^* yields two interior solutions, denoted henceforth by a_L^* and a_H^*, where $0 < a_L^* < a_H^* < 1$.[11] These two equilibria exist if and only if $\theta > \tilde{\theta}(\lambda, \tau)$. Moreover, both equilibria are a function of the society's cultural stance, θ, the relative productivity in the market, λ, and the market's fee, τ. The effect of these parameters on the equilibrium size of the clan will be discussed in more detail below.

Note that when $\theta > \tilde{\theta}$, the game has three equilibria: $|\mathcal{C}| = 1$, a_H^* and a_L^*. However, to make the analysis more tractable, we may want to limit the number of possible outcomes, using an equilibrium selection criterion. To this end, we introduce a criterion of *robustness to deviations of small groups*. More specifically, we select the equilibria in which there is no small group of individuals who may profitably deviate from their equilibrium strategies.[12]

Lemma 2. *Whenever all three equilibria – 1, a_H^* and a_L^* – exist, 1 and a_L^* are robust to deviations of small groups, while a_H^* is not.*

Proof. See appendix A. ■

To prove Lemma 2, and noting that $|\mathcal{C}| = a^*$ in the interior solutions, we define the function $\Delta^{\mathcal{C}} = 0.5|\mathcal{C}| + 1 - \theta - \lambda\sqrt{\tau}(1 - |\mathcal{C}|)|\mathcal{C}| + \tau$, which captures the change in utility that results from moving to the clan. In the appendix we show that $\Delta^{\mathcal{C}}$ is an opening-up parabola with (up to) two x-intercepts, a_L^* and a_H^*. Using the properties of $\Delta^{\mathcal{C}}$, we show that no small group of individuals may profitably deviate from the equilibria a_L^* and 1. On the other hand, there exists a deviating group in which all individuals gain utility as a result of deviation from a_H^*.

[11] The two solutions, a_L^* and a_H^*, are explicitly presented in Appendix A.

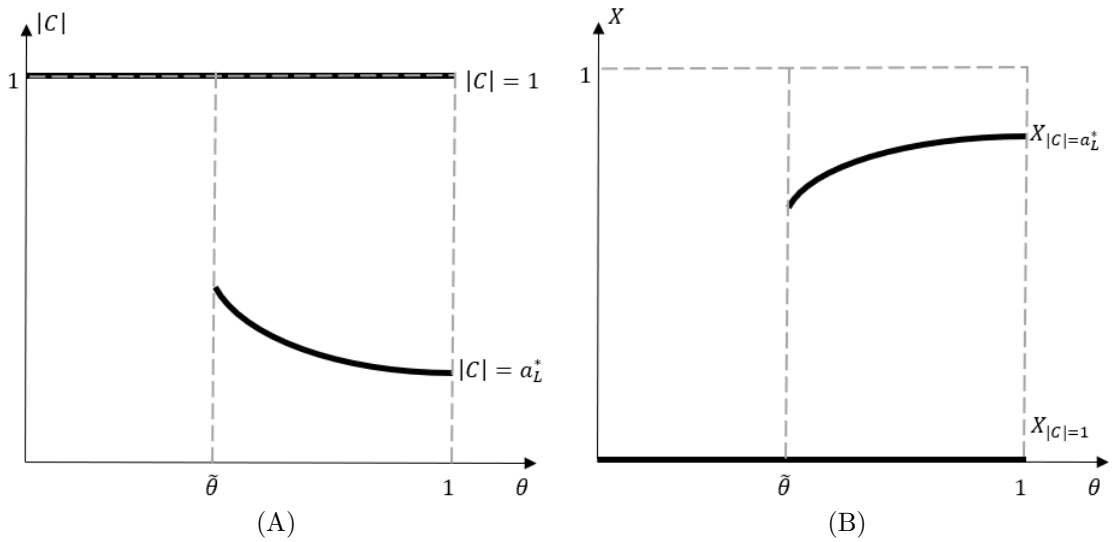
[12] We could have used instead the notion of Continuous Stability (CSS, Eshel and Motro (1981)), which in our setting implies considering small deviations of the *threshold* a^*. Our stability requirement is stricter, as it requires robustness to deviations of *any* small group of individuals, not necessarily those with ability close to a^*. However, while a_L^* is robust to any deviation of a small group of individuals, a_H^* is not even continuously stable. Another reason for refraining from using CSS is that it is more naturally applied to symmetric games, which would mean in our case treating the individuals as ex ante ignorant about their realized ability. In such a setup, an equilibrium with threshold a^* is reinterpreted as a strategy profile in which all individuals adopt the same threshold strategy (settle in the market iff the realized ability a^i is such that $a^i > a^*$), and the deviation studied is to a nearby threshold strategy.

Lemma 2 provides a reasonable criterion for distinguishing between the equilibria of the game, allowing us to henceforth focus on the two stable equilibria, 1 and a_L^*. These will play a key role in the following subsection, when we turn to the dynamic part of our model.

We conclude this subsection by observing the effects of the exogenous parameters on the size of the clan (and thus on institutional quality) in the interior equilibrium, a_L^*. It turns out that $\frac{\partial a_L^*}{\partial \theta} < 0$ and $\frac{\partial a_L^*}{\partial \lambda} < 0$, whereas the relationship between a_L^* and τ is U-shaped. The intuition behind the two first results is similar to the one presented in Equation 7: The more individualistic society is, and the more productive the market is relative to the clan, the fewer individuals settle in the clan. Moreover, it holds that $\frac{\partial \tilde{\theta}}{\partial \lambda} < 0$. In words, the higher λ is, the less individualistic should society be to sustain the interior equilibrium. The effect of the market's fee on a_L^* is more intricate. When τ is low, increasing it leads to a substantial improvement in institutional quality. However, due to the deadweight loss in the collection of the fee, higher values of τ yield lower improvements, and deter the less talented individuals from settling in the market. We further explore this effect in Appendix B, where we let τ be endogenously determined by the individuals who settle the market.

The main results of the Subsection are summarized in Figure 3. The figure presents the effect of the cultural stance, θ, on the size of the clan, $|\mathcal{C}|$ (Panel A), and on institutional quality, X (Panel B), in both of the stable equilibria, 1 and a_L^*.

Figure 3: The Effect of Culture on Social Organization and Institutions



The figure presents the effect of the cultural stance, θ, on the size of the clan, $|\mathcal{C}|$ (Panel A), and on institutional quality, X (Panel B). It shows both of the robust equilibria, 1 and a_L^*. In the former, all individuals settle in the clan and institutions do not exist, regardless of the cultural stance, θ. The latter equilibrium depends on θ: the more individualistic the society is, the smaller is the clan, and the better institutions function. If θ is sufficiently low (i.e., if it falls below $\tilde{\theta}$), a_L^* is not an equilibrium of the game.

3.2 The Dynamic model

3.2.1 Preliminaries

In the first part of our model, we studied the effect of individualistic culture and institutional quality on social organization. Then, we endogenized institutions, making them an equilibrium variable. In what follows, we endogenize culture as well. However, unlike social organization and institutions, we treat culture as a state variable. The reason for doing so is that, as explained in

more detail below, it makes sense to think of culture as gradually changing over long periods of time. Institutions, by contrast, are more quickly adapting and often simply reflect the current state of the society.

We begin by making a few adjustments to account for the dynamic dimension of the model. Consider a successive-generations model in discrete time, $t = 0, 1, 2 \ldots$, where individuals still live for one period. The individual's life course in period t is similar to the one studied thus far, except for two modifications. First, the cultural stance is now updated in equilibrium, along with the size of the clan and the quality of institutions. Second, after deciding where to settle, the individual gives birth to one offspring, who then becomes an adult in period $t + 1$.

It is important to note that the individual's actions have no impact on his offspring's utility, since within a continuum of individuals, he neither affects institutional quality, nor shapes his offspring's cultural stance.[13] Thus

$$U_t^i = c_t^i + d(1 - \theta_t) \tag{11}$$

Let us now turn to the dynamics of culture. The cultural stance, θ_t, is intrinsically endogenous, and may be affected by various social and economic factors. We postulate that the society's individualistic inclination is positively affected by the size of the market. Intuitively, the more individuals settle in the market, the more legitimate it appears to prioritize one's personal interests over the clan's prosperity. In other words, a society that is not centered around the clan, will find it difficult to maintain its significance in the eyes of future generations, and is expected to become more individualistic over time. At the same time, and in line with the notion that culture changes gradually (Parsons; 1951; Roland; 2004), we assume that there exists a cultural drift, i.e., the contemporary cultural stance is affected also by the previous generation's culture.

Putting it together, the dynamics of culture are characterized by the following equation:

$$\theta_{t+1} = (1 - \psi)\theta_t + \psi(1 - |\mathcal{C}_{t+1}|), \quad \psi \in (0, 1). \tag{12}$$

Individualistic inclination in the current period is an increasing function of this inclination in the previous period, and of the share of individuals who reside in the market in the current period. For simplicity, we specify a linear function, in which the parameter $\psi \in (0, 1)$ denotes the relative significance of the economic factor compared to the cultural one, and captures the graduality of the change. Since θ_{t+1} is a function of $|\mathcal{C}_{t+1}|$ and not of $|\mathcal{C}_t|$, we henceforth use the former, i.e., focus on the size of the clan in period $t + 1$.

To account for the dynamic dimension, we rewrite Equation 9 as follows:

$$X_{t+1} = \sqrt{\tau}(1 - |\mathcal{C}_{t+1}|) \tag{13}$$

Recall now that there can be up to two equilibria that are robust to deviations of small groups, $|\mathcal{C}_{t+1}| = a^*_{L,t+1}$ and $|\mathcal{C}_{t+1}| = 1$. However, to study the dynamics of culture, we must specify the equilibrium size of the clan in each period. We are agnostic regarding which of these two equilibria is chosen at the initial stage, as it makes sense that different societies had chosen different equilibria in the distant past. At the same time, we assume that the choice of the equilibrium is subject to

[13] Since individuals undergo the same socialization process and subsequently hold the same cultural values, a single individual does not affect his offspring's cultural stance by deciding where to settle. This further implies that the individual's optimal choice would have remained unchanged even if we had assumed parental altruism, a conventional assumption in this strand of the literature.

dynamic consistency (or inertia), so that the equilibrium chosen in a given period is chosen again in the following period, as long as this equilibrium still exists. Therefore, if $|\mathcal{C}_0| = 1$, then, for any $t > 0$, $|\mathcal{C}_t| = 1$. Namely, the society remains collectivistic and does not establish institutions. If, on the other hand, $|\mathcal{C}_0| = a^*_{L,0}$, then, for any $t > 0$, $|\mathcal{C}_t| = a^*_{L,t}$, as long as it exists. In such as case, the size of the clan, and the corresponding institutional quality, will evolve, depending on the society's cultural stance. In what follows we concentrate on this case.

Note, however, that we cannot simply use the expression of a^*_L that solves Equation 10, since we now have to account for the cultural drift as given in Equation 12. Thus, we plug Equation 12 in Equation 10 and rewrite it in terms of period $t+1$, while using $|\mathcal{C}_{t+1}| = a^*_{t+1}$:

$$\lambda\sqrt{\tau}(1 - a^*_{t+1})a^*_{t+1} - \tau = 0.5a^*_{t+1} + 1 - ((1-\psi)\theta_t + \psi(1 - a^*_{t+1})) \tag{14}$$

As in Equation 10, there exists an interior solution, $a^*_{L,t+1} \in (0,1)$ if the cultural stance is sufficiently individualistic, i.e., if $\theta_t > \tilde{\theta}(\lambda, \psi, \tau)$.[14] Note that since θ_{t+1} is a linear combination of θ_t and $|\mathcal{C}_{t+1}|$, the form of the function $\Delta^{\mathcal{C}}$ remains unchanged, and thus Lemma 2 still holds, indicating that $a^*_{L,t+1}$ (alongside $|\mathcal{C}_{t+1}| = 1$) is robust to deviations of small groups.

Obtaining $|\mathcal{C}_{t+1}|$ in equilibrium allows us to compute θ_{t+1} and X_{t+1} (using 12 and 13, respectively), and thus to completely characterize the dynamic trajectory. Namely, both individualistic inclination and institutional quality in the next period depend on the size of the market, which in turn depends on the current individualistic inclination, θ_t. We can thus characterize θ_{t+1} as a function of θ_t alone. Importantly, the dynamics of culture display a positive feedback loop: The more individualistic society is, the smaller is the clan, and the higher is the institutional quality. Better institutions increase the market, which in turn makes culture even more individualistic. The existence of a positive feedback loop suggests that convergence is a pivotal feature of the dynamic system. In the following subsection we explicitly analyze the dynamics of culture. We first characterize the steady states, paying particular attention to their stability, and then outline the dynamic trajectories, from a given initial point to the steady state that is reached in the long run.

3.2.2 Steady states

Following the principle of inertia outlined earlier, we assume that $|\mathcal{C}_{t+1}| = a^*_{L,t+1}$ as long as $a^*_{L,t+1}$ exists, i.e., as long as $\theta_t > \tilde{\theta}$. When, on the other hand, $\theta_t \leq \tilde{\theta}$, the nonexistence of $|\mathcal{C}_{t+1}| = a^*_{L,t+1}$ implies that $|\mathcal{C}_{t+1}| = 1$. Putting it together, the dynamics of culture can be restated as follows:

$$\theta_{t+1} = \begin{cases} (1-\psi)\theta_t & \text{if } \theta_t \leq \tilde{\theta} \\ (1-\psi)\theta_t + \psi(1 - a^*_{L,t+1}) & \text{if } \theta_t > \tilde{\theta} \end{cases} \tag{15}$$

Solving 15 for $\theta_{t+1} = \theta_t$ yields the system's steady states, which we present in the following proposition:

Proposition 4. *There may exist up to three steady states, depending on three critical values of λ, denoted by $\lambda^{\mathcal{M}}(\tau) < \bar{\lambda}(\tau, \psi) < \lambda^{\mathcal{C}}(\tau, \psi)$. Namely, it holds that:*

1. *For any $\lambda \geq \lambda^{\mathcal{M}}(\tau)$, there exists an "individualistic steady state", $\theta^{\mathcal{M}}(\lambda, \tau)$.*
2. *For any $\lambda \leq \lambda^{\mathcal{C}}(\tau, \psi)$, there exists a "collectivistic steady state", $\theta^{\mathcal{C}} = 0$.*

[14] The interior equilibrium, $a^*_{L,t+1}$, is explicitly presented in Appendix A.

3. *For any* $\lambda \in [\lambda^{\mathcal{M}}(\tau), \bar{\lambda}(\tau, \psi)]$*, there exists a steady state* $\bar{\theta}(\lambda, \tau)$*.*

The first two steady states may be either locally or globally stable, depending on the values of λ *and* ψ*. The third steady state is unstable.*

Proof. See appendix A. ■

The individualistic steady state (part 1 of the proposition) characterizes a predominately individualistic society, where institutional quality is relatively high and many individuals reside in the market. The collectivistic steady state (part 2) characterizes a completely collectivistic society, where market-supporting institutions do not exist and all individuals reside in the clan. These two steady states represent two distinct, antithetic classes of societies. Both are stable, indicating that a given society would probably end up in one of these two steady states.

The third steady state is situated somewhere in between the individualistic and the collectivistic steady states. It characterizes a society that is not predominately individualistic or collectivistic. In this steady state, institutional quality is lower and the market is smaller than in the individualistic steady state. Although this steady state is unstable, it plays a key role in determining the society's dynamic trajectory and ultimate position, as shown in the next subsection.

Setting the stage for the convergence analysis, we point to the effect of the relative productivity in the market, λ, on two of the steady states, $\theta^{\mathcal{M}}$ and $\bar{\theta}$. As shown in Appendix A, it holds that $\frac{\partial \theta^{\mathcal{M}}}{\partial \lambda} > 0$ and $\frac{\partial \bar{\theta}}{\partial \lambda} < 0$. In words, if a society is in the individualistic steady state, $\theta^{\mathcal{M}}$, higher values of λ make it more individualistic, which in turn increases the size of its market and increases institutional quality (see Figure 3). In the unstable steady state, $\bar{\theta}$, the effect of an increase in λ is the opposite, making the society more collectivistic, thereby reducing the size of the market and the quality of institutions. The intuition behind the results and their practical significance will be presented in the next subsection.

