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Keywords: paddy rice, prejudice, market, contact hypothesis, group identity

JEL Classification: J15, N55, Z1

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Paddy and Prejudice:

Evidence on the Agricultural Origins of Prejudice from China and 12 other Asian Societies[1]

An Huang*, Paulo Santos† and Russell Smyth‡

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I. Introduction

There is a growing consensus that the ability to cooperate with non-kin lies at the heart of humans' success as a species (Bowles and Gintis 2011, Henrich 2015). Such cooperation is sustained by shared norms, which facilitate social learning, and likely emerged among small groups, possibly in the context of competition against other groups (Bowles 2009). The dark side of this success is an inherited and pervasive tendency to avoid those who don't look like us. Although out-group prejudice does not auntomatically follow from in-group favouritism (Brewer, 1999), a large literature speaks to their intimate connection, and their common roots in human evolution. Primates engage in deadly inter-group competition for access to resources (Mitanni et al. 2010) and civil wars are fought mostly along ethnic differences (Esteban, Mayoral and Ray 2012). Children younger than one year choose to interact with those who share their mother's accent (Kinzler, Dupoux and Spelke 2007, Kinzler et al. 2009) while out-group animosity explains virality in social media interactions (Rajthe et al. 2021) . Even "mild" preferences for similar neighbours can lead to de facto segregation (Schelling 1971), while social networks are a good illustration that "birds of a feather flock together" (McPherson, Smith-Lovin and Cook 2001), depriving some from the resources that they provide (Ioannides and Loury 2004).

This affective feeling towards a person based on their perceived personal characteristics, rather than the actual experience, is prejudice (Allport 1954), which is found to impede individual cooperation and performance, and adversely affect economic development and social cohesion (e.g., Brooks et al. 2018, and Hoff and Pandey 2014). Despite a growing body of empirical work that focuses on how to reduce prejudice (e.g., see Paluck et al. 2021, and Paluck and Green 2009 for reviews), we generally lack evidence on its origins. If we better understood the origins of prejudice, we could plausibly guide the design of better strategies to reduce prejudice (see, more generally, Nunn 2009 and Spolaore and Wacziarg 2013, for a similar argument).

This paper examines the role of pre-modern agricultural technology, in particular the importance of paddy rice cultivation, on the extent of prejudice in contemporary societies. We build on recent work that establishes a link between agricultural activities and behaviour (e.g., Bentzen et al. 2017, Buggle 2020, Galor and Özak 2016, Muthukrishna et al. 2021, Oishi 2014, and Putterman and Weil 2010). Notable in this literature, Talhelm et al. (2014) propose, and test, the "rice culture" hypothesis that there are major psychological differences in different regions of China which can be attributed to differences in the importance of paddy farming in those areas. This hypothesis has generated a large and expanding literature that uses more diverse data to explore the role of paddy rice farming on the strength of several norms of behaviour, including democratic norms (Ang et al. 2021), the monitoring of ingroup members (Liu et al. 2019), collectivist culture (Talhelm et al. 2018), social norms (Talhelm and English 2020), and relational mobility (Thomson et al. 2018).

We combine contemporary individual-level survey data on prejudice from the most recent available wave of the World Value Survey (WVS) for China and 12 other Asian societies, with data on the importance of paddy rice farming, measured as the percentage of the total cultivation area devoted to ths crop. We measure prejudice using five questions from the WVS, in which respondents were asked if they would be explicitly opposed to having neighbours who were i) immigrants/foreign workers, ii) homosexuals, iii) people of a different race, iv) people of a different religion, or v) people who speak a different language/dialect. There is a high correlation in the pattern of answers to these questions, supporting the idea of grouping of preferences (Kranton et al. 2020) and, consequently, we use the summation of the answers to these five statements as our summary measure of prejudice.

We first focus on the relationship between prejudice and agricultural technology in China. As others have argued, and we will also show in section 3, China's farming pattern has changed very little over time, reflecting the absence (until recently) of major technical changes in agricultural production since mediaeval times (Perkins 1969, Shiue and Keller 2007). This pattern reflects the fact that, given the large economic returns to growing rice (Buck 1935), this crop is grown wherever natural soil and climatic conditions were suitable. These conditions are summarised by the environmental suitability index for paddy rice (FAO 2010), creating plausibly exogenous variation in the importance of this technology that we employ in order to quantify the effect of paddy rice farming on prejudice.

Our results indicate that people in areas dominated by the production of paddy rice exhibit lower levels of prejudice towards out-group members. Our instrumental variable (IV) estimates suggest that a one percentage point increase in the importance of paddy cultivation leads to a 1.2 percentage point decrease in the five-item measure of prejudice in contemporary China (or 0.7% relative to the sample mean). This magnitude is economically meaningful. For instance, in Jiangsu and Shandong, two adjacent coastal provinces that differ starkly in the levels of prejudice (1.47 for Jiangsu and 2.17 for Shandong on a five-item scale), more than 90% of the difference can be explained by differences in the importance of paddy farming (that accounts for 60% of the cultivated land in Jiangsu, but only 2% in Shandong). These estimates are robust to a large number of sensitivity checks, including the timing of the measurement of the importance of paddy rice, different definitions of the estimation sample (including restricting the analysis to the urban sub-sample, and excluding respondents from provinces where paddy cultivation has a much more recent history) and different ways to measure prejudice.

In section 4, we show that these results are generalizable to other societies in tropical Asia where paddy rice has been historically important and for which WVS data is available. We start by focusing on India where, contrary to China, the importance of paddy rice changes according to longitude (East vs. West), rather than latitude (North vs. South), to show that our conclusion remains unchanged. We then expand this analysis to 12 other societies. Our conclusions are largely unchanged, confirming that the "rice culture" that was initially largely focused on explaining psychological differences in China (Talhelm et al. 2014) is generalizable more broadly across Asian societies. The IV estimates suggest a one percentage point increase in paddy cultivation leads to a 2.35 percentage point decrease in contemporary prejudice on a five-point scale (corresponding to 1.4% relative to the sample mean, an effect that is much larger than the estimates in the Chinese sample). Taken together, our work extends the analysis of the origins of contemporary prejudice to the role of past technology, adding to the small but growing literature that analyses its historical roots (for example, Ananyev and Poyker 2021, Voigtlander and Voth 2015, and Grosjean and Khattar 2019).

An important question that follows from these results is what is special about paddy that may explain this reduction in prejudice. Paddy cultivation is technologically different from other major staple crops because of its higher land productivity (which can be three to five times larger than other major staples, see Buck 1935 and Perkins 1969), the need for irrigation and high labour demand. These technological differences, in turn, demand different institutions and social rules.

On the one hand, high yields created production surpluses, which facilitated the early expansion of grain markets (Brandt et al. 2014, Deng 2000, Shiue and Keller 2007, and Shiue 2014). A large literature suggests that such historical market exchanges, themselves derived from paddy rice's higher land productivity, may represent an ideal setting for profitable and cooperative inter-group contact (e.g., see Brandt et al. 2014, Deng 2000, Shiue 2014, Zelin 1991), which can effectively reduce prejudice (Allport 1954). On the other hand, reliable irrigation and high labour demand in paddy rice farming requires a high level of local cooperation and produce powerful in-group based institutions, which may encourage interaction with in-group members and reduce cooperation with strangers (Henrich and Muthukrishna 2021, p. 230). Studies in such settings demonstrate that effective cooperation takes place within cohesive in-groups, while fostering distrust of ousiders (Alesina and Giuliano 2015; Moscona, Nunn and Robinson 2017).

We use mediation analysis (Imai et al. 2010) with IVs (Dippel et al. 2020) to quantify the relative importance of gretater market integration, on the one hand, and the effect of requiring reliable irrigation and labour demand on creating in-group social norms that reinforce social identity on the other. To proxy historical market integration, we use the extent of paddy market integration in the Qing dynasty (1742-1795). To proxy the role of in-group institutions on creating social norms we use measures of strength of clan, the paramount social organization in pre-modern China and central to sustaining local cooperation (Greif and Tabellini 2017, Watson 1982).