3.2.3 Convergence analysis

Having obtained the system's steady states, we can now fully characterize the dynamic system. More specifically, we can trace the society's dynamic trajectory and ultimate position, given its initial conditions and the exogenous parameters. The following proposition summarizes the possible types of dynamic processes:

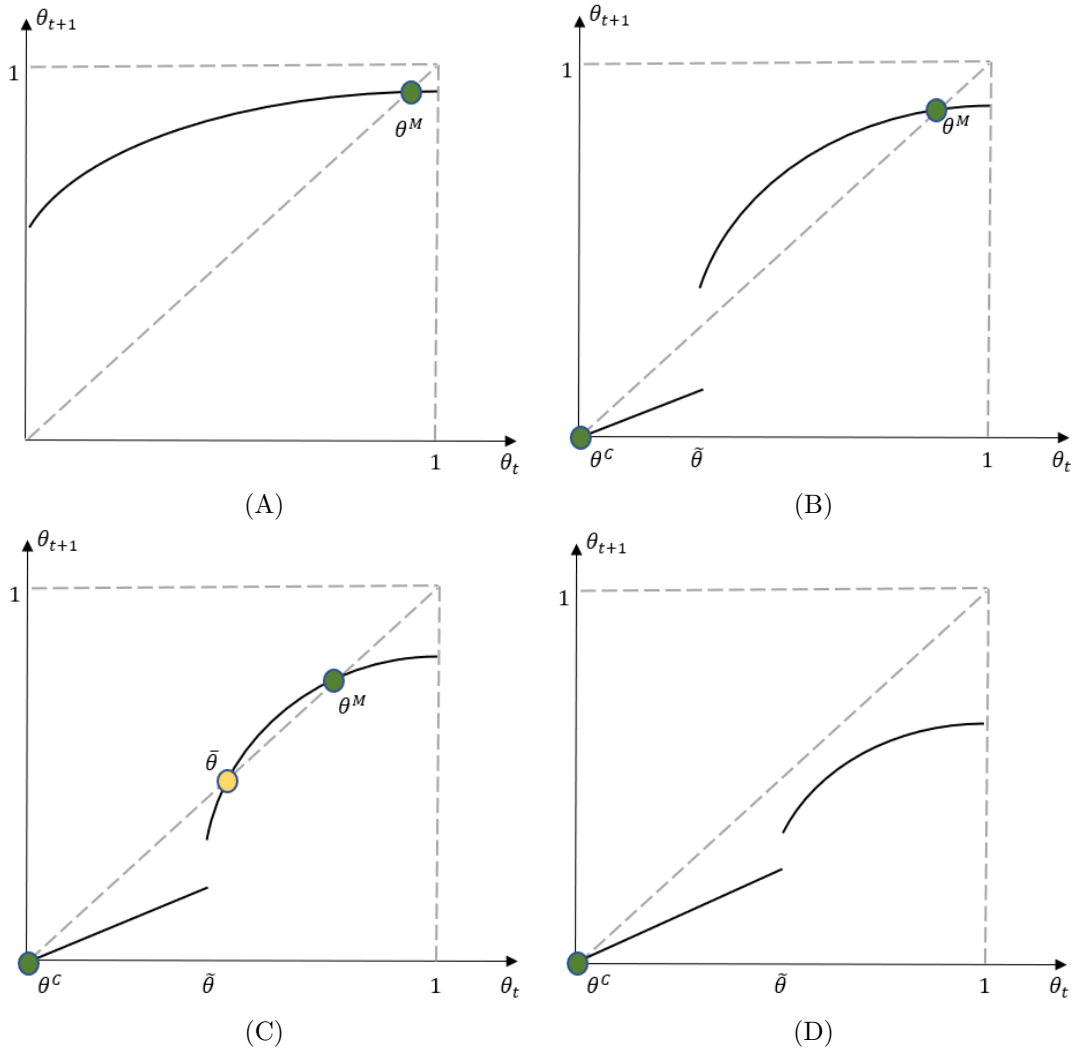
Proposition 5. *Depending on the values of* θ_0*,* λ*,* τ *and* ψ*, as* $t \to \infty$*, the system converges to a steady state according to the following rules:*

1. *For any* $\lambda > \lambda^{\mathcal{C}}$*,* $\lim_{t\to\infty} \theta_t = \theta^{\mathcal{M}}$
2. *For any* $\lambda \in (\bar{\lambda}, \lambda^{\mathcal{C}}]$*,* $\lim_{t\to\infty} \theta_t = \begin{cases} \theta^{\mathcal{M}} & \text{if } \theta_0 > \tilde{\theta} \\ \theta^{\mathcal{C}} & \text{if } \theta_0 \leq \tilde{\theta} \end{cases}$
3. *For any* $\lambda \in (\lambda^{\mathcal{M}}, \bar{\lambda}]$*,* $\lim_{t\to\infty} \theta_t = \begin{cases} \theta^{\mathcal{M}} & \text{if } \theta_0 > \bar{\theta} \\ \bar{\theta} & \text{if } \theta_0 = \bar{\theta} \\ \theta^{\mathcal{C}} & \text{if } \theta_0 < \bar{\theta} \end{cases}$
4. *For any* $\lambda \leq \lambda^{\mathcal{M}}$*,* $\lim_{t\to\infty} \theta_t = \theta^{\mathcal{C}}$

Proof. See appendix A. ■

Proposition 5 lists four different dynamic processes, ordered according to the value of λ. We first discuss the parts of the proposition where λ is very high (part 1) or very low (part 4). Then, we turn to discuss the more interesting parts, 2 and 3, where λ has intermediate values. Figure 4, which depicts the four different dynamic processes, accompanies our analysis throughout the subsection.

Figure 4: Four Possible Dynamical Systems



Panels A-D present the four possible dynamic processes. In Panel A, where λ is very high, the system converges over time to the individualistic steady state, $\theta^{\mathcal{M}}$. In Panels B and C, where λ takes intermediate values, there exist two (locally) stable steady states, and the system's ultimate position depends on the location of the initial cultural stance, θ_0, with respect to a given threshold: $\tilde{\theta}$ in Panel B, and $\bar{\theta}$ in Panel C. In Panel D, where λ is very low, the system converges over time to the collectivistic steady state, $\theta^{\mathcal{C}}$.

Part 1 of Proposition 5, where λ is very high, is depicted in Panel A of Figure 4. It characterizes a society that converges to the individualistic steady state, $\theta^{\mathcal{M}}$, regardless of its initial cultural stance, θ_0. What is the intuition behind this result? In such a society, the relative productivity in the market is so high, that even in a completely collectivistic culture, some individuals settle in the market. By settling there, these individuals establish institutions, attracting even more individuals to join them. As the size of the market increases, it gives rise to a cultural change, making the society more individualistic. This, in turn, weakens the individuals' commitment to the clan, further increasing the size of the market and increasing institutional quality. Such a positive feedback loop

persists until the society converges to the individualistic steady state. Moreover, recalling that $\frac{\partial \theta^{\mathcal{M}}}{\partial \lambda} > 0$, it holds that such a society would end up being more individualistic (and would have a larger market and better functioning institutions) the higher λ is. Higher values of λ make the market more attractive, and can thus sustain better institutions and a more individualistic cultural stance.

Part 4 of Proposition 5, where λ is very low, is depicted in Panel D of Figure 4. It characterizes a society that converges to the collectivistic steady state, $\theta^{\mathcal{C}}$, regardless of its initial cultural stance, θ_0. If such a society is sufficiently individualistic at time t (if $\theta_t > \tilde{\theta}$), some individuals settle in the market despite its low relative productivity. However, in such a case, the size of the market is so small that the society actually becomes more collectivistic. In the course of time, it becomes predominately collectivistic, so that even the most talented individuals settle in the clan, and both the market and its institutions cease to exist. Following the termination of the market, the society becomes even more collectivistic, eventually converging to the collectivistic steady state.

Our analysis indicates that the coevolution of culture, institutions and social organization governs the society's dynamic trajectory. However, in parts 1 and 4, where λ is either very high or very low, it constitutes the single factor that determines the society's ultimate position (conditional on the other exogenous parameters, τ and ψ). This, however, is not the case in parts 2 and 3 (Panels B and C of Figure 4, respectively), where λ takes intermediate values. In both parts 2 and 3, what sets the society's dynamic trajectory and determines its ultimate position is the initial cultural stance, θ_0. If the society is sufficiently individualistic to begin with ($\theta_0 > \tilde{\theta}$ in part 2, $\theta_0 > \bar{\theta}$ in part 3), it will converge to the individualistic steady state, $\theta^{\mathcal{M}}$. In a similar vein, if the society is sufficiently collectivistic initially ($\theta_0 \leq \tilde{\theta}$ in part 2, $\theta_0 < \bar{\theta}$ in part 3), it will converge to the collectivistic steady state, $\theta^{\mathcal{C}}$. The only difference between the two parts is in the cultural threshold between the region from which the system converges to $\theta^{\mathcal{M}}$ and the region from which the system converges to $\theta^{\mathcal{C}}$. In part 2, the unstable steady state, $\bar{\theta}$, does not exist, and thus $\tilde{\theta}$ serves as the threshold between the two convergence regions.

How does λ affect the convergence processes when the society's ultimate position depends on θ_0? As we have already observed in part 1 of Proposition 5, higher values of λ make the society more individualistic in $\theta^{\mathcal{M}}$. In parts 2 and 3, however, λ plays an additional role in the dynamic process. Recall that $\tilde{\theta}$ and $\bar{\theta}$, which serve as thresholds between the two convergence regions, are both negatively affected by λ (see the end of Subsection 3.1.4 for the latter statement). It follows that the higher λ is, the larger is the region from which the system converges to $\theta^{\mathcal{M}}$. The intuition behind the result is similar to the one presented earlier: when λ is high, it attracts more individuals to the market, initiating a coevolution of culture and institutions that leads eventually to the individualistic steady state. In other words, λ shapes the economic environment in a way that induces the spread of individualism and the establishment of well-functioning institutions.

The analysis of the dynamic processes presented in Proposition 5 has two interesting implications. First, it indicates that initially distinct societies may end up in the same steady state. Take for example societies A and B, with the same exogenous parameters, λ, τ and ψ, but with $\theta_0^A < \theta_0^B$, and suppose that $\bar{\theta}$ exists. If $\bar{\theta} < \theta_0^A < \theta_0^B$ then, by part 3 of Proposition 5, both societies will end up in the individualistic steady state, even if their initial cultural differences were significant. In fact, if λ is higher in society A, it will eventually become more individualistic than society B. The second implication is that if instead $\theta_0^A < \bar{\theta} < \theta_0^B$, then the two societies will end up in different steady states, even if initially they had similar cultural stances. In such a case, minor initial differences are subsequently amplified due to the coevolution of culture, institutions and

social organization, which results in growing divergence. Thus, an economic model that focuses on a single explanatory variable, rather than on the coevolution of a few variables, cannot account for such dynamic patterns.

4 Historical Survey: China and Europe

The theoretical model developed in this study points to the long-lasting effects of initial conditions (θ_0 and λ) on the development of different societies. These conditions set the course for a subsequent coevolution of culture, institutions and social organization, which resulted in a continuous widening of initial differences.

In what follows, we apply the model to a specific historical case: the cultural, institutional and social divergence between Chinese and European civilizations. We begin by contrasting ancient Chinese collectivism with European individualism. Then, we show that the different cultural conditions gave rise to the emergence of distinct social organizations: cohesive, kinship-based groups in China, and loose, interest-based groups in Europe. Finally, we discuss the growing institutional divergence between the two regions.

4.1 Cultural Differences

To link the theoretical model to a historical case, we have to start by identifying the earliest evidence of cultural dissimilarities between China and Europe. In his comparative account of ancient China and Greece, Keightley (1990) argues that the pivotal cultural difference between the two civilizations, which became apparent during the early Bronze age, lays in their attitude toward ancestors.[15] These different attitudes were manifested in various, seemingly unrelated, practices and perceptions. One example is the perception of death. In China, ancestor worship rendered death less problematic. Since an individual's death, however tragic, did not break the ancestral line, it could be tolerated from a cultural point of view (Keightley; 1990). Ancient Greeks, on the other hand, were preoccupied with death, since from their perspective, the persistence of the lineage could not assuage the tragic fate of each individual. In a similar vein, Chinese burial practices reflected collectivistic inclinations. The spaciousness of the graves, the abundance of luxury grave goods, and the presence of accompaniers-in-death, particularly in the graves of elite members, all pointed to the cultural importance of ancestors (Keightley; 1990). Burial practices in Greece were noticeably different. Greek graves were relatively austere, and accompanying-in-death was not a widespread practice, indicating that the Greek civilization attached less importance to ancestor worship (Keightley; 1990).

Another example is the perception of the origins of humankind, which was a pivotal topic in ancient Greek philosophical discourse, but did not receive much attention in China. Apparently, Chinese genealogies, recording the families' ancestors and going back many generations, were sufficient to answer the question of the origins (Keightley; 1990). Finally, ancestor worship may have shaped the attitude toward individual self-expression. In China, it was rarely encouraged, since it could pose a threat to social harmony, and undermine the sacred status of the ancestors (King; 2018). Ancient Greeks, by contrast, fostered self-expression, innovation and freedom of thought (Roebuck and Finley; 1964). The weaker moral obligation to the ancestral line allowed

[15] Attitudes toward ancestors are closely related to IC, and societies that attach great importance to ancestors tend to be more collectivistic. Ancestor worship, which emphasizes the group's common origins, both reflect and reinforce group consciousness and social cohesion (see Keightley (1990)).

them to take a more critical stance toward their ancestors and to be more inclined to accept new ideas (Keightley; 1990).

Two major developments, the spread of Confucianism in China and of Christianity in Europe, widened the cultural cleavage between the two regions. Let us now consider these two developments in turn. Confucianism was a collectivistic moral philosophy, where individuals were thought of as interrelated social beings, rather than as autonomous entities (King; 2018). A key concept defining individuals' relationships was *shu*, vaguely translated as reciprocity, the principle of not doing to others what you do not want done to yourself (Analects, 15:23).[16] To abide by this principle, Confucianism instructed individuals to always put themselves in the position of others (Goldin; 2014). In Confucianism, the prescribed behavior in each relationship depended on the social status of each of the parties involved. Confucius' saying, "There is government, when the prince is prince, and the minister is minister; when the father is father, and the son is son" (Analects, 12:11), guided individuals to act in accordance with their assigned roles, with all the duties and prerogatives these roles entailed.

Kinship relationships, specifically, occupied a central position in Confucianism. Of the five "cardinal relationships" in the Confucian tradition used to characterize the society's social structure (Yang et al.; 1966), three (parent and child, husband and wife and old and young) were based on kinship. The cultural importance of kinship was also reflected in the convention to use terms denoting family relationships in social or political contexts. For example, the relationship between a teacher and a student, or the emperor and his subjects, were supposed to emulate the bonds tying a father and a son (King; 2018). Kinship relationships were hierarchical in nature: younger family or group members were obliged to show respect, devotion and unquestioning obedience to elder members. Indeed, "filial piety", the virtue of respect for parents and ancestors, was so important that it took precedence over abiding the law (Fung; 1949).

While China became increasingly collectivistic under the influence of Confucianism, Christianity made Europe more individualistic. Early Christianity advanced an intrinsic view of the individual: Unlike ancient Greeks and Romans, who believed that the individual's tangible faculties made him unique, Christianity held that the individual's uniqueness stemmed from his inner self, and from his personal relationship with God (Niebuhr; 1996). Similarly, unlike many Greek philosophical traditions, early Christian writings claimed that individuals possessed free will (Frede; 2011), and the inner ability to make the right decision and to shape their own destiny.

The spread of Christianity marked a transition from a public religion to a private one. The pagan religions in ancient Greece and Rome were confined almost exclusively to the public sphere, and worship of gods centred on public events, rituals and sacrifices (Rüpke; 2011). Christianity, on other hand, hinged on individual faith, required personal devotion and specified rules of behavior. Its moral content was thus largely alien to the contemporary pagan religions (Rüpke; 2011). Christianity was also the first universal religion. In ancient Greece and Rome, religious affiliation hinged on ethnic or local identities, although they were not mutually exclusive, and the multiplicity of gods was usually tolerated. Christianity, by contrast, sought to establish a community of believers, where ethnic and local identities play no role, and instead universal humanity was put at the core (Brown; 2012).

However consequential for the further development of Chinese and European societies, Confucian-

[16] This Confucian formulation of the "Golden Rule" goes beyond the liberal Harm Principle. The latter is essentially prohibitive, restricting harmful types of behaviour. The former, on the other hand, also has a positive content, exhorting individuals to actively love, care for and empathize with others (see, e.g., Sta. Maria (2017)).

ism and Christianity did not come out of the blue. In China, the Confucian principles of reciprocity and filial piety had already been widespread in the days of Confucius and his disciples. Similarly, Europe's culture did not originate from a single religious or philosophical system. Christianity, too, built on earlier, Greco-Roman traditions (see our discussion above for their relatively high individualistic inclinations). This indicates that, in line with our theory, cultural change in both regions was evolutionary and path-dependent.

In the beginning of the second millennium CE, both Confucianism in China and Christianity in Europe assumed dominant positions. In China, after six hundred years of decline, Confucianism experienced a revival in the early Song dynasty, when the Neo-Confucianism, a moral philosophy with Confucian origins, gained prominence and became the state's official orthodoxy (Liu; 1998). Although Neo-Confucianism differed from the classic Confucian tradition in many aspects, it maintained its collectivistic inclination, advocating reciprocity and filial piety (Watson; 1982). In Europe, Christianity continued its spread throughout the first millennium CE, and by the 11th century, most European ethnic groups were christianized. During the middle ages, Christian thinkers, such as Augustine of Hippo, Peter Abelard and Thomas Aquinas contributed to a further elaboration of individualistic perceptions (Morris; 1987). Thus, in the beginning of the second millennium CE, the cultural cleavage between China and Europe reached its zenith.

4.2 Differences in Social Organization

Our theory suggests that the widening of cultural differences would give rise to the emergence of distinct social organizations. In collectivistic societies, individuals would settle in clans and other kinship-based organizations, while in individualistic societies, interest-based organizations are more likely to emerge. Historical evidence indicates that the social organization in China and Europe generally followed these patterns, respectively.

In China, distinct familial organizations existed even prior to the Song dynasty (960-1279 CE). Among the elites, families forged marriage alliances as a means for accumulating wealth and political power. However, they were mostly concerned with maintaining the "purity" of the lineage, rather than with establishing centralized social organizations (Watson; 1982). Among the commoners, "communal families", multi-generational households with shared property, were quite prevalent, but they were small, usually confined to members of a single family (Ebrey et al.; 1986).

The Song dynasty marked the transition from small familial organizations to large kinship-based organizations, which we refer to as clans.[17] Clans emerged amidst mass migration movements from the northern plains, which suffered from recurring wars and adverse climatic shocks, to the safer regions south of the Yangtze River (Kuhn; 2011). The number of clans increased significantly during this period, particularly in the Southeast, indicating that the emergence of clans was closely related to these mass migration movements (Greif and Tabellini; 2017).