We find that, as expected, the prevalence of multiple clans increases prejudice, consistent with research in psychology that emphasises the role of social identity in promoting in-group favouritism and out-group prejudice (Park and Rothbart 1982, Tajfel et al. 1979). However we find the extent of market integration decreases prejudice. Our results on the importance of markets as a mechanism that leads to the reduction of prejudice is in line both with an old tradition in economic thinking that argues that markets can have a civilizing influence by promoting contact among strangers (Hirschman 1977, 1982), and with seminal work in psychology on the contact hypothesis (Allport 1954), according to which interactions between equal peers in the course of ordinary purposeful pursuits are effective ways to reduce prejudice. Interactions with such characteristics routinely occur in the context of market exchange, suggesting that market expansion can then be seen as a large natural contact experiment.

II. What's Special about Paddy? Technology, Markets and Cooperation

In this section, we discuss the unique technological characteristics associated with paddy rice which may have driven different institutions that, in turn, played a role in mediating the stark differences in contemporary prejudice attitudes between people from areas where paddy is historically important and those where it is not.

A. Paddy's High Productivity and the Early Formation of Grain Markets

Historically, paddy rice yielded three to five times more output than other major staples (Perkins 1969, p19 and p267). Buck (1935) documents that Chinese rice farmers obtained yields of 223 kilograms per mou (666.5 square meters), which is more than three-fold wheat yields (71 kilograms per mou). This difference led to a marketable surplus, fuelling the formation of early grain markets which can be traced back to at least the Song era (960-1279, Brandt et al. 2014, p53). After some erosion, during the Mongol (Yuan) interregnum (1279–1368), the importance of agricultural markets bounced back during the Ming–Qing dynasties (1368-1644) and, from that period to the early twentieth century, as much as 20-40 per cent of China's agricultural output (mainly paddy) was marketed, amounting to about one-sixth to one-third of the country's total GDP (Perkins 1969, p115 and Feuerwerker 1976, p86). More recent evidence by Xing et al. (2000, p170, p180), who estimate the scale of the long-distance grain trade, suggests that perhaps 2.6 million tonnes were shipped each year from southern China to feed the north of the country during the mid-Qing Dynasty (1644–1911). In other words, 30–40 percent of agricultural production of paddy was marketed during the early 20th century (Perkins 1969, p114). In addition, markets for paddy were often bundled with trade in other commodities. Northern merchants frequently exchanged commodities such as cotton and cotton fabrics, silk and silk fabrics, tea, and salt, all of which were also a significant share of internal trade (Rowe 1984, p55).

Who were the main actors in this trade? Unlike the one that is specialized by a specific group of population (e.g., Diamonds and Jewish Merchants, Sosis 2005), actors in ancient China's grain trade were diverse, involving local (petty) traders, brokers, wholesale dealers, itinerant (traveling) merchants, with the bulk of grain (paddy, Shiue 2014, p. 348) circulating in the domestic market likely passing through private hands – peasants, local merchants, and long-distance traders. Ordinary farmers participated regularly and actively in the market by trading a considerable percentage of their output (Deng 2000), and villagers were deeply engaged with markets as many households made daily trips to local markets (Zelin 1991, p38). While grain prices were collected by officials, the government took a relatively hands-off approach to the daily affairs of trade (Shiue 2014). Consequently, in the absence of official restrictions on personal mobility, peddlers and merchants were free to move to profitable locations (e.g., paddy rice farming areas and especially the Yangzi Delta regions, see Brandt et al. 2014, p57). Numerous local organizations of merchants from distant places (huiguan) attest to the importance of commercial sojourning (He 1966). According to Skinner (1964, 1977, p19), imperial China only had around 1,360 counties from the Ming period (1368-1644) to the early twentieth century, but China's multi-regional, multi-layered trading network, clustered in the lower Yangzi region (central and southern parts of the country), consisted of as many as 45,000 market towns, each of which had in its hinterland 15-20 villages on average.

Greater market integration should reflect lower transaction costs and, with that reduction, increased frequency of market exchange greater rewards from trading with strangers from different backgrounds (Buggle 2020, Bowles 1998, Henrich et al. 2010). To the extent that such trade can be characterized as "pleasant and cooperative contact between locals and outsiders engaged in the pursuit of mutually beneficial transactions", it would meet the conditions of Allport's (1954) contact hypothesis which we posit should lower prejudice towards outsiders.