Migration itself, however, cannot account for the emergence of clans, since individuals could possibly form other types of social organizations, such as markets. Apparently, the Chinese formed clans because they appreciated the collectivistic principles of reciprocity and filial piety. It is telling that the emergence of clans coincided with the rise of the collectivistic Neo-Confucian philosophy. Following Confucianism, Neo-Confucian philosophers thought that kinship relationships might

[17] See Watson (1982); Ebrey et al. (1986) and Ebrey et al. (1986) for a discussion of the different types of kinship-based organizations. In this study we contrast two types of social organizations: those based on kinship and the ones based on individual interests, and thus abstract from possible variations within each type. Hence, throughout the study, we use two generic terms, clan and market, to denote these two types.

constitute a solid foundation for the Chinese society (Watson; 1982). However, their endorsement of kinship-based organization did not always follow any designed political scheme, and was often merely rhetorical. Neo-Confucianism thus reflected, but not engendered, the profound change in Chinese social organization (Watson; 1982), which was essentially a bottom-up process driven by deeply entrenched cultural inclinations.

In Europe, kinship-based relationships were common before the spread of Christianity. The Roman law allowed, if not encouraged, marriage to a close kin, adoption and concubinage (Goody and Goody; 1983). These practices were common across Western Europe, including in German and Celtic lands (Goody and Goody; 1983), enlarging the family and reinforcing kinship-based social organizations.

Beginning in the late antiquity, the Catholic Church gradually abolished such family-enlarging practices, including adoption, remarriage, polygamy and concubinage. The Church was particularly preoccupied with incest, and thus outlawed marriage between relatives, eventually extending the ban to sixth cousins (Goody and Goody; 1983; Witte Jr; 2015), and inflicting harsh punishments on those violating the ban. The Church also encouraged newly married couples to leave their relatives and establish an independent household, which further limited the extent of the family. Eventually, the religious restrictions on marriage led to the disintegration of clans in Western Europe, with only small pockets of kinship-based societies remaining.

As clans disintegrated, a different type of social organizations, which we refer to as markets, began to emerge.[18] Unlike clans, market organizations, such as free cities, were interest-based, as they were established to allow individuals to pursue their interests. Shared economic interests or common occupational characteristics were thus the markets' *raison d'être* (Greif; 2006a; De Moor; 2008). During late medieval period, markets spread throughout Western Europe, both in urban areas (Pirenne; 2014) and in the countryside (Brenner; 1976). As our theory suggests, the proliferation of interest-based organizations in Western Europe was indicative of its individualistic culture.

Chinese clans and European markets had a few similar functions. Clans provided public goods, assisted the poor, regulated relationships between group members and supported education, both on the elementary level and as preparation for the Chinese imperial examinations (Watson; 1982; Ebrey et al.; 1986). Markets engaged in public good provision, law enforcement and protection of property rights (Pirenne; 2014), while also fostering the transmission of technological knowledge, specifically in craft guilds (De Munck and Soly; 2007). By absorbing a wide range of responsibilities, clans and markets substituted state authorities, which, during the late medieval period, were decentralized and weak (Tilly; 1989; Greif; 2005).

Notwithstanding such similarities, clans and markets differed in three fundamental aspects: the economic, the cultural and the institutional ones. Here we consider the first two aspects, postponing the discussion of institutional differences to the next subsection.

Economically, clans and markets differed in the degree of independence individuals possessed. Chinese clans were loci of collective economic activities (Ahern; 1976; Watson; 1982). Clan members collectively owned agricultural lands, factories and various commercial properties, and some clans gained monopolistic rights over production or trade of specific goods (Watson; 1982). The income generated by these economic activities was then shared among the clan members. In addition, the income financed the clan's ritual activities, such as ancestor worship or the construction and

[18] A common term for interest-based social organizations is *corporation* (see, e.g., Greif (2006a)). However, since in this study we focus mainly on the degree of economic independence individuals posses in each type of social organization, the term market seems more adequate.

maintenance of collectively-owned gathering halls (Watson; 1982). Indeed, the clan's collective economic activities and its cultural cohesiveness were closely intertwined.

The economic structure of European markets took a different form. Markets operated under the principle of private property, and individuals were self-reliant.[19] Certainly, the personal interests of market members coincided, and they were often able to coordinate collective action to protect these interests. Merchant guilds, for example, successfully coordinated retaliations against abuses of their members' property (Greif et al.; 1994), contributing thereby to the security of property rights. Nevertheless, cooperation was just the means to protect shared interests, and did not necessarily entail any collective ownership.

Clans and markets also differed in how socially cohesive they were. Membership in a clan pivoted on kinship ties, which served to forge group consciousness and draw a distinction between members and outsiders (Watson; 1982). Further fostering a sense of affiliation, clans held periodical rituals, worshiping ancestors and celebrating the group's unity (Ahern; 1973; Watson; 1982). Chinese clans also prescribed rules of behaviour, guiding clan members to assist each other and to practice filial piety. The persistence and prosperity of the clan depended crucially on the commitment of its members, and thus, more generally, on the prevalence of collectivism in society.

As we mentioned earlier, unlike clans, markets were established to allow individuals to pursue their personal interests. In the absence of kinship relationships, markets usually consisted of many independent nuclear families (Greif; 2006a), and lacked solid group consciousness. Thus, although members of the market had to obey its laws (see our discussion of market institutions in the following subsection), they were not closely tied to each other. The persistence of such loose social organizations both hinged on and reinforced Europe's individualistic culture.

4.3 Institutional Differences

The late medieval period saw growing institutional divergence between China and Europe. As our theory suggests, institutional development in both regions pivoted on their social organization. Chinese institutions built on solid kinship ties to support economic relations, settle disputes among clan members, and protect them from abuses by non-members. In individualistic Europe, by contrast, formal institutions took the place of kinship relationships in performing these functions. We now consider in detail the institutional development in China, and then turn to the European case.

In china, clans often took on the responsibility for regulating intra-clan economic relations. Clan leaders had the authority to enforce contracts, adjudicate civil disputes and punish group members (Ma; 2007). Clan-based adjudication relied heavily on local customs and practices, applied on a case by case basis (Gellhorn; 1987; Ma; 2007). As the clan's goal was to restore social harmony, and not to achieve abstract justice, its leaders sought to reach compromise and conciliation between the disputants (Gellhorn; 1987). Apparently, the social cohesiveness of Chinese clans, and their collectivistic inclinations facilitated the functioning of such informal institutional mechanisms (Hamilton; 1996).

The formation of such clan-based institutions in China may explain why the state played only a limited role in regulating economic relations and adjudicating civil disputes. On the one hand, imperial statuses indicate that the Chinese state did recognize the existence of property rights and its obligation to protect them (Zelin; 2004). Covering a wide range of issues, including debt

[19] See Pirenne (2014) for a detailed account of the economic structure of medieval cities in Europe.

relations, theft, monopolies and land disputes, these statuses aimed at providing an institutional framework for market activities (Zelin; 2004). On the other hand, the state did not interfere in most economic transactions, did not regulate the content or form of contracts and refrained from using punitive means to enforce them (Hamilton; 1996; Zelin; 2004). Moreover, despite a continuous population growth, the state's bureaucracy remained small, limiting its administrative capacity. In a population of tens of millions, only 1300 county magistrates were employed to adjudicate civil disputes. These magistrates had to handle many other duties, which were unrelated to adjudication, and lacked any specialized legal training (Greif; 2005).

Chinese institutional structure limited inter-clan economic relations, since the mechanisms to settle disputes and the collectivistic principles binding individuals to behave justly were only applicable within the clan, but not outside it (Greif; 1994, 2005). When economic transactions between members of different clans did occur, the two parties took specific measures to guarantee their success. For example, the buyer had to pay a large share of the price in advance, to minimize the seller's loss in case of default. The buyer was also expected to carefully check the quality of the product before accepting the transaction, since complaints were inadmissible once it had been carried out (Gellhorn; 1987). Despite these measures, most economic relations took place within the kinship network (Greif; 2005).

The informality of Chinese institutions also had an adverse effect on its legal development. As implied earlier, clan leaders and county magistrates sought to solve each case individually, rather than to develop a codified and consistent set of laws that would serve as precedents in future cases (Gellhorn; 1987; Ma; 2007). They were, in other words, "more interested in influencing the outcome – rather than the rules – of the game" (Ma; 2007). The absence of written laws hindered the accumulation of legal knowledge and inhibited further legal development. It is telling, therefore, that Chinese market-supporting institutions remained underdeveloped for many centuries, and did not undergo substantial reforms until as late as the 20^{th} century.[20]

Let us now turn to Europe. In the beginning of the second millennium CE, Europe faced substantial institutional challenges. The medieval period in Europe was marked by political fragmentation (Bloch et al.; 2014). Since European rulers had limited administrative capacities, they rarely interfered in economic transactions, and could not commit to the security of property rights (Greif; 2005). Abuses of property, either by individual merchants or by local communities, were quite common (Greif et al.; 1994; Greif; 2006b), hindering market activities. There was thus a need for market-supporting institutions that would regulate the economic relations between individuals.

The need for such institutions begat the formation of a new legal system, called the "Law Merchant". The system, which was administered by merchant courts, provided a uniform set of commercial laws, resolved disputes and punished dishonest behaviour. Formed to meet immediate economic needs, the development of the "Law Merchant" was spontaneous and undesigned, and it continuously evolved in response to changing circumstances (Benson; 1989). Courts operating under the "Law Merchant" were highly functional, adopting various practices to simplify and expedite adjudication: they forbade appeals to avoid lengthy litigation, approved ownership transfers in the absence of psychical delivery and did not require attorney attestation as evidence of an economic transaction (Benson; 1989). At the same time, these courts often adjudicated highly technical

[20]The idea that codification is a prerequisite for legal development is based on two reasons. First, it facilitates the accumulation of legal knowledge, which can later be applied to improve the system. Second, written laws make adjudication more logical and less arbitrary, rendering the verdict more predictable. See Berman (1983) for a detailed analysis of legal development in Europe.

commercial disputes, and employed professional judges with adequate judicial expertise (Benson; 1989).

As the "Law Merchant" spread in Western Europe, it allowed merchants from distant regions to safely engage in economic transactions under a universal set of laws. Over time, these laws were codified, which made the system more predictable, objective and nonarbitrary. As a result, the "Law Merchant" was gradually adopted in many regions of Western Europe, contributing to the protection of property rights and the expansion of market activities (Benson; 1989).

While a universal set of laws was a necessary condition to regulate economic relations, it was insufficient in itself. As the market expanded and impersonal economic relations became common, an institutional mechanism was needed to induce decent behaviour and prevent misconduct. One such mechanism was the "Community Responsibility System" (CRS henceforth). The CRS was based on communal liability: in case of contractual default, the community of the injured party held the defaulter's community legally liable, and could demand an adequate compensation (Greif; 2006b,c). Since the defaulter's community's only alternative - to cease trading with the other community - was often too costly, it had to comply. The CRS thus compelled self-interested communities to impose impartial justice within their jurisdiction and protect the property rights of alien merchants (Greif; 2006b).

Importantly, the communal liability entailed by the CRS affected the communities' interior institutions, inducing them to take measures to avoid economic and reputational damage. First, to prevent free-riding by untrustworthy merchants, communities restricted the affiliation of new members and set up mechanisms verifying each merchant's identity (Greif; 2006b). Second, local courts compelled merchants to bear the costs of their default, and if they refused to do so, expelled them from the community. As the CRS proved efficient, many communities in England, Flanders, Germany and Italy joined the system, and it was also used in the fairs of Champagne (Greif; 2006b), reaching its zenith during the 12^{th} and 13^{th} centuries.

A distinct, complementary mechanism that regulated economic relations was the "merchant guild". Operating within a community or as an inter-community institution, the merchant guild "was an administrative body that supervised the overseas operation of merchant residents of a specific territorial area and held certain regulatory powers within that territorial area" (Greif et al.; 1994). If the property rights of its members were abused, the merchant guild coordinated retaliation, usually a trade embargo, against the abuser's community. This served to deter other communities from abusing the property rights of the guild members in future transactions (Greif et al.; 1994). To make the threat of an embargo credible, the merchant guild prohibited its members from trading with the other community, and punished those who did not abide, either by imposing a fine or by expelling them. In addition, merchant guilds often charged entry fees, as a means to ensure that their members would adhere to the rules and to deter untrustworthy merchants from joining them (Greif et al.; 1994).[21]

As the above discussion indicates, the distinguishing feature of European market-supporting institutions was their *systematicity* (Greif; 2005, 2006c). Indeed, European commercial law and the mechanisms designed to regulate economic relations were uniform, predictable and objective. Not less important, commercial rules and court verdicts in civil disputes were written and codified. It followed that, unlike in China, European market-supporting institutions had the capacity to develop under debate, analysis and synthesis (Berman; 1983).

Institutional development in Europe went hand in hand with the expansion of the market. In

[21] The fee we introduce in Subsection 3.1.4 of our model aims to reflect this historical fact.

the process, medieval institutions, such as the Law Merchant, the CRS and the merchant guild, were gradually replaced by more centralized state institutions, which could support the market on a larger scale. Beginning in the late medieval period, Western European rulers sought to undermine the authority of the Law Merchant, and make royal courts more attractive. In England, for example, the Law Merchant was gradually absorbed by the Common Law, and in the early 16^{th} century, merchant courts practically disappeared (Benson; 1989). The CRS began to decline in the 13^{th}, when large communities in Italy and Flanders abolished the system within their jurisdiction (Greif; 2006b). This was also the case with the merchant guild, which ceased to play an active role in the protection of property rights once the duty was taken by rulers with functioning bureaucracies and coercive power (Greif et al.; 1994). Interestingly, therefore, institutional development and the growth of commerce, brought about by these medieval institutions, ultimately led to their decline. In the long run, these processes resulted in the widening of institutional differences between China and Western Europe, which persist, in some measure, to this day.

5 Empirical Evidence

In this section we provide empirical evidence to further show that our model fits the data. In particular, using a cross section of countries, we show that the quality of market-supporting institutions is positively correlated with the relative productivity in the market (λ in our model), and with historical levels of individualism (θ_0 in the model). Next, we use ethnic-level data and show that the relative productivity in the market is positively associated with both historical levels of individualism and historical institutions, and is negatively correlated with the historical existence of clans.

5.1 Empirical Model

We estimate the association between the quality of market-supporting institutions as a dependent variable, and both the relative productivity in the market and the historical levels of individualism as explanatory variables, using the linear probability model. In particular, we estimate the following model using ordinary least squares (OLS):

$$\text{Inst}_i = \beta_0 + \beta_1 \lambda_i + \beta_2 \theta_{0,i} + \Sigma_j \gamma_j Z_{i,j} + \gamma_r \delta_{r,i} + \epsilon_i \tag{16}$$

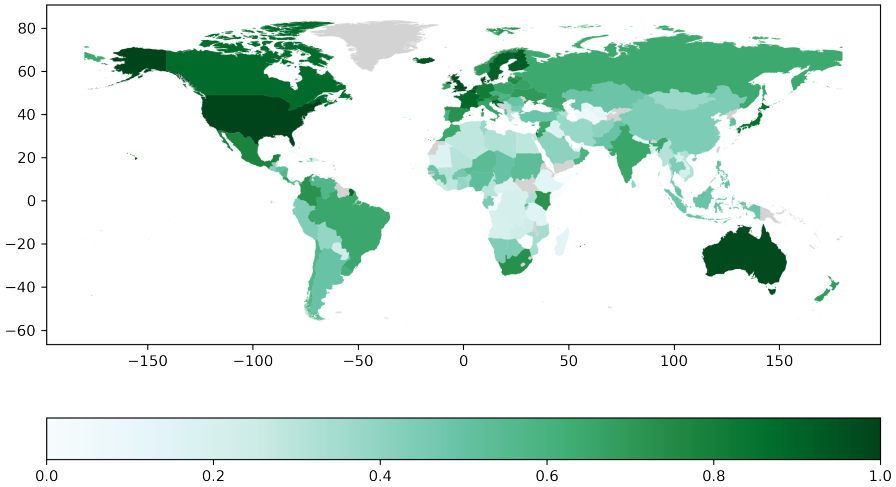
where Inst_i is the quality of market-supporting institutions in country i, λ_i is the the relative productivity in the market, $\{Z_{i,j}\}$ is a set of potentially confounding effects in country i, $\delta_{r,i}$ is a set of regional fixed effects, and ϵ_i is a country-specific error term.

5.1.1 Main Dependent Variables: The Quality of Market-Supporting Institutions

Data on institutional quality is taken from the Institutional Profile Database (IPD). This database covers a wide range of institutions reflecting the quality of governance and the degree of state intervention. All in all, the IPD provides data on numerous indicators for the years 2001, 2006, 2009, 2012 and 2016, ranging from 18 indicators for 51 countries in 2001, to 125 indicators for 144 countries in 2016.[22] Since the questionnaire, on the basis of which the indicators are calculated, has changed over the years, comparison of institutional quality of different years is somewhat difficult.

[22] See Bertho (2013) for more details on this database.

Figure 5: Security of Transactions and Contracts



This figure presents the global variation in the quality of market-supporting institutions, as measured by the security of transactions and contracts in the goods and services market. Darker colors present high institutional quality. Countries coloured grey have missing data. Source: IPD (See details above).

For this reason, we focus on the last year available, 2016, which allows us to have a large sample of countries and institutions.[23]

The indicators of the IPD are divided into different sectors: public institutions and civil society; institutions in the markets of goods and services; institutions in the capital markets; and institutions in the labor market and social relations. Institutions are ranked from 0 (weak) to 4 (strong).[24] In addition, the indicators are divided by the IPD into groups based on their functions: Political institutions; Security, law and order, control of violence; Functioning of public administration; Free operation of markets; Coordination of stakeholders, strategic vision and innovation; Security of Transactions and contracts; Market regulation, social dialogue; Openness; and Social cohesion and social mobility. For each sector-function pair, we aggregate institutional quality by calculating the mean level of institutions in this pair. In total, we have 26 aggregated measures of institutional quality.[25] Some are strictly market-oriented, such as security of transactions and contracts in the goods and services markets, while other are strictly not market oriented, such as civil liberties and freedoms. Other measures are somewhat oriented to support markets, albeit not necessarily directly. Table C.1 provides data on our aggregated institutional quality data, and Figure 5 provides a map of the quality of the one type of institutions that seems to be most related to our research question: the security of transactions and contracts in the goods and services markets.

[23]For robustness, we show that our results hold also for other years.

[24]For some of the indicators we had to reverse the order to be coherent with other indicators, which belong to the same pair.

[25]Some of the possible pairs do not have indicators in them.

5.1.2 Main Explanatory Variables: Proxies for Historical λ and θ_0

A Proxy for Historical λ Our theory suggests that regions that were more suitable for independent work became more individualistic and developed better market-supporting institutions. What makes a region more suitable for independent work? Empirical evidence has already provided several potential factors, which seem to have generated a more collectivistic culture.[26] One important factor is the suitability of the region for wheat cultivation rather than for the cultivation of rice. Indeed, *The Rice Theory* (Talhelm et al.; 2014) argues that societies that cultivated rice became more collectivistic than societies that cultivated wheat. This is based on two reasons: First, rice cultivation necessitates the construction and maintenance of irrigation networks, which requires extensive cooperation and thus renders individuals interdependent. Second, rice cultivation requires an extraordinary amount of work, which in turn induces cooperation and leads to collectivism.[27].

Our measure is based on the suitability for rice and wheat cultivation, calculated as the potential yield in calories of growing either (Galor and Özak; 2016, 2015; Galor et al.; 2016). The estimates of potential crop yield (measured in tons, per hectare, per year) for each $5' \times 5'$ cell in a global grid (i.e., approximately 100 square kilometers), are provided by FAO. These measures are based on agro-climatic estimates, under a low level of inputs and rain-fed agriculture, capturing conditions that prevailed in early stages of development.[28] The conversion of these crop yields into caloric yield (measured in millions of kilo calories, per hectare, per year), produces comparable estimates of crop yields for all wheat and rice crops.[29] For each region (either a country or the homeland of a historical ethnicity), we calculate the mean crop yield for each of the four types of wheat and two types of rice, and then the difference between the maximum caloric yield among the four types of wheat and the maximum caloric yield among the two types of rice. When we analyze country-level data, we use the migration matrix from Putterman and Weil (2010), and adjust the value of each country to its ancestral origins. That is, the values of the difference between the potential yield of wheat and rice are calculated for the people who reside in the country, and not based on the geography of the country itself (because, as Putterman and Weil (2010) note, people bring their culture with them as they migrate). Figure 6 presents the global distribution of the measure of wheat-rice suitability difference, ancestry adjusted.

Historical Individualism Our model predicts that historical levels of individualism, θ_0, should affect current levels of individualism independently of the relative productivity in the market. Thus, to test the model, we need a proxy for historical individualism. To this end, we use the Kinship Intensity Index (KII) data from Schulz et al. (2019). The rationale for using it is that cohesive kinship-based groups foster collectivism, because they reward conformity and discourage

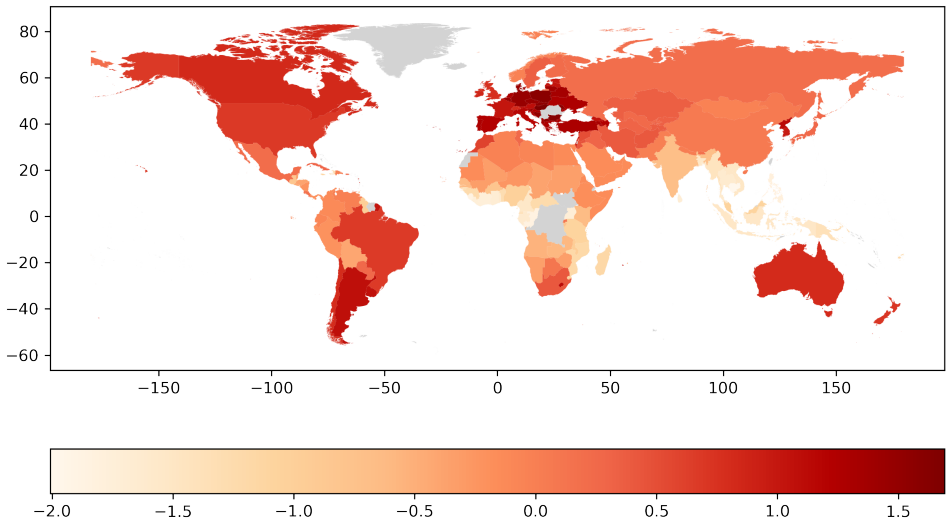
[26] These include rainfall variation (Davis; 2012), the prevalence of infectious diseases (Nikolaev and Salahodjaev; 2016), the time passed since the Neolithic Revolution (Olsson and Paik; 2016) and the usage of irrigation (Buggle; 2020).

[27] Boserup (1965), for instance, estimated that the hours required for rice cultivation are thrice as much as those required for wheat cultivation.

[28] For each crop, GAEZ provides estimates for crop yield based on three alternative levels of inputs – high, medium, and low - and two possible sources of water supply – rain-fed and irrigation. Moreover, for each input-water source category, it provides two separate estimates for crop yield, based on agro-climatic conditions, which are arguably unaffected by human intervention, and agro-ecological constraints, which could potentially reflect human intervention. The FAO dataset provides for each cell in the agro-climatic grid the potential yield for each crop. These estimates account for the effect of temperature and moisture on the growth of the crop, the impact of pests, diseases and weeds on the yield, as well as climatic related `workability constraints". In addition, each cell provides estimates of the growth cycle for each crop, capturing the days elapsed from planting to harvesting.

[29] The crops we use are buckwheat, spring wheat, winter wheat, wheat, dryland rice and wetland rice. The caloric content of each crop is based on estimates of the United States Department of Agriculture Nutrient Database for Standard Reference.

Figure 6: Wheat-rice suitability difference (Ancestry Adjusted)



This figure presents the global variation of wheat rice suitability. Darker (lighter) colors imply high wheat (rice) suitability relative to rice (wheat). Countries coloured grey have missing data. Source: authors calculations based on data from the FAO-GAEZ (See details above).

independence and self-expression (Schulz et al.; 2019; Henrich; 2020). Hence, looser kinship ties should be associated with higher levels of historical individualism. The KII is based on different variables in the Ethnographic Atlas (Murdock; 1967, EA henceforth), shedding light on the intensity of kinship ties in each ethnicity.[30] We use the country-level data of KII from Schulz et al. (2019), who map the KII index from the EA to countries using the common methodologies used in the literature (see, for instance, Alesina et al. (2013)).

5.1.3 Baseline Controls

To isolate the effect of λ from other geographic, historical and ethnic characteristics, we control for a variety of potential confounding variables, which may have affected the quality of contemporary market-supporting institutions. Specifically, we control for a large set of geographic characteristics, which include the country's mean elevation and mean ruggedness, mean precipitation, and the distance of the country's centroid from the equator. These may have affected the potential for historical agriculture, which, in turn, may have had an effect on the emergence of historical individualism, and thus on contemporary individualism and institutions.[31] We also use the total length of the coast and the centroid's distance from the coast or from a major river, as these may

[30] Specifically, the measure is based on five variables in the EA, which stand for five characteristics of kinship: Cousin marriage preference (variable v26 in the EA), the existence of polygamy (variable v9 in the EA), co-residence of extended families (variables v8 and v12 in the EA), lineage organizations (variable v43 in the EA), and community organization (variable v15 in the EA). See the Supplementary Material of Schulz et al. (2019) for more details on the construction of the Kinship Intensity Index.

[31] Moreover, the emergence of agriculture have been also associated with the formation of market-supporting institutions, such as institutions protecting property rights. See Bowles and Choi (2019).

have affected the potential for trade (Henderson et al.; 2018), which was considered an individualistic occupation in ancient times (Roland; 2020).[32]

Moreover, we control for various ethnographic characteristics, which may have affected the formation of market-supporting institutions. These include settlement type, political complexity, the mean size of the local community, and agricultural intensity (all measured as ancestry-adjusted from the EA). We also use a set of historical controls, including the years elapsed since the Neolithic Revolution, state antiquity (from Putterman (2007)) and colonial history. Table C.2 provides the descriptive statistics of the variables we use.

5.1.4 Addressing Endogeneity

While in this section of the study we do not attempt to identify causality, we should stress that our proxy for λ, the wheat-rice suitability difference, does not measure the actual cultivation of wheat and rice, but the potential to cultivate them. As such, it is independent of any human intervention, and thus immune to reverse causality problems. Hence, it could potentially be an instrumental variable in an IV strategy. Nonetheless, there are different channels through which λ shapes contemporary institutions. These include the effect of λ on historical individualism (θ_0), contemporary individualism (either directly or indirectly via historical individualism) and a direct effect on contemporary institutions. Therefore, we think that any proxy for λ would fail to meet the exclusion restriction. While all these channels are consistent with our model, they bar us from using the IV approach. Instead, we may interpret our results as a reduced form, which shows the overall effect of λ on contemporary institutions, through the aforementioned channels.

Furthermore, we use historical and ethnic-level data to show that the mechanism described in our model is indeed consistent with the data. In addition, we run some robustness tests, using indicators from different years in the IPD and other institutional data from the Fraser Institute (2020). Finally, we check whether the results are robust to spatial auto-correlation.

Another procedure we use to show that our model fits the data is a Placebo test we run on the different measures of institutions from the IPD. In particular, we classify the different measures of institutions into two groups: those that are more market-oriented, and other institutions that seem less related to markets. Then we run our baseline model, where in each regression we use a different measure of institutions as the dependent variable. We show that, in general, market-supporting institutions are correlated with the Kinship Intensity Index, whereas other institutions are less likely to correlate with it.

5.2 Results

5.2.1 Country-Level Results

Table 1 presents our main results. The dependent variable in all columns is the level of security of transactions and contracts in the market of goods and services. As can be seen in Column (1), the unconditional correlation between the wheat-rice suitability, and the dependent variable is positive, and economically and statistically significant at the 1% level. The coefficient in column (1) suggests that a one-standard deviation increase in wheat-rice suitability difference increases the security of transactions and contracts in the market of goods and services by 0.29 (in a scale of 0 to 4). At the

[32]Specifically, we calculate the great circle distance of each unit (country or ethnicity) to the coast or to a major river (we take the minimum of the two). Data on rivers are from Natural Earth (2012), and major rivers are defined as in the scale between 1 to 7 (out of 11).

same time, the coefficient of the KII is, as expected, negative and statistically and economically significant, suggesting that a one standard deviation increase in the KII is associated with 0.21 decline in the security of transactions and contracts in the markets for goods and services. Moreover, adding regional fixed-effects (in column (2)) and the geographical controls, which may have affected the suitability to cultivate either rice or wheat does not substantially change the results (column (3)). Next, in columns (4) and (5) we add the ethnic characteristics of each country's forefathers, and the country's historical controls, and, importantly, the colonial history of the country, as those might have affected the formation of institutions. Yet, the coefficient of wheat-rice suitability difference changes only slightly, and remains statistically significant at the 1%, while the coefficient of KII is statistically significant at the 5%, and exhibits a substantial economic effect.[33]

Table 1: Wheat-Rice Suitability and Security of Transactions and Contracts

	Security of Transactions and Contracts				
	(1)	(2)	(3)	(4)	(5)
Wheat-rice suitability	0.29***	0.15**	0.19**	0.19**	0.21***
	(0.04)	(0.07)	(0.09)	(0.08)	(0.08)
Kinship intensity index	-0.21***	-0.31***	-0.29***	-0.29***	-0.28***
	(0.04)	(0.07)	(0.07)	(0.08)	(0.08)
Regional FE	No	Yes	Yes	Yes	Yes
Geographical controls	No	No	Yes	Yes	Yes
Ethnic controls	No	No	No	Yes	Yes
Historic controls	No	No	No	No	Yes
Adjusted-R^2	0.42	0.52	0.55	0.61	0.62
Observations	118	118	118	118	118

Notes: This table establishes the robust and significant effect of the historical relative productivity in the market on the quality of contemporary market-supporting institutions. Specifically, the analysis shows that an increase of one standard deviation in wheat-rice suitability is associated with an increase of 0.25 points in the quality of institutions. The analysis is robust to controlling for regional fixed effects, geographical controls (absolute latitude, mean elevation, mean ruggedness, mean precipitation, total coast length, mean crop CSI, mean precipitation), ethnic controls (mean size of historical community, type of historical settlement, agricultural dependence, and number of jurisdictional levels beyond the local level), and historical controls(years since the neolithic revolution, colonial history, state antiquity). Data on institutions are taken from the IPD; Data on wheat-rice suitability difference are based on FAO-GAEZ data, and the kinship intensity index is from Schulz et al. (2019). Heteroskedasticity robust standard error estimates are reported in parentheses; *** denotes statistical significance at the 1% level, ** at the 5% level, and * at the 10% level, all for two-sided hypothesis tests; All regressions include a constant.

5.2.2 Robustness

We run several robustness checks. First, given the fact that we use data only on the quality of institutions in 2016, we show that our results are robust also for using data from 2012. Table C.5 shows that the results are hardly affected by using institutional data from this year. Second, it might be that the institutional data used in the previous analysis includes measurement errors, which bias our results. To overcome this problem, we replicate Table 1, but this time we use data on institutional quality from Fraser Institute (2020). Specifically, we use data on Legal System and Property Rights, which is Fraser's equivalent of the Security of Transactions and Contracts in the IPD. The results are presented in Table C.6. As can be seen in this table, the results are

[33]Table C.4 replicates Table 1 while listing all the controls used.

qualitatively similar to the ones we reported in Table 1. Namely, the correlation between the quality of market-supporting institutions and wheat-rice suitability difference is positive and statistically and economically significant, while the correlation between the former and KII is negative, and statistically and economically significant.

Next, a typical potential concern with a spatial analysis like the one we perform here is that some of the variables might be spatially autocorrelated. This implies that the correlation we find might merely stem from geographic proximity and not from economic reasons. To overcome this problem, we correct the standard errors using the methodology of Conley (1999). The results are presented in Table C.7, indicating that our results are robust to spatial autocorrelation. Nevertheless, Furthermore, following Kelly (2020) , we perform Monte Carlo simulations with 5000 repetitions, where in each we generate spatially autocorrelated white noise, and show that white noise cannot explain our dependent variables.

5.2.3 Market-Supporting Institutions and Other Institutions

Table 1 indicates that our model fits the data. However, the IPD database includes twenty six different aggregated indicators for institutional quality, whereas the table presents results for only one of them. Could the quality of institutions that are not related to markets be also explained by wheat-rice suitability? Alternatively, could these differences in suitability fail to explain the differences in other market-supporting institutions?

To answer these questions, we divide the twenty six indicators into two groups: thirteen indicators of market-supporting institutions and thirteen indicators of other institutions, which are not directly related to markets.[34] We run the baseline model with the full specification and all controls (Column (5) in Table 1), where in each regression we use a different indicator as the dependent variable. The results of this Placebo test are presented in Figure 7: panel (A) presents the coefficients of KII, and panel (B) presents the coefficients of wheat-rice suitability difference. In both sub-figures, market-supporting institutions are on the left and colored red, whereas the other institutions are on the right and colored blue. The dot in each regression represents the coefficient size of the explanatory variable, and the lines represent the confidence intervals (at the 5% level).

As can be seen in panel (A), the coefficients in all the regressions of market-supporting institutions are negative, as our theory suggests. Moreover, nine of them are statistically significant at the 5% level,[35] while only three are not statistically significant.[36] Interestingly, the finding that countries whose ancestors were more individualistic (and hence are more individualistic today) are characterized by lower levels of corruption, provides empirical evidence in support of Tanzi (1994), who argued theoretically that individualistic societies are predicted to be less corrupt. Furthermore, the coefficient of social mobility in the labor market is significant at the 8% (the last red coefficient). Its statistical significance, despite being marginal, is consistent with the findings of Leonard and Smith (2021), who show that more individualistic societies are characterized by higher social mobility. Similar to the market-supporting institutions, the other institutions have negative

[34] Table C.1 presents the descriptive statistics of these two groups of institutions.

[35] These indicators include the Security of transactions and contracts with political institutions, in the markets of goods and services, in the financial markets and in the labor market; The free operation of the markets for goods and services and in the labor market; Market operation and social dialogue in the markets for goods and services; Labor market regulation; and Functioning of political institutions (which implies the lack of corruption, transparency of economic activity of the public sector and other market-supporting features).

[36] These include the Functioning of public administrations in the markets of goods and services, Technological environment of firms, and Trade liberalization.

coefficients as well. However, only five are statistically significant, whereas the other eight are not.[37]

Panel B presents the coefficients of wheat-rice suitability for the same exercise. Consistent with our theory, all but two market-supporting institutions have positive coefficients, whereas the two negative ones are not statistically significant.[38] Moreover, as can be seen in the figure, seven indicators of market-supporting institutions are not only positive but also statistically significant, and the rest are not significant.[39] Among the other institutions, most of the coefficients are positive, but four.[40] Among the positive coefficients, only five are statistically significant.[41]

While our division is dichotomous, reality, of course, is more complex: Institutions may support markets in different ways, some of which may be indirect. Among the institutions that are not directly related to markets, the Political Institutions indicator is negatively correlated with KII, and it is positively correlated with wheat-rice suitability (the latter coefficient is marginally significant). This indicator measures the functioning of democratic institutions: the freedom of elections at the national level, freedom of information, the existence of functioning opposition, etc. Clearly, this indicator is not directly related to markets, but it might affect their efficiency by reducing uncertainty.[42] Moreover, given the fact that some political, non-market-supporting, institutions come hand-in-hand with market-supporting institutions, our task of identifying the effect of historical levels of individualism on institutions is even more intricate. Hence, one should not look at the results presented above as a claim for causality, but rather as supporting evidence that our model is consistent with the data.