B. Decentralized Irrigation Systems, Labor Demand, and Local Cooperation

Among the major farm crops in China, the ability to manage seasonally abundant water through irrigation has been particularly beneficial to growing paddy rice. Irrigation is a technology that allows agricultural households to achieve three- to five-fold increases in yields (Bray 1986, p. 11). The earliest evidence of the importance of irrigation can be dated back to the Song era (960-1279, Ho 1956 and Sudo 1962). A distinctive feature of the vast majority of Chinese irrigation schemes was that they were relatively small and confined to the village-level (Mann 2012, p. 94). In contrast to large-scale irrigation schemes developed and managed by central authorities, coordination was achieved at the local level without third-party enforcement. Such irrigation schemes are decentralized, reliant on farmers to coordinate with each other not only to decide the sequence of irrigation, the optimal allocation of water and the cycles of wet and dry phases, but also to contribute to the construction and maintenance of the irrigation network (e.g., Aoki 2001, Janssen 2007).

Similarly, another unique technical feature of rice cultivation is its much higher labour demand (Deng 2000), which also heavily relies on local cooperation. Paddy requires twice the number of man-hours to grow as wheat (Fei 1945). Such high labour demand cannot be satisfied by individual households (e.g., Bray 1986, Fei 1945, p65). With the absence of the formal labour market, rice farmers normally set up cooperative labour exchanges (network) to address labour demand (Talhelm and Oishi 2018).

One social solution to the labor problem has been family clans. Family clans are a social organization that includes (some or all of) patrilineal households that trace their origin to a (self-proclaimed) common male ancestor. Clans have been particularly important in facilitating local cooperation in rice villages. Clans had surprisingly broad powers in pre-modern China. County magistrates ruled on civil, commercial, and criminal matters, broad swathes of social life were governed by private customs, and elders from the villages and from clans adjudicated disputes and sanctions (e.g., Chen and Myers 1978).

As Ostrom (1990) has argued, the sustainability of such common-pool resources, and the norms of cooperation that make it possible, require a set of principles, including the central role of monitoring of resource use, rules about contributions and about punishment of free-riders. Norms of cooperation are thought to be easier to enforce among close-knit groups. Clans sustained cooperation among close-knit members and reinforced their sense of belonging (Greif and Tabellini 2017, Watson 1982). Clans also regulated interactions with non-members, strengthenging in-group identities and group-boundaries with strangers. This intuition is consistent with research in psychology that emphasises the role of social identity in promoting in-group favouritism and out-group prejudice (Park and Rothbart 1982, Tajfel et al. 1979), such that the intergroup biases are found higher among natural groups (versus minimal groups, Shayo 2020). These features suggest that people living in paddy rice farming areas will exhibit more prejudice towards out-group members.

C. Summary of Hypotheses

This discussion leads us to state the following hypotheses that we test in the paper:

1) The relationship between paddy rice farming and prejudice will be mediated by the experience of market participation, with exposure to better integrated markets reducing prejudice.

2) The relationship between paddy rice farming and prejudice will be mediated by the strength of clan, such that prejudice will be higher in locations where the local in-group based institution, clan, is salient, which are also those that have historically cultivated paddy rice.

The overall effect of paddy rice farming on prejudice depends on the relative strength of the two channels. Paddy rice farming will lead to lower prejudice if the market integration effect dominates.

III. Data

We use data on prejudice towards out-groups collected as part of the latest available wave of the WVS. Respondents in the WVS were chosen using a random probability sample that is representative of the adult population, and all surveys were conducted using face-to-face interviews in local languages (see Haerpfer et al. 2020 for information of survey design and implementation). In addition to data from China, which we employ in our main analysis, we have data from India and Pakistan (collected as part of the sixth wave of the WVS in 2012); Bangladesh; Indonesia; Japan; Malaysia; Myanmar; Philippines;

South Korea; Taiwan ROC; Thailand; and Vietnam (collected as part of the seventh wave of WVS, in 2018-2020). In total, we have a sample of 19,912 respondents across these societies. We start by describing the data for China, for which we have richer detail in terms of both history and control variables, and then we discuss the data for the other Asian societies.