5.2.4 A Possible Mechanism

In this subsection we provide empirical evidence that, in line with our model, the historical relative productivity in the market shaped historical social organizations of markets and clans, historical individualism and historical institutions. In particular, we use data at the ethnicity level, and show that the wheat-rice suitability difference is negatively correlated with the historical existence of clans, and positively correlated with historical levels of individualism and historical institutions.

To this end, we first need to construct a measure of wheat-rice suitability difference at the ethnicity level. We thus merge the EA with The *Ethnologue* (Lewis et al.; 2009), which provides the current homelands of all languages spoken today. With a region of residence of each ethnicity in the EA, we calculate the wheat-rice suitability difference using the same methodology described above. We also calculate all other geographical characteristics for these homelands. Table C.3 presents the descriptive statistics of the variables we use at the ethnicity level analysis.

[37] The significant ones are Political institutions; Free financial markets operation (which measures the independence of the central bank and the size of the private sector in the financial markets); Capital liberalization; Political institutions in the labor market; and Labor market social dialogue.

[38] These two indicators are Trade openness and Labor market openness.

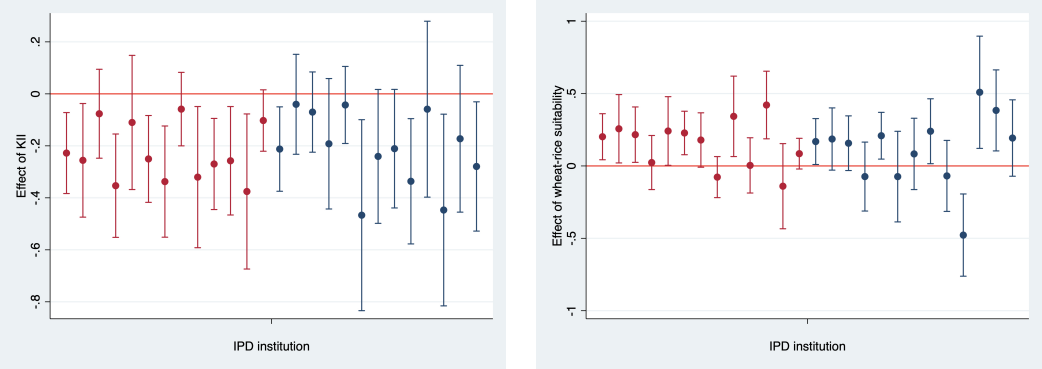
[39] The significant ones are Security of transactions and contracts with political institutions, in the markets of goods and services, in the financial markets and in the labor market; Functioning of political institutions (which implies the lack of corruption, transparency of economic activity of the public sector and other market-supporting features); Functioning of public administrations in the markets of goods and services; and Technological environment of firms. The insignificant coefficients are of the following indicators: Free operations of the markets of goods and services, and the labor market; Market regulations, social dialogue (which is marginally significant at the 6%), Trade liberalization; Labor market openness; and Social cohesion and social mobility, which, like in the case of KII, is marginally significant.

[40] The following ones are negative: Freedom of movement of persons and information; Free financial markets operation; Openness of the financial markets; and Importance of micro-finance, which is also (negatively) statistically significant.

[41] These are Political institutions; Social cohesion and social mobility (political institutions); Financial market regulation; Political institutions in the labor market; and Labor market social dialogue.

[42] Indeed, Nikolaev and Salahodjaev (2017); Henrich (2020); Gorodnichenko and Roland (2021) provide evidence that more individualistic societies form more democratic institutions.

Figure 7: Individualism and Institution Quality



(A) (B)

The figures display the coefficients of KII (Panel A) and wheat-rice suitability difference (Panel B) resulting from running the full specification in equation (16) with all controls, using a different measure of institutions from the IPD. Market-supporting institutions are on the left of each panel and marked red, and other institutions are on the right of each panel and marked blue. As can be seen, both of the explanatory variables are more correlated with market-supporting institutions than the other institutions.

To construct different measures of the prevalence of clans, historical individualism and historical political complexity, we use data from the Ethnographic Atlas (Murdock; 1967, EA) and the Standard Cross-Cultural Sample (Murdock and White; 1969, SCCS).

We first show that wheat-rice suitability is negatively correlated with our main proxy for historical individualism: the KII (this time at the ethnicity level). To construct the KII at the ethnicity level, we follow Schulz et al. (2019). A second measure of historical individualism captures whether a given society tended to educate its offspring for competitiveness. We construct this measure by creating a dummy variable, which receives the value 1 if competitive inclination is at least moderate either for boys or girls (variables 302-305 in the SCCS). Our third and last proxy for historical individualism is how intensively a given ethnicity relied on trade, as trade is considered an individualistic occupation (Roland; 2020). To do so, we create a dummy variable that receives the value 1 if at least 10% of the food of the ethnicity is imported (variable 1 in the SCCS).[43]

As for the importance of clans, we proxy it using data on the prevalence of "unilineal cousin marriage", which implies that it is allowed to marry cousins only from one side of the family tree (variable 23 in the EA). Such norms are associated with the salience of kinship ties (Roland; 2020).

Finally, to get a proxy for historical institutions, we measure political complexity by the number of jurisdictional levels beyond the local community (variable 33 in the EA), as political complexity may serve as evidence for the historical existence of formal institutions.

Table 2 details the results of all these tests. Column (1) shows a negative correlation between wheat-rice suitability and the Kinship Intensity Index, implying that historical ethnicities that resided in regions with a higher wheat-rice suitability had weaker kinship ties. In column (4) we show a negative association between wheat-rice suitability difference and unilineal cousin marriages. In both cases, the association is statistically and economically significant. These two columns are consistent with the prediction of the model, which suggests that a higher λ is associated with individualism and with smaller clans.

Next, the table suggests that a higher λ is associated with higher levels of historical individualism.

[43] The 10% threshold divides the sample into two groups, with relative size of 2/3 and 1/3 of the sample.

This can be seen in columns (2)-(3), where wheat-rice suitability difference is positively associated with the tendency of ethnicities to educate their offspring to competitiveness (column (2)) and with reliance of the ethnicity on trade (column (3)), which is hypothesized to be an individualistic occupation (Roland; 2020). Finally, column (5) shows that a higher λ is associated with more complex political institutions. More specifically, it shows that wheat-rice suitability difference is positively correlated with the number of jurisdictional levels beyond the local community.

Table 2: Wheat-rice suitability difference, Historical Norms and Social Structure

	Dependent Variable				
	KII	Competiti -veness inclination	Trade	Unilineal cousin marriage	Political Complexity
	(1)	(2)	(3)	(4)	(5)
Wheat-rice suitability	-0.06**	0.11*	0.18***	-0.04***	0.11**
	(0.03)	(0.07)	(0.05)	(0.01)	(0.05)
All Geographic Controls	Yes	Yes	Yes	Yes	Yes
Regional FE	Yes	Yes	Yes	Yes	Yes
Mean dep. variable	0.07	0.61	0.67	0.07	1.91
Adjusted-R^2	0.26	0.15	0.24	0.05	0.27
Observations	1062	111	167	857	940

Notes: This table presents a robust and significant associations between the historical relative productivity in the market and historical societal characteristics, which fit our model. Specifically, the table shows that societies, which resided in regions that were more suitable for cultivating wheat than rice, and therefore, were more individualistic, had less intense kinship (column 1), were more inclined to educate their offspring for competitiveness (column 2), worked more in trade (column 3), allowed less unilineal cousin marriages (column 4), and developed more complex institutions (column 6). The analysis includes regional fixed effects and geographical controls (distance from the equator, mean ruggedness, total length of coast, distance from the coast, distance from a major river), mean precipitation, mean temperature, and agricultural suitability. Heteroskedasticity robust standard error estimates are reported in parentheses; *** denotes statistical significance at the 1% level, ** at the 5% level, and * at the 10% level, all for two-sided hypothesis tests; All regressions include a constant.

6 Conclusions

In this study we developed a theoretical framework to analyze the relationship between IC and market-supporting institutions, a relationship that is well observed in the data. Unlike previous studies, which focused on a causal effect of a single factor on another, we postulated that the positive correlation between individualism and institutional quality stems from their interaction and coevolution. What sets the society's dynamic trajectory and determines its ultimate position are the initial cultural conditions. Our model thus demonstrated that distinct societies may converge to the same steady state, while relatively similar societies may end up in different ones. Using contemporary institutional data and historical proxies for individualism and relative productivity in the market, we showed that the model fits the data.

The main outcome of our analysis is the existence of two distinct types of societies, corresponding to the two stable steady states: the individualistic one and its collectivistic counterpart. Western Europe, characterized by individualistic culture and well-functioning market-supporting institutions, is the epitome of the individualistic steady state. China, on the other hand, is characterized by a collectivistic culture and institutions that are far less market-supporting, and it thus represents

the collectivistic steady state. In our historical survey, we demonstrated that these contemporary differences have their roots in the distant past. More specifically, we showed how the consolidation of collectivism in China and individualism in Europe gave rise to the emergence of distinct social organizations, which resulted in growing institutional divergence between the two regions. In the process, initial differences were amplified due to the interplay between culture and institutions, leading China and Europe in distinct trajectories.

Our study offers many potential avenues for future research. On the theoretical side, one may incorporate the state as a distinct economic agent, and analyze its effect on the coevolution of culture and institutions. Such an analysis may be particularly insightful in the context of the early modern period, when, in Europe, centralized states with efficient bureaucracies began to emerge. Another research direction is to link the dynamic processes studied in our model to long-run economic growth. Empirical evidence, which we briefly surveyed earlier, indicates that individualistic societies tend to be more developed. However, it remains unclear whether individualism affects economic development directly, or indirectly, via institutions. Applying our theoretical framework, in which both culture and institutions are endogenously determined, to study economic growth, may shed a new light on the forces at work.

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1.1

A Proofs

A.1 Proof of Proposition 1

Part (i)

By 1 and 3, the utility of an individual i who settles in the market when all other individuals settle there, is:

$$U^{i,\mathcal{M}}_{|\mathcal{C}|=0} = \lambda X a^i \tag{A.1}$$

By 2 and 3, the utility of an individual i who settles in the clan when all other individuals settle in the market, is:

$$U^{i,\mathcal{C}}_{|\mathcal{C}|=0} = \lim_{|\mathcal{C}|\to 0} \frac{\int_{j\in\mathcal{C}} a^j dj}{|\mathcal{C}|} = a^i \tag{A.2}$$

Then, if $U^{i,\mathcal{M}}_{|\mathcal{C}|=0} \geq U^{i,\mathcal{C}}_{|\mathcal{C}|=0}$, i.e., if $X \geq \frac{1}{\lambda}$, there is no profitable deviation to the clan, and $|\mathcal{C}| = 0$ is an equilibrium outcome of the game.

Part (ii)

By 1 and 3, it holds that:

$$\frac{\partial U^{i,\mathcal{M}}}{\partial a^i} = \lambda X \geq 0 \tag{A.3}$$

That is, $U^{i,\mathcal{M}} \geq U^{j,\mathcal{M}}$ if and only if $a^i \geq a^j$. It follows that if, given that $|\mathcal{C}| = 1$, the most talented individual, $i : a^i = 1$, has no profitable deviation to the market, other individuals do not have it either. Hence, $|\mathcal{C}| = 1$ is an equilibrium outcome of the game if $U^{i,\mathcal{C}}_{|\mathcal{C}|=1} \geq U^{i,\mathcal{M}}_{|\mathcal{C}|=1}$ for $i : a^i = 1$.

By 1 and 3, the utility of an individual $i : a^i = 1$ who settles in the market when all other individuals settle in the clan, is:

$$U^{i,\mathcal{M}}_{|\mathcal{C}|=1} = \lambda X \tag{A.4}$$

By 2 and 3, the utility of any individual i who settles in the clan when all other individuals settle there, is:

$$U^{i,\mathcal{C}}_{|\mathcal{C}|=1} = 0.5 + (1-\theta) \tag{A.5}$$

Thus, if $X \leq \frac{1.5-\theta}{\lambda}$, $|\mathcal{C}| = 1$ is an equilibrium outcome of the game. ■

A.2 Proof of Lemma 1

In the interior equilibrium, there exists an individual k who settles in the market and satisfies $U^{k,\mathcal{C}} < U^{k,\mathcal{M}}$, and an individual j who settles in the clan and satisfies $U^{j,\mathcal{C}} > U^{j,\mathcal{M}}$.

Since individuals are continuously distributed over ability, and differ only in their abilities, there must exist an individual $i : a^k > a^i > a^j$ who is indifferent between the clan and the market and satisfies $U^{i,\mathcal{C}} = U^{i,\mathcal{M}}$. ■

A.3 Proof of Proposition 2

Let $U^{i,\mathcal{C}} = U^{i,\mathcal{M}}$, i.e., $a^i = a^*$. Recall that for any two individuals j and k who satisfy $a^k > a^i > a^j$, it holds that $U^{k,\mathcal{C}} = U^{i,\mathcal{C}} = U^{j,\mathcal{C}}$ and $U^{k,\mathcal{M}} > U^{i,\mathcal{M}} > U^{j,\mathcal{M}}$. It follows that $U^{k,\mathcal{C}} < U^{k,\mathcal{M}}$ and individual k settles in the market, while $U^{j,\mathcal{C}} > U^{j,\mathcal{M}}$ and individual j settles in the clan. ■

A.4 Proof of Proposition 3

Part (i)

Suppose by contradiction that an equilibrium in which $|\mathcal{C}| = 0$ exists. By 1, 3 and 9, the utility of an individual i who settles in the market when all other individuals settle there, is:

$$U^{i,\mathcal{M}}_{|\mathcal{C}|=0} = \lambda\sqrt{\tau}a^i - \tau \tag{A.6}$$

Recall that the utility of an individual i who settles in the clan when all other individuals settle in the market, is $U^{i,\mathcal{C}}_{|\mathcal{C}|=0} = a^i$. It follows that all individuals whose abilities are in $[0, \frac{\tau}{\lambda\sqrt{\tau}-1}]$ would be better off if they deviate to the clan. Thus, an equilibrium in which $|\mathcal{C}| = 0$ does not exist.

Part (ii)

By 1, 3 and 9, the utility of an individual i who settles in the market when all other individuals settle in the clan, is:

$$U^{i,\mathcal{M}}_{|\mathcal{C}|=1} = -\tau \tag{A.7}$$

Recall that the utility of an individual i who settles in the clan when all other individuals settle there, is $U^{i,\mathcal{C}}_{|\mathcal{C}|=1} = 1.5 - \theta$. Since $U^{i,\mathcal{C}}_{|\mathcal{C}|=1} > U^{i,\mathcal{M}}_{|\mathcal{C}|=1}$, an equilibrium in which $|\mathcal{C}| = 1$ exists for any θ. ■

A.5 Obtaining the interior equilibria in Subsection 3.1.4

Solving Equation 10 for a^*, we obtain two solutions, which are given by:

$$\begin{cases} a^*_L = \frac{2\lambda\tau - \sqrt{\tau} - \sqrt{-\tau(-16\lambda\sqrt{\tau}\theta - 4\lambda^2\tau + 16\lambda\tau^{1.5} + 20\lambda\sqrt{\tau} - 1)}}{4\lambda\tau} \\ a^*_H = \frac{2\lambda\tau - \sqrt{\tau} + \sqrt{-\tau(-16\lambda\sqrt{\tau}\theta - 4\lambda^2\tau + 16\lambda\tau^{1.5} + 20\lambda\sqrt{\tau} - 1)}}{4\lambda\tau} \end{cases} \tag{A.8}$$

In Lemma 2 we show that a^*_L is robust to deviations of small groups, whereas a^*_H is not. Hence, in what follows, we focus only on a^*_L. Differentiating a^*_L with respect to the parameters, θ, λ and τ, we get that:

$$\text{sign}\left(\frac{\partial a^*_L}{\partial \theta}\right) = \text{sign}\left(\frac{\partial a^*_L}{\partial \lambda}\right) = -1 \tag{A.9}$$

while the relationship between a^*_L and τ is U-shaped.

The interior equilibrium, a^*_L, exits if and only if $\theta > \tilde{\theta}$, where $\tilde{\theta}$ is given by:

$$\tilde{\theta} = \frac{16\lambda\tau^{1.5} + 20\lambda\sqrt{\tau} - 4\lambda^2\tau - 1}{16\lambda\sqrt{\tau}} \tag{A.10}$$

Differentiating a^*_L with respect to the parameters, λ and τ, we get that:

$$\frac{\partial \tilde{\theta}}{\partial \lambda} < 0 \tag{A.11}$$

while the relationship between $\tilde{\theta}$ and τ is U-shaped. ■

A.6 Proof of Lemma 2

We define a function $\Delta^{\mathcal{C}}(|\mathcal{C}|) = 0.5|\mathcal{C}| + 1 - \theta - \lambda\sqrt{\tau}(1 - |\mathcal{C}|)|\mathcal{C}| + \tau$ that captures the change in the utility of the pivotal individual (whose ability equals $|\mathcal{C}|$) if he moves from the market to the clan. The function is continuous and twice differentiable in $[0, 1]$. When $\theta > \tilde{\theta}$, the function has two x-intercepts, a_L^* and a_H^*, which are given by A.8. It also has a single minimum point, denoted by $a^{min} = 0.5 + \frac{1}{4\lambda\sqrt{\tau}}$, which is the midpoint between a_L^* and a_H^*. $\Delta^{\mathcal{C}}(|\mathcal{C}|)$ is thus an opening-up parabola.

Characterizing the function $\Delta^{\mathcal{C}}(|\mathcal{C}|)$ will help us consider cases in which a small group of individuals deviates from the equilibrium. In each case, we will check whether the deviation makes any individual in the deviating group worse off. If this is the case, we will conclude that such a group will not deviate from the equilibrium. To prove that an equilibrium is robust to deviations of small groups, we thus have to show that there is no (small) group of individuals who may profitably deviate from this equilibrium. On the other hand, to prove that an equilibrium is not robust to deviations of small groups, it is sufficient to show that there exists a deviating group in which no individual loses utility as a result of the deviation (and some strictly gain from the deviation).

In what follows, we consider each equilibrium in turn, beginning with a_L^*.

Part (i): $|\mathcal{C}| = a_L^*$

We begin by considering deviations "to the right" of a_L^*, i.e., where the deviating group moves from the market to the clan. Let a_L^* be the equilibrium of the game, and suppose that a small group, which is composed of all individuals whose abilities are in $[a_L^*, \bar{a}]$, deviates from the equilibrium and settles in the clan. Suppose further that the group is sufficiently small, such that $\bar{a} < a_H^*$. In such a case, for individual $i : a^i = \bar{a}$, it holds that:

$$U^{i,\mathcal{C}}_{|\mathcal{C}|=\bar{a}} = 0.5\bar{a} + 1 - \theta \tag{A.12}$$

and

$$U^{i,\mathcal{M}}_{|\mathcal{C}|=\bar{a}} = \lambda\sqrt{\tau}(1 - \bar{a})\bar{a} - \tau \tag{A.13}$$

Since $\bar{a} \in [a_L^*, a_H^*]$, and given the properties of $\Delta^{\mathcal{C}}(|\mathcal{C}|)$, it holds that $U^{i,\mathcal{M}}_{|\mathcal{C}|=\bar{a}} > U^{i,\mathcal{C}}_{|\mathcal{C}|=\bar{a}}$. The deviation thus makes individual $i : a^i = \bar{a}$ worse off, which indicates that this group will not deviate to the clan.

Now suppose that a small group of the same size, which is composed of all individuals whose abilities are in $[\underline{a}, \bar{a}]$, deviates from the equilibrium and settles in the clan. Let p denote the size of this group, i.e., $p = \bar{a} - \underline{a}$. We saw that any group of size p with $\underline{a} = a_L^*$ would not deviate to the

clan. Now we hold p constant, and check what happens to the utility of individual $i : a^i = \bar{a}$ as we increase $\underline{a}$ above a_L^*. For individual $i : a^i = \bar{a}$, it holds that:

$$U^{i,\mathcal{C}} = \frac{0.5{a_L^*}^2 + 0.5(\bar{a} - \underline{a})(\bar{a} + \underline{a})}{a_L^* + \bar{a} - \underline{a}} + 1 - \theta = \frac{{a_L^*}^2 + p(2\bar{a} - p)}{2(a_L^* + p)} + 1 - \theta \tag{A.14}$$

and

$$U^{i,\mathcal{M}} = \lambda\sqrt{\tau}(1 - a_L^* - p)\bar{a} - \tau \tag{A.15}$$

Differentiating both expressions with respect to $\bar{a}$, we get:

$$\frac{\partial U^{i,\mathcal{C}}}{\partial \bar{a}} = \frac{p}{a_L^* + p} \tag{A.16}$$

and

$$\frac{\partial U^{i,\mathcal{M}}}{\partial \bar{a}} = \lambda\sqrt{\tau}(1 - a_L^* - p) \tag{A.17}$$

When p is sufficiently small, it holds that $\frac{\partial U^{i,\mathcal{M}}}{\partial \bar{a}} > \frac{\partial U^{i,\mathcal{C}}}{\partial \bar{a}}$. It follows that the more talented individual $i : a^i = \bar{a}$ is, and, consequently, the higher the average ability of the deviating group is, the less individual $i : a^i = \bar{a}$ gains from deviating to the clan. Since we have seen that $U^{i,\mathcal{M}} > U^{i,\mathcal{C}}$ even when this individual is the least talented he can be ($\bar{a} = a_L^* + p$), we can conclude that any individual $i : a^i = \bar{a}$ with $\bar{a} > a_L^* + p$ would not deviate to the clan either. Hence, any small group of the size p, which is composed of all individuals whose abilities are in $[\underline{a}, \bar{a}]$, will not deviate to the clan.

Now suppose that a small group of the size p, which is composed of some of the individuals whose abilities are in $[\underline{a}, \bar{a}]$, deviates from the equilibrium and settles in the clan. That is, we are now considering a group which is composed of a subset of individuals in $[\underline{a}, \bar{a}]$, but not of all the individuals whose abilities are in $[\underline{a}, \bar{a}]$, where $\bar{a} \geq a_L^* + p$. In a such a group, it thus holds that $\bar{a} - \underline{a} > p$.

We will now compare this group to one that has the same p and $\bar{a}$, but is composed of all individuals whose abilities are in $[\underline{a}, \bar{a}]$ (as considered earlier), i.e., the one whose $\underline{a}$ is necessarily larger. Thus, we will analyze what happens to the utility of individual $i : a^i = \bar{a}$ as a result of the decrease in $\underline{a}$. We know that by decreasing $\underline{a}$, we make the average ability in the clan, and the utility of individual $i : a^i = \bar{a}$ in the clan, (weakly) lower relative to the case in which the deviating group is composed of all individuals whose abilities are in $[\underline{a}, \bar{a}]$. On the other hand, as long as we hold p constant, the utility of individual $i : a^i = \bar{a}$ in the market remains unchanged.

Since, even when $\underline{a} = \bar{a} - p$, individual $i : a^i = \bar{a}$ does not deviate to the clan, then for any $\underline{a} < \bar{a} - p$, individual $i : a^i = \bar{a}$ would not deviate to the clan either. Hence, any small group of the size p, which is composed of a subset of the individuals whose abilities are in $[\underline{a}, \bar{a}]$, will not deviate to the clan.

We now turn to consider deviations "to the left" of a_L^*, i.e., where the deviating group moves from the clan to the market. Let a_L^* be the equilibrium of the game, and suppose that a small group, which is composed of all individuals whose abilities are in $[\underline{a}, a_L^*]$, deviates from the equilibrium and settles in the market. In such a case, for individual $i : a^i = \underline{a}$, it holds that:

$$U^{i,\mathcal{C}}_{|\mathcal{C}|=\underline{a}} = 0.5\underline{a} + 1 - \theta \tag{A.18}$$

and

$$U^{i,\mathcal{M}}_{|\mathcal{C}|=\bar{a}} = \lambda\sqrt{\tau}(1-\underline{a})\underline{a} - \tau \tag{A.19}$$

Since $\underline{a} < a_L^*$, and given the properties of $\Delta^{\mathcal{C}}(|\mathcal{C}|)$, it holds that $U^{i,\mathcal{M}}_{|\mathcal{C}|=\underline{a}} < U^{i,\mathcal{C}}_{|\mathcal{C}|=\underline{a}}$. The deviation thus makes individual $i : a^i = \underline{a}$ worse off, which indicates that this group will not deviate to the market.

Now suppose that a small group of the same size, which is composed of all individuals whose abilities are in $[\underline{a}, \bar{a}]$, deviates from the equilibrium and settles in the market. Let p denote the size of this group, i.e., $p = \bar{a} - \underline{a}$. We saw that any group of size p with $\bar{a} = a_L^*$ would not deviate to the market. Now we hold p constant, and see what happens to the utility of individual $i : a^i = \underline{a}$ as we decrease $\bar{a}$ below a_L^*. For individual $i : a^i = \underline{a}$, it holds that:

$$U^{i,\mathcal{C}} = \frac{0.5{a_L^*}^2 - 0.5(\bar{a}-\underline{a})(\bar{a}+\underline{a})}{a_L^* - \bar{a} + \underline{a}} + 1 - \theta = \frac{{a_L^*}^2 - p(2\underline{a}+p)}{2(a_L^* - p)} + 1 - \theta \tag{A.20}$$

and

$$U^{i,\mathcal{M}} = \lambda\sqrt{\tau}(1 - a_L^* + p)\underline{a} - \tau \tag{A.21}$$

Differentiating both expressions with respect to $\underline{a}$, we get:

$$\frac{\partial U^{i,\mathcal{C}}}{\partial \underline{a}} = -\frac{p}{a_L^* - p} \tag{A.22}$$

and

$$\frac{\partial U^{i,\mathcal{M}}}{\partial \underline{a}} = \lambda\sqrt{\tau}(1 - a_L^* + p) \tag{A.23}$$

For any p, it holds that $\frac{\partial U^{i,\mathcal{M}}}{\partial \underline{a}} > \frac{\partial U^{i,\mathcal{C}}}{\partial \underline{a}}$. It follows that the less talented individual $i : a^i = \underline{a}$ is, and, consequently, the lower the average ability of the deviating group is, the less individual $i : a^i = \underline{a}$ gains from deviating to the market. Since we have seen that $U^{i,\mathcal{M}} < U^{i,\mathcal{C}}$ even when this individual is the most talented he can be ($\underline{a} = a_L^* - p$), we can conclude that any individual $i : a^i = \underline{a}$ with $\underline{a} < a_L^* - p$ would not deviate to the clan either. Hence, any small group of the size p, which is composed of all individuals whose abilities are in $[\underline{a}, \bar{a}]$, will not deviate to the market.

Now suppose that a small group of the size p, which is composed of some of the individuals whose abilities are in $[\underline{a}, \bar{a}]$, deviates from the equilibrium and settles in the market. That is, we are now considering a group that is composed of a subset of individuals in $[\underline{a}, \bar{a}]$, but not of all the individuals whose abilities are in $[\underline{a}, \bar{a}]$, where $\underline{a} \leq a_L^* - p$. In a such a group, it thus holds that $\bar{a} - \underline{a} > p$.

We will now compare this group to one that has the same p and $\bar{a}$, but is composed of all individuals whose abilities are in $[\underline{a}, \bar{a}]$ (as considered earlier), i.e., the one whose $\underline{a}$ is necessarily larger. Thus, we will analyze what happens to the utility of individual $i : a^i = \underline{a}$ as a result of the decrease in $\underline{a}$.

We know that by decreasing $\underline{a}$, we make the average ability in the clan, and the utility of individual $i : a^i = \bar{a}$ in the clan, (weakly) higher relative to the case in which the deviating group is composed of all individuals whose abilities are in $[\underline{a}, \bar{a}]$. On the other hand, the utility of individual $i : a^i = \underline{a}$ in the market is smaller than before.

Since, even when individual $i : a^i = \underline{a}$ satisfies $\underline{a} = \bar{a} - p$, he does not deviate to the market, then any individual $i : a^i = \underline{a}$ with $\underline{a} < \bar{a} - p$, would not deviate to the market either. Hence, any small group of the size p, which is composed of a subset of the individuals whose abilities are in $[\underline{a}, \bar{a}]$, will not deviate to the market.

Finally, we consider deviations "from both sides" of a_L^*. Let a_L^* be the equilibrium of the game, and suppose that a small group, which is composed of some individuals with $a^i > a_L^*$ (i.e., who settle in the market in a_L^*) and some individuals with $a^i < a_L^*$ (i.e., who settle in the clan in a_L^*), deviates from the equilibrium.

Let $\underline{a}$ denote the ability of the least talented individual in the deviating group. Since $\underline{a} < a_L^*$, this individual deviates from the clan to the market. We saw that for any group which is composed only of individuals with $a^i < a_L^*$, a deviation to the market makes individual $i : a^i = \underline{a}$ worse off. Here, in addition, some individuals with $a^i > a_L^*$ deviate to the clan. By doing so, they increase the average ability in the clan, making it more attractive, while simultaneously decrease institutional quality, making the market less attractive. Since, even when there are no individuals with $a^i > a_L^*$ who deviate to the clan, individual $i : a^i = \underline{a}$ does not deviate to the market, then, when there are individuals with $a^i > a_L^*$ who deviate to clan, he would not deviate to the market either. Hence, any small group which is composed of some individuals with $a^i > a_L^*$ and some individuals with $a^i < a_L^*$ will not deviate from the equilibrium.

Putting it together, we get that there is no small group of individuals who may profitably deviate from a_L^*, indicating that a_L^* is robust to deviations of small groups.

Part (ii): $|\mathcal{C}| = a_H^*$

We consider a deviation "to the right" of a_H^*, i.e., where the deviating group moves from the market to the clan. Let a_H^* be the equilibrium of the game, and suppose that a small group, which is composed of all individuals whose abilities are in $[a_H^*, \bar{a}]$, deviates from the equilibrium and settles in the clan. In such a case, for individual $i : a^i = \bar{a}$, it holds that:

$$U^{i,\mathcal{C}}_{|\mathcal{C}|=\bar{a}} = 0.5\bar{a} + 1 - \theta \tag{A.24}$$

and

$$U^{i,\mathcal{M}}_{|\mathcal{C}|=\bar{a}} = \lambda\sqrt{\tau}(1 - \bar{a})\bar{a} - \tau \tag{A.25}$$

Since $\bar{a} > a_H^*$, and given the properties of $\Delta^{\mathcal{C}}(|\mathcal{C}|)$, it holds that $U^{i,\mathcal{M}}_{|\mathcal{C}|=\bar{a}} < U^{i,\mathcal{C}}_{|\mathcal{C}|=\bar{a}}$. The deviation thus makes individual $i : a^i = \bar{a}$ better off.

Then, for any individual j in the deviating group, it holds that $U^{j,\mathcal{C}}_{|\mathcal{C}|=\bar{a}} = U^{i,\mathcal{C}}_{|\mathcal{C}|=\bar{a}}$, and $U^{j,\mathcal{M}}_{|\mathcal{C}|=\bar{a}} <$

$U^{i,\mathcal{M}}_{|\mathcal{C}|=\bar{a}}$, where $i : a^i = \bar{a}$. It follows that for any individual j in the deviating group, it holds that $U^{j,\mathcal{M}}_{|\mathcal{C}|=\bar{a}} < U^{j,\mathcal{C}}_{|\mathcal{C}|=\bar{a}}$. Hence, the deviation to the clan makes all individuals better off.

Putting it together, we get that there exists a deviating group in which all individuals gain utility as a result of the deviation, indicating that a^*_H is not robust to deviations of small groups.

Part (iii): $|\mathcal{C}| = 1$

In the case of $|\mathcal{C}| = 1$, the only possible deviation is "to the left" of the equilibrium, i.e., where the deviating group moves from the clan to the market. Let 1 be the equilibrium of the game, and suppose that a small group, which is composed of all individuals whose abilities are in $[\underline{a}, 1]$, deviates from the equilibrium and settles in the market. Suppose further that the group is sufficiently small, such that $a^*_H < \underline{a}$. In such a case, for individual $i : a^i = \underline{a}$, it holds that:

$$U^{i,\mathcal{C}}_{|\mathcal{C}|=\underline{a}} = 0.5\underline{a} + 1 - \theta \tag{A.26}$$

and

$$U^{i,\mathcal{M}}_{|\mathcal{C}|=\underline{a}} = \lambda\sqrt{\tau}(1 - \underline{a})\underline{a} - \tau \tag{A.27}$$

Since $\underline{a} \in [a^*_H, 1]$, and given the properties of $\Delta^{\mathcal{C}}(|\mathcal{C}|)$, it holds that $U^{i,\mathcal{M}}_{|\mathcal{C}|=\underline{a}} < U^{i,\mathcal{C}}_{|\mathcal{C}|=\underline{a}}$. The deviation thus makes individual $i : a^i = \underline{a}$ worse off, which indicates that this group will not deviate to the market.

Now suppose that a small group of the same size, which is composed of all individuals whose abilities are in $[\underline{a}, \bar{a}]$, deviates from the equilibrium and settles in the market. Let p denote the size of this group, i.e., $p = \bar{a} - \underline{a}$. We saw that any group of size p with $\bar{a} = 1$ would not deviate to the market. Now we hold p constant, and see what happens to the utility of individual $i : a^i = \underline{a}$ as we decrease as we decrease $\bar{a}$ below 1. For individual $i : a^i = \underline{a}$, it holds that:

$$U^{i,\mathcal{C}} = \frac{0.5 - 0.5(\bar{a} - \underline{a})(\bar{a} + \underline{a})}{1 - \bar{a} + \underline{a}} + 1 - \theta = \frac{1 - p(2\underline{a} + p)}{2(1 - p)} + 1 - \theta \tag{A.28}$$

and

$$U^{i,\mathcal{M}} = \lambda\sqrt{\tau}p\underline{a} - \tau \tag{A.29}$$

Differentiating both expressions with respect to $\underline{a}$, we get:

$$\frac{\partial U^{i,\mathcal{C}}}{\partial \underline{a}} = -\frac{p}{1 - p} \tag{A.30}$$

and

$$\frac{\partial U^{i,\mathcal{M}}}{\partial \underline{a}} = \lambda\sqrt{\tau}p \tag{A.31}$$

For any p, it holds that $\frac{\partial U^{i,\mathcal{M}}}{\partial \underline{a}} > \frac{\partial U^{i,\mathcal{C}}}{\partial \underline{a}}$. It follows that the less talented individual $i : a^i = \underline{a}$ is, and, consequently, the lower the average ability of the deviating group is, the less individual $i : a^i = \underline{a}$ gains from deviating to the market. Since we have seen that $U^{i,\mathcal{M}} < U^{i,\mathcal{C}}$ even when this individual

is the most talented he can be ($\underline{a} = 1 - p$), we can conclude that any individual $i : a^i = \underline{a}$ with $\underline{a} < 1 - p$ would not deviate to the clan either. Hence, any small group of the size p, which is composed of all individuals whose abilities are in $[\underline{a}, \bar{a}]$, will not deviate to the market.

Now suppose that a small group of the size p, which is composed of some of the individuals whose abilities are in $[\underline{a}, \bar{a}]$, deviates from the equilibrium and settles in the market. That is, we are now considering a group that is composed of a subset of individuals in $[\underline{a}, \bar{a}]$, but not of all the individuals whose abilities are in $[\underline{a}, \bar{a}]$, where $\underline{a} \leq a_L^* - p$. In a such a group, it thus holds that $\bar{a} - \underline{a} > p$.

We will now compare this group to one that has the same p and $\bar{a}$, but is composed of all individuals whose abilities are in $[\underline{a}, \bar{a}]$ (as considered earlier), i.e., the one whose $\underline{a}$ is necessarily larger. Thus, we will analyze what happens to the utility of individual $i : a^i = \underline{a}$ as a result of the decrease in $\underline{a}$. We know that by decreasing $\underline{a}$, we make the average ability in the clan, and the utility of individual $i : a^i = \bar{a}$ in the clan, (weakly) higher relative to the case in which the deviating group is composed of all individuals whose abilities are in $[\underline{a}, \bar{a}]$. On the other hand, the utility of individual $i : a^i = \underline{a}$ in the market is smaller than before.

Since, even when individual $i : a^i = \underline{a}$ satisfies $\underline{a} = \bar{a} - p$, he does not deviate to the market, then any individual $i : a^i = \underline{a}$ with $\underline{a} < \bar{a} - p$, would not deviate to the market either. Hence, any small group of the size p, which is composed of a subset of the individuals whose abilities are in $[\underline{a}, \bar{a}]$, will not deviate to the market.

Putting it together, we get that there is no small group of individuals who may profitably deviate from 1, indicating that 1 is robust to deviations of small groups.

■

A.7 Obtaining the interior equilibrium in Subsection 3.2.1

Solving Equation 14 for a_{t+1}^*, we obtain two solutions. The smaller of the two, $a_{L,t+1}^*$, is given by:

$$a_{L,t+1}^* = \frac{\lambda\sqrt{\tau} - \psi - 0.5 - \sqrt{(-\lambda\sqrt{\tau} + \psi + 0.5)^2 - 4\lambda\sqrt{\tau}(1 + \tau - \theta_t - \psi + \psi\theta_t)}}{2\lambda\sqrt{\tau}} \tag{A.32}$$

Differentiating $a_{L,t+1}^*$ with respect to the parameters θ_t and λ, we get that $\frac{\partial a_{L,t+1}^*}{\partial \theta_t} < 0$ and $\frac{\partial a_{L,t+1}^*}{\partial \lambda} < 0$.

The interior equilibrium, $a_{L,t+1}^*$, exists for $\theta_t > \tilde{\theta}$, where $\tilde{\theta}$ is given by:

$$\tilde{\theta} = \frac{4\lambda\sqrt{\tau} - 4\lambda\psi\sqrt{\tau} + 4\lambda\tau^{1.5} - (-\lambda\sqrt{\tau} + \psi + 0.5)^2}{4\lambda\sqrt{\tau} - 4\lambda\psi\sqrt{\tau}} \tag{A.33}$$

Differentiating $\tilde{\theta}$ with respect to the parameter λ, we get that $\frac{\partial \tilde{\theta}}{\partial \lambda} < 0$. ■

A.8 Proof of Proposition 4

Part (i)

We first obtain the individualistic steady state, $\theta^{\mathcal{M}}$, analytically. Plugging A.32 in the second equation of 15, and solving for $\theta_{t+1} = \theta_t$, we obtain two solutions. Here we focus on the greater of the two, $\theta^{\mathcal{M}}$, which is given by:

$$\theta^{\mathcal{M}} = 0.5 + \frac{0.75}{\lambda\sqrt{\tau}} + 0.25\sqrt{4 + \frac{9}{\lambda^2\tau} - \frac{12}{\lambda\sqrt{\tau}} - \frac{16\sqrt{\tau}}{\lambda}} \tag{A.34}$$

Differentiating $\theta^{\mathcal{M}}$ with respect to λ, we get that $\frac{\partial\theta^{\mathcal{M}}}{\partial\lambda} > 0$.

Setting the radicant in A.34 to equal to zero and solving for λ, we obtain a single solution, denoted by $\lambda^{\mathcal{M}}(\tau)$. It holds that the individualistic steady state exists for any $\lambda \geq \lambda^{\mathcal{M}}(\tau)$.

To prove that $\theta^{\mathcal{M}}$ is stable, it is sufficient to show that the three following statements hold true: (1) $\theta^{\mathcal{M}}$ is the highest point in which $\theta_{t+1} = (1-\psi)\theta_t + \psi(1 - a^*_{L,t+1})$ intersects with $\theta_{t+1} = \theta_t$. (2) If $\theta_t = 1$, then $\theta_{t+1} < \theta_t$. (3) $\theta_{t+1} = (1-\psi)\theta_t + \psi(1 - a^*_{L,t+1})$ is continuous in $\theta_t \in (\tilde{\theta}, 1]$. We now consider each statement in turn.

First, as we mentioned earlier, solving the second equation of 15 yields two solutions, and $\theta^{\mathcal{M}}$ is the greater of the two. The function $\theta_{t+1} = (1-\psi)\theta_t + \psi(1 - a^*_{L,t+1})$ does not intersect with $\theta_{t+1} = \theta_t$ line in other points.

Second, when $\theta_t = 1$, $\theta_{t+1} = 1 - \psi + \psi(1 - a^*_{L,t+1})$. Since in such a case,

$$a^*_{L,t+1} = \frac{\lambda\sqrt{\tau} - \psi - 0.5 - \sqrt{(-\lambda\sqrt{\tau} + \psi + 0.5)^2 - 4\lambda\tau^{1.5}}}{2\lambda\sqrt{\tau}} > 0 \tag{A.35}$$

it holds that $\theta_{t+1} < \theta_t$.

Third, when $\theta_t \in (\tilde{\theta}, 1]$, $a^*_{L,t+1}$ exists, and thus $\theta_{t+1} = (1-\psi)\theta_t + \psi(1 - a^*_{L,t+1})$ is continuous.

Putting the three statements together, we get that $\frac{\partial\theta_{t+1}}{\partial\theta_t}|_{\theta_t=\theta^{\mathcal{M}}} < 1$, proving that the individualistic steady state, $\theta^{\mathcal{M}}$, is stable.

Part (ii)

We first obtain the collectivistic steady state, $\theta^{\mathcal{C}}$, analytically. Plugging $|\mathcal{C}| = 1$ in the first equation of 15, and solving for $\theta_{t+1} = \theta_t$, we get $\theta^{\mathcal{C}} = 0$.

The collectivistic steady state exists when $\tilde{\theta} \geq 0$. Setting Equation A.33 to equal to zero and solving for λ, we obtain a single solution, denoted by $\lambda^{\mathcal{C}}(\tau, \psi)$. Since $\frac{\partial\tilde{\theta}}{\partial\lambda} < 0$, it holds that the collectivistic steady state exists for any $\lambda \leq \lambda^{\mathcal{C}}(\tau, \psi)$.

By the first equation of 15, $\theta_{t+1} = (1-\psi)\theta_t$ for any $\theta_t \leq \tilde{\theta}$. It follows that $\frac{\partial\theta_{t+1}}{\partial\theta_t}|_{\theta_t=\theta^{\mathcal{C}}} = 1 - \psi < 1$, proving that the collectivistic steady state, $\theta^{\mathcal{C}}$, is stable.

Part (iii)

We first obtain the steady state, $\bar{\theta}$, analytically. Plugging A.32 in the second equation of 15, and

solving for $\theta_{t+1} = \theta_t$, we obtain two solutions. Here we focus on the smaller of the two, $\bar{\theta}$, which is given by:

$$\bar{\theta} = 0.5 + \frac{0.75}{\lambda\sqrt{\tau}} - 0.25\sqrt{4 + \frac{9}{\lambda^2\tau} - \frac{12}{\lambda\sqrt{\tau}} - \frac{16\sqrt{\tau}}{\lambda}} \tag{A.36}$$

Differentiating $\bar{\theta}$ with respect to λ, we get that $\frac{\partial\bar{\theta}}{\partial\lambda} < 0$.

As in the case of the individualistic steady state, $\theta^{\mathcal{M}}$, for $\bar{\theta}$ to exist, λ should be bounded from below by $\lambda^{\mathcal{M}}(\tau)$. However, in the case of $\bar{\theta}$, λ is also bounded from above by $\bar{\lambda}(\tau,\psi)$, where $\bar{\lambda}(\tau,\psi)$ is the solution to $\tilde{\theta} = \bar{\theta}$, where $\tilde{\theta}$ is given by A.33 and $\bar{\theta}$ is given by A.36. When $\lambda > \bar{\lambda}(\tau,\psi)$, the function $\theta_{t+1} = (1-\psi)\theta_t + \psi(1 - a^*_{L,t+1})$ intersects with $\theta_{t+1} = \theta_t$ only in $\theta^{\mathcal{M}}$, and $\bar{\theta}$ does not exist.

To prove that $\bar{\theta}$ is unstable, it is sufficient to show that the three following statements hold true: (1) The function $\theta_{t+1} = (1-\psi)\theta_t + \psi(1 - a^*_{L,t+1})$ intersects with $\theta_{t+1} = \theta_t$ in only two points, $\bar{\theta}$ and $\theta^{\mathcal{M}}$. (2) The individualistic steady state, $\theta^{\mathcal{M}}$, is stable. (3) $\theta_{t+1} = (1-\psi)\theta_t + \psi(1 - a^*_{L,t+1})$ is continuous in $\theta_t \in (\tilde{\theta}, 1]$.

We have already showed that the three statements hold true. Putting them together, we get that $\frac{\partial\theta_{t+1}}{\partial\theta_t}|_{\theta_t=\bar{\theta}} > 1$, proving that $\bar{\theta}$ is unstable. ■

A.9 Proof of Proposition 5

To characterize the system's dynamic trajectory, we first show that $\lambda^{\mathcal{M}}(\tau) < \bar{\lambda}(\tau,\psi) < \lambda^{\mathcal{C}}(\tau,\psi)$.

Suppose by contradiction that $\lambda^{\mathcal{M}}(\tau) > \bar{\lambda}(\tau,\psi)$. Then, if $\lambda < \lambda^{\mathcal{M}}(\tau)$, we get that $\theta^{\mathcal{M}}$ and $\bar{\theta}$ do not exist. However, if, in such a case, $\lambda = \bar{\lambda}(\tau,\psi)$, then $\tilde{\theta} = \bar{\theta}$, which cannot hold true if $\bar{\theta}$ does not exist. We can thus conclude that $\lambda^{\mathcal{M}}(\tau) < \bar{\lambda}(\tau,\psi)$.

Now recall that $\bar{\lambda}(\tau,\psi)$ is the solution to $\tilde{\theta} = \bar{\theta}$, while $\lambda^{\mathcal{C}}(\tau,\psi)$ is the solution to $\tilde{\theta} = 0$. Since $\bar{\theta} > 0$, and $\frac{\partial\tilde{\theta}}{\partial\lambda} < 0$, it holds that $\bar{\lambda}(\tau,\psi) < \lambda^{\mathcal{C}}(\tau,\psi)$.

Putting it together, we get that $\lambda^{\mathcal{M}}(\tau) < \bar{\lambda}(\tau,\psi) < \lambda^{\mathcal{C}}(\tau,\psi)$. We can now trace the system's dynamic trajectory and ultimate position for each range of λ.

Part (i)
By Proposition 4, when $\lambda > \lambda^{\mathcal{C}}(\tau,\psi)$, it holds that $\tilde{\theta} < 0$. In such a case, θ_{t+1} is given by the second equation in 15, i.e., $\theta_{t+1} = (1-\psi)\theta_t + \psi(1 - a^*_{L,t+1})$ for any θ_t.

Since $\bar{\lambda}(\tau,\psi) < \lambda^{\mathcal{C}}(\tau,\psi)$, $\bar{\theta}$ does not exist, and the function $\theta_{t+1} = (1-\psi)\theta_t + \psi(1 - a^*_{L,t+1})$ intersects with $\theta_{t+1} = \theta_t$ only in $\theta^{\mathcal{M}}$. Since, by Proposition 4, $\frac{\partial\theta_{t+1}}{\partial\theta_t}|_{\theta_t=\theta^{\mathcal{M}}} < 1$, it holds that $\theta_{t+1} > \theta_t$ for any $\theta_t < \theta^{\mathcal{M}}$, and $\theta_{t+1} < \theta_t$ for any $\theta_t > \theta^{\mathcal{M}}$. That is, the system converges to $\theta^{\mathcal{M}}$ from any initial point, θ_0.

Part (ii)
By Proposition 4, when $\lambda \in (\bar{\lambda}, \lambda^{\mathcal{C}}]$, it holds that $\tilde{\theta} > 0$.

Now, if $\theta_t \leq \tilde{\theta}$, then θ_{t+1} is given by the first equation in 15, i.e., $\theta_{t+1} = (1-\psi)\theta_t$. In such a case,

$\theta_{t+1} < \theta_t$ for any t, until the system converges to $\theta^{\mathcal{C}}$.

If, on the other hand, $\theta_t > \tilde{\theta}$, then θ_{t+1} is given by the second equation in 15, i.e., $\theta_{t+1} = (1-\psi)\theta_t + \psi(1-a^*_{L,t+1})$. Since $\lambda \in (\bar{\lambda}, \lambda^{\mathcal{C}}]$, $\bar{\theta}$ does not exist, and the function $\theta_{t+1} = (1-\psi)\theta_t + \psi(1-a^*_{L,t+1})$ intersects with $\theta_{t+1} = \theta_t$ only in $\theta^{\mathcal{M}}$. Since, by Proposition 4, $\frac{\partial \theta_{t+1}}{\partial \theta_t}|_{\theta_t = \theta^{\mathcal{M}}} < 1$, it holds that $\theta_{t+1} > \theta_t$ for any $\theta_t \in (\tilde{\theta}, \theta^{\mathcal{M}})$, and $\theta_{t+1} < \theta_t$ for any $\theta_t > \theta^{\mathcal{M}}$. That is, the system converges to $\theta^{\mathcal{M}}$ from any $\theta_0 > \tilde{\theta}$.

Putting it together, we get that for any $\lambda \in (\bar{\lambda}, \lambda^{\mathcal{C}}]$, $\lim_{t\to\infty} \theta_t = \begin{cases} \theta^{\mathcal{M}} & \text{if } \theta_0 > \tilde{\theta} \\ \theta^{\mathcal{C}} & \text{if } \theta_0 \leq \tilde{\theta} \end{cases}$.

Part (iii)
By Proposition 4, when $\lambda \in (\lambda^{\mathcal{M}}, \bar{\lambda}]$, it holds that $\tilde{\theta} > 0$.

Now, if $\theta_t \leq \tilde{\theta}$, then θ_{t+1} is given by the first equation in 15, i.e., $\theta_{t+1} = (1-\psi)\theta_t$. In such a case, $\theta_{t+1} < \theta_t$ for any t, until the system converges to $\theta^{\mathcal{C}}$.

If, on the other hand, $\theta_t > \tilde{\theta}$, then θ_{t+1} is given by the second equation in 15, i.e., $\theta_{t+1} = (1-\psi)\theta_t + \psi(1-a^*_{L,t+1})$. Since $\lambda \in (\lambda^{\mathcal{M}}, \bar{\lambda}]$, both $\bar{\theta}$ and $\theta^{\mathcal{M}}$ exist. Since, by Proposition 4, $\frac{\partial \theta_{t+1}}{\partial \theta_t}|_{\theta_t = \bar{\theta}} > 1$, it holds that $\theta_{t+1} < \theta_t$ for any $\theta_t \in (\tilde{\theta}, \bar{\theta})$. That is, θ_t diminishes over time, until it crosses $\tilde{\theta}$, such that $\theta_t \leq \tilde{\theta}$. In such a case, $\theta_{t+1} < \theta_t$ for any t, and the system converges to $\theta^{\mathcal{C}}$.

Moreover, since, by Proposition 4, $\frac{\partial \theta_{t+1}}{\partial \theta_t}|_{\theta_t = \theta^{\mathcal{M}}} < 1$, it holds that $\theta_{t+1} > \theta_t$ for any $\theta_t \in (\bar{\theta}, \theta^{\mathcal{M}})$, and $\theta_{t+1} < \theta_t$ for any $\theta_t > \theta^{\mathcal{M}}$. That is, the system converges to $\theta^{\mathcal{M}}$ from any $\theta_0 > \bar{\theta}$.

Putting it together, we get that for any $\lambda \in (\lambda^{\mathcal{M}}, \bar{\lambda}]$, $\lim_{t\to\infty} \theta_t = \begin{cases} \theta^{\mathcal{M}} & \text{if } \theta_0 > \bar{\theta} \\ \bar{\theta} & \text{if } \theta_0 = \bar{\theta} \\ \theta^{\mathcal{C}} & \text{if } \theta_0 < \bar{\theta} \end{cases}$

Part (iv)
By Proposition 4, when $\lambda < \lambda^{\mathcal{M}}$, it holds that $\tilde{\theta} > 0$.

Now, if $\theta_t \leq \tilde{\theta}$, then θ_{t+1} is given by the first equation in 15, i.e., $\theta_{t+1} = (1-\psi)\theta_t$. In such a case, $\theta_{t+1} < \theta_t$ for any t, until the system converges to $\theta^{\mathcal{C}}$.

If, on the other hand, $\theta_t > \tilde{\theta}$, then θ_{t+1} is given by the second equation in 15, i.e., $\theta_{t+1} = (1-\psi)\theta_t + \psi(1-a^*_{L,t+1})$. Since $\lambda < \lambda^{\mathcal{M}}$, both $\bar{\theta}$ and $\theta^{\mathcal{M}}$ do not exist. It follows that $\theta_{t+1} < \theta_t$ for any $\theta_t > \tilde{\theta}$, and θ_t diminishes over time, until it crosses $\tilde{\theta}$, such that $\theta_t \leq \tilde{\theta}$. In such a case, $\theta_{t+1} < \theta_t$ for any t, and the system converges to $\theta^{\mathcal{C}}$. That is, the system converges to $\theta^{\mathcal{C}}$ from any initial point, θ_0. ■

B Endogenous fee in the market

In Section 3.1.4 we introduced a fee, τ, which individuals settling in the market must pay to support institutions. In this section we endogenize the fee and show that by doing so, we do not change our qualitative results.

Before describing the mechanism that produces the endogenous fee, we consider what would be the optimal fee for an individual with ability a^i. On the one hand, the individual wishes to minimize the fee in order to reduce the cost of settling in the market. On the other hand, the fee serves to support institutions so the individual wants it to be high. To find the optimal fee, τ^i, in the static case, recall that the utility of an individual who settles in the market (in the robust interior equilibrium, a_L^*) is given by

$$\lambda\sqrt{\tau}(1-a_L^*)a^i - \tau \tag{B.1}$$

Differentiating by τ yields

$$\tau^i = \frac{1}{4}\lambda^2(1-a_L^*)^2(a^i)^2 \tag{B.2}$$

The optimal fee monotonically increases in the individual's ability. This is sensible: while all individuals who settle in the market pay the same fee, the more talented ones benefit from institutions to a greater extent because they can leverage it for producing more income.

Let us now turn to considering a possible mechanism for eliciting an endogenous fee out of these heterogeneous preferences. Suppose the fee is determined by a voting among all the market residents. In particular, it is determined through a Condorcet voting process: individuals can (indefinitely) propose a fee, and any new proposal competes (by voting among all the market residents) against the current leading proposal until a final decision is reached. Since preferences are unidimensional, this process produces the median preference as a Condorcet Winner.[44] Thus, due to the monotonicity of the optimal fee in the individual's ability, we can simply plug the median ability of the market residents, $a^i = \frac{1+a_L^*}{2}$, into B.2 and get:

$$\tau = \frac{1}{16}\lambda^2(1-a_L^*)^2(1+a_L^*)^2 \tag{B.3}$$

Plugging it in Equation 10, we get

$$\frac{1}{16}\lambda^2(1-a_L^*)^2(1+a_L^*)(3a_L^*-1) = 0.5a_L^* + 1 - \theta \tag{B.4}$$

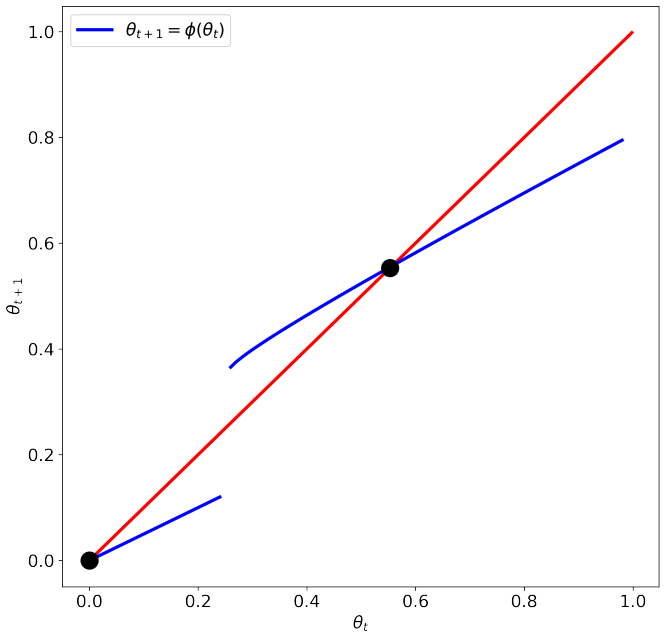
This is a quartic equation, and it cannot be analytically solved. Thus, we will simulate it instead. Before doing so, we modify B.4 to its dynamic version, by using equation 14 instead of 10. We get

$$\frac{1}{16}\lambda^2(1-a_{L,t+1}^*)^2(1+a_{L,t+1}^*)(3a_{L,t+1}^*-1) = 0.5a_{L,t+1}^* + 1 - (1-\psi)\theta_t - \psi(1-a_{L,t+1}^*) \tag{B.5}$$

In constructing the simulation, we do the following: First, we set the parameter values at $\psi = 0.5$ and $\lambda = 8$. Then, for a given θ_t, we solve B.5. If we get two solutions in $[0,1]$, we select the smaller

[44] One could of course come up with alternative mechanisms, for example producing the average rather than the median preference. This would have no qualitative effect on our results.

Figure B.1: The Dynamic System with Endogenous fee



The figure presents the simulation of the dynamic equation of θ_{t+1} as a function of θ_t, given endogenous τ. The simulation reveals that the dynamic system remains qualitatively similar to the case of an exogenous τ (see Panel B in Figure 4). Namely, there exist two stable steady states: the collectivistic steady state, $\theta^{\mathcal{C}} = 0$, and an individualistic one, $\theta^{\mathcal{M}} > 0$. The convergence to each steady state depends on the initial point, θ_0, relative to the cultural threshold, $\tilde{\theta}$.

of the two, $|\mathcal{C}_{t+1}| = a^*_{L,t+1}$, and plug it into 12 to obtain θ_{t+1}. If we get no solutions in $[0, 1]$, we conclude that $|\mathcal{C}_{t+1}| = 1$, and plug it into 12 to obtain θ_{t+1}. We repeat the process for $n + 1$ points of θ_t, with a gap of $\frac{1}{n}$ between each two points. Finally, to characterize the dynamic system, we plot the $n + 1$ points on the (θ_t, θ_{t+1}) plane.

Figure B.1 presents the results of the simulation. The simulation reveals that the dynamic system remains qualitatively similar to the case of an exogenous τ (see Panel B in Figure 4). Namely, there exist two stable steady states: the collectivistic steady state, $\theta^{\mathcal{C}} = 0$, and an individualistic one, $\theta^{\mathcal{M}} > 0$. The convergence to each steady state depends on the initial point, θ_0, relative to the cultural threshold, $\tilde{\theta}$.

C Additional Tables and Results

Table C.1: Summary Statistics of Institution Quality

Variable	Mean	Std. Dev.	Min.	Max.	N
Market-supporting institutions					
Functioning of political institutions	2.266	0.59	0.739	3.701	139
Security of property rights and contracts with political institutions	2.392	0.753	0.65	3.938	139
Ease of starting a business	2.153	0.533	0.6	3.375	139
Free operations of markets	1.751	0.62	0.083	3.117	139
Technological environment of firms	1.992	0.820	0.194	4	139
Security of transactions and contracts	2.081	0.625	0.75	3.6	139
Market regulations, social dialogue	1.911	0.681	0.367	3.567	139
Trade Liberalization	2.048	0.363	1.167	3	139
Security of financial transaction and contracts	2.918	0.848	0.5	4	139
Free operation of labor markets	1.899	0.604	0.5	3.556	139
Security of transactions and contracts in the labor market	2.565	0.815	0	3.889	139
Labor market openness	2.791	0.897	0	4	139
Social cohesion and social mobility	2.07	0.467	1.209	3.176	139
Other institutions					
Political institutions	2.384	0.535	0.5	3.3	139
Security of persons and goods	2.739	0.817	0.1	4	139
Ability of the State to make a decision	2.356	0.593	0.491	3.715	139
Freedom of movement of persons and information	2.819	0.741	1	4	139
Social cohesion and social mobility (political institutions)	2.415	0.605	0.607	3.535	139
Free financial markets operation	2.475	0.966	0	4	139
Venture capital	2.388	0.698	0.667	4	139
Financial market regulation	2.691	0.766	0.4	4	139
Openness of the financial markets	2.578	0.736	0.5	4	137
Importance of microfinance	2.289	0.776	0	3.667	113
Political institutions in the labor market	2.483	1.105	0	4	133
Coordination of stakeholders, strategic vision, innovation in the labor market	1.802	0.857	0	4	139
Labor market social dialogue	2.072	0.763	0	4	139

Table C.2: Summary statistics

Variable	Mean	Std. Dev.	Min.	Max.	N
Wheat-rice suitability difference	0.097	1.03	-2.006	1.708	118
Kinship intensity index	-0.193	0.988	-1.557	1.48	118
Absolute Latitude	28.585	17.874	0.533	64.092	118
Land Suitability	0.461	0.251	0.003	0.965	118
Elevation (mean)	0.172	0.942	-0.912	4.659	118
Coast Length	0.116	1.254	-0.239	11.154	118
Ruggedness (mean)	-0.027	0.924	-1.001	3.589	118
Minimal distance to a coast or river	0.124	1.121	-0.589	6.967	118
Precipitation (mean)	-0.168	0.854	-1.408	2.308	118
Settlement Type	6.145	1.668	0.009	7.99	118
Political Complexity	3.393	1.111	0.005	4.999	118
Mean Size Local Community	5.558	2.869	0	8	118
Agricultural Dependence	6.123	1.27	1.034	8.981	118
Sub-Saharan Africa region dummy	0.237	0.427	0	1	118
Middle East and North Africa region dummy	0.068	0.252	0	1	118
Europe and Central Asia region dummy	0.339	0.475	0	1	118
South Asia region dummy	0.051	0.221	0	1	118
East Asia and Pacific region dummy	0.119	0.325	0	1	118
North America region dummy	0.017	0.13	0	1	118
Latin America and Caribbean region dummy	0.169	0.377	0	1	118
State antiquity index	0.488	0.236	0.028	0.964	118
Neolithic Transition Timing (Ancestors)	5373.1	1888.627	1356.99	10400	118
Colonial history dummy	0.593	0.493	0	1	118

Table C.3: Summary statistics of the variables used in the mechanism section

Variable	Mean	Std. Dev.	Min.	Max.	N
Difference in wheat-rice suitability difference	0.29	1.158	-1.41	2.976	1071
Kinship intensity index	0.05	0.597	-2.804	1.055	1072
Unilineal marriage	0.065	0.246	0	1	866
individualism_indicator	0.021	0.065	-0.2	0.333	905
Competitiveness Inculcation	0.613	0.489	0	1	111
Intensity of Trade	0.671	0.471	0	1	167
Jurisdictional Hierarchy Beyond Local Community	1.916	1.036	1	5	950
Absolute Latitude	0.39	1.307	-1.094	4.447	1072
Ruggedness (mean)	-0.207	0.749	-0.834	5.036	1072
Coast Length	0.214	1.722	-0.103	33.298	1072
Distance to River (km)	1127.004	2045.977	0.249	13338.587	1063
Distance to Coast (km)	509.288	487.069	0.124	3505.43	1063
Precipitation (mm/month) (mean)	-0.394	0.901	-1.776	4.279	1072
Temperature (Daily Mean) (mean)	-0.292	1.2	-5.001	1.093	1072
Average Caloric Crop Yield	-0.029	1.124	-2.542	3.924	1072
Sub-Saharan Africa region	0.405	0.491	0	1	1072
Middle East and North Africa region	0.023	0.151	0	1	1072
Europe and Central Asia region	0.05	0.219	0	1	1072
South Asia region	0.055	0.228	0	1	1072
East Asia and Pacific region	0.201	0.401	0	1	1072
North America region	0.141	0.348	0	1	1072
Latin America and Caribbean region	0.125	0.331	0	1	1072

Table C.4: Wheat-Rice Difference and Security of Transactions and Contracts

	Security of Transactions and Contracts				
	(1)	(2)	(3)	(4)	(5)
Wheat-rice suitability difference	0.29***	0.15**	0.25***	0.23***	0.23***
	(0.04)	(0.07)	(0.08)	(0.08)	(0.08)
Kinship intensity index	-0.21***	-0.31***	-0.24***	-0.25***	-0.25***
	(0.04)	(0.07)	(0.07)	(0.08)	(0.08)
Sub-Saharan Africa region dummy		-0.76***	-0.76***	-0.63**	-0.79**
		(0.21)	(0.28)	(0.28)	(0.31)
Middle East and North Africa region dummy		-0.62***	-0.80***	-0.65**	-0.65**
		(0.21)	(0.30)	(0.31)	(0.32)
Europe and Central Asia region dummy		-0.53***	-0.95***	-0.69***	-0.96***
		(0.12)	(0.25)	(0.26)	(0.29)
South Asia region dummy		-0.81***	-1.02***	-0.80**	-0.84**
		(0.20)	(0.33)	(0.31)	(0.34)
East Asia and Pacific region dummy		-0.79***	-1.07***	-0.79***	-0.93***
		(0.21)	(0.32)	(0.29)	(0.31)
North America region dummy		0.00	0.00	0.00	0.00
		(.)	(.)	(.)	(.)
Latin America and Caribbean region dummy		-1.22***	-1.38***	-1.23***	-1.31***
		(0.10)	(0.26)	(0.24)	(0.25)
Absolute Latitude			0.01*	0.01	-0.00
			(0.01)	(0.01)	(0.01)
Land Suitability			-0.47**	-0.46**	-0.48**
			(0.20)	(0.21)	(0.21)
Elevation (mean)			-0.13**	-0.10*	-0.13**
			(0.06)	(0.05)	(0.05)
Coast Length			-0.06	-0.04	-0.03
			(0.04)	(0.04)	(0.04)
Ruggedness (mean)			0.08	0.08	0.09
			(0.08)	(0.07)	(0.07)
Minimal distance to a coast or river			-0.05	-0.08**	-0.08**
			(0.05)	(0.04)	(0.03)
Precipitation (mean)			0.23***	0.16**	0.13*
			(0.08)	(0.08)	(0.08)
Settlement Type				0.07*	0.08**
				(0.04)	(0.04)
Political Complexity				-0.18***	-0.19***
				(0.05)	(0.05)
Mean Size Local Community				0.05*	0.06**
				(0.03)	(0.03)
Agricultural Dependence				-0.07	-0.08*
				(0.05)	(0.05)
State antiquity index					-0.18
					(0.22)
Neolithic Transition Timing (Ancestors)					-0.00
					(0.00)
Colonial history dummy					-0.44**
					(0.18)
Mean Dep. Variable	2.08	2.08	2.08	2.08	2.08
Adjusted-R^2	0.42	0.52	0.57	0.61	0.62
Observations	118	118	118	118	118

Table C.5: Wheat-Rice Difference and Security of Transactions and Contracts Robustness for Using 2012 Data

	Security of Transactions and Contracts				
	(1)	(2)	(3)	(4)	(5)
Wheat-rice suitability	0.22***	0.17***	0.20**	0.21***	0.23***
	(0.03)	(0.05)	(0.08)	(0.07)	(0.07)
Kinship intensity index	-0.15***	-0.26***	-0.25***	-0.20**	-0.20**
	(0.04)	(0.08)	(0.08)	(0.08)	(0.08)
Regional FE	No	Yes	Yes	Yes	Yes
Geographical controls	No	No	Yes	Yes	Yes
Ethnic controls	No	No	No	Yes	Yes
Historic controls	No	No	No	No	Yes
Mean Dep. Variable	2.14	2.14	2.14	2.14	2.14
Adjusted-R^2	0.36	0.40	0.41	0.42	0.41
Observations	120	120	120	120	120

Notes: This table establishes the robust and significant effect of the the historical relative productivity in the market on market supporting institutions. Specifically, the analysis shows that an increase of one standard deviation in wheat-rice suitability is associated with an increase of 0.25 points in the quality of institutions. The analysis is robust to controlling for regional fixed effects, geographical controls (absolute latitude, mean elevation, mean ruggedness, total coast length, mean crop CSI, mean precipitation), ethnic controls (mean size of historical community, type of historical settlement, agricultural dependence, and number of jurisdictional levels beyond the local level), and historical controls (years since the neolithic revolution, colonial history, and state antiquity). Heteroskedasticity robust standard error estimates are reported in parentheses; *** denotes statistical significance at the 1% level, ** at the 5% level, and * at the 10% level, all for two-sided hypothesis tests; All regressions include a constant.

Table C.6: Wheat-Rice Difference, KII and Legal System & Property Rights

	Legal System and Property Rights				
	(1)	(2)	(3)	(4)	(5)
Wheat-rice suitability	7.36***	4.90***	4.80**	4.51**	5.05**
	(0.96)	(1.57)	(1.94)	(1.85)	(1.93)
Kinship intensity index (KII based on EA)	-4.69***	-3.79*	-3.46**	-3.97**	-3.64**
	(1.21)	(1.94)	(1.56)	(1.52)	(1.57)
Regional FE	No	Yes	Yes	Yes	Yes
Geographical controls	No	No	Yes	Yes	Yes
Ethnic controls	No	No	No	Yes	Yes
Historic controls	No	No	No	No	Yes
Mean Dep. Variable	51.34	51.34	51.34	51.34	51.34
Adjusted-R^2	0.42	0.59	0.65	0.68	0.67
Observations	122	122	122	122	122

Table C.7: Market-Supporting Institutions, Wheat-Rice & KII
Robustness to Spatial Autocorrelation (Conley, 1999)

	Security of Transactions and Contracts				
	2.5°	5°	10°	20°	50°
	(1)	(2)	(3)	(4)	(5)
Wheat-rice suitability	0.21***	0.21***	0.21***	0.21***	0.21***
	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)
Kinship intensity index (KII based on EA)	-0.28***	-0.28***	-0.28***	-0.28***	-0.28***
	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)
Regional FE	Yes	Yes	Yes	Yes	Yes
Geographical controls	Yes	Yes	Yes	Yes	Yes
Ethnic controls	Yes	Yes	Yes	Yes	Yes
Historic controls	Yes	Yes	Yes	Yes	Yes
Centered-R^2	0.69	0.69	0.69	0.69	0.69
Observations	118	118	118	118	118