III.1 China

The unit of observation in the Chinese sample is an individual nested in a province and there are 3,036 individuals nested in 29 provinces (Tibet and Xinjiang were not surveyed by the WVS).

[Table 1. *Summary Statistics (China)*]

A. Outcome Variable

In all WVS surveys, respondents are asked to explicitly state if they opposed having neighbours with each of the following characteristics: i) immigrants/foreign workers, ii) homosexuals, iii) people of a different race, iv) people of a different religion, or v) people who speak a different language/dialect. For each of these questions, respondents answered on a binary scale (yes/no) and we code the indicator that equals one if a respondent was explicitly opposed to having people with each characteristic as a neighbour. At the individual level, 80% of the respondents indicated their opposition to having neighbours with at least one of the listed characteristics.

The data also shows that exhibiting one type of prejudice is highly correlated with exhibiting the remaining others (see Appendix Table A1 for the correlation among the five survey items), which is confirmed by the results of an exploratory Multiple Correspondence Analysis which shows that the first component, in which each answer appears with a positive and similar loading, explains 97% of the variance of prejudice in the Chinese sample (Appendix Table A2). Accordingly, we measure prejudice as the summation among all answers (i.e., the total number of prejudices), with a higher value revealing a more prejudiced individual. Descriptive statistics for this measure of prejudice are presented in Table 1, while Figure 1.A presents evidence of substantial differences in prejudice within China.

[Fig. 1. *Spatial Distribution of Contemporary Prejudice and Importance of Paddy Farming in China*]

B. Explanatory and Instrumental Variables

Similar to previous work (Talhelm et al. 2014), we measure the importance of paddy rice farming in China by the percentage of paddy farming area over the total cultivated area. Values for this variable are presented in Table 1, and graphically presented in Figure 1.B. China's rice farming is centred around the Yangtze River and in the south of the country (where, on average, paddy was grown in 80% of the area) while being virtually absent from provinces in northern China (where less than 5% of the cultivated area is dedicated to this crop and where dryland crops like wheat, corn, and millet are common).

Comparing the distribution of paddy rice farming and prejudice provides suggestive evidence that there is an inverse relationship: areas where paddy is more important (darker areas in Figure 1.A) are also those where prejudice is less prevalent (lighter areas in Figure 1.B). This relationship is strong: the cross-province correlation between the importance of paddy farming and prejudice is $\rho = -0.64$ (p-value < 0.01, N = 29).

The importance of rice is naturally correlated with a potentially large set of variables, some of which are also plausibly linked to prejudice (e.g., disease prevalence; see Faulkner et al. 2004, Navarrete and Fessler 2006, Park et al. 2007). In order to establish a causal relation between agricultural technology and prejudice, we follow Talhelm et al. (2014) and use an index of environmental suitability for growing paddy as a source of exogenous variation in the importance of paddy.

This index is a score that reflects the United Nations Food and Agriculture Organization's (FAO 2010) evaluation of agro-climatic constraints (including precipitation, temperature, wind speed, sunshine duration and relative humidity) and agro-edaphic suitability (reflecting soil limitations and prevailing topographic conditions) for paddy farming. The index ranges from 0 to 100, with a higher value indicating a higher suitability for growing paddy rice (versus cultivating other crops) and, importantly, it does not reflect whether rice is being produced or not. Some descriptive statistics are presented in Table 1, while Figure 1.C suggests that, reflecting its economic advantages, paddy is grown wherever it can be grown: land suitability for growing paddy and observed importance of paddy farming are strongly correlated across regions in China ($\rho = 0.86$, p-value <0.01, N=29). As Figure 1.D shows, our instrumental variable is also negatively correlated with prejudice ($\rho = -0.56$, p-value < 0.01, N=29).

Although we will be using data on the importance of paddy rice for a relatively recent period in time (1996, the earliest year for which official data is available for all of China), the available evidence suggests that the importance of this crop has changed very little over time. This stability of the importance of paddy cultivation is confirmed by the very high correlation between the importance of paddy in 1996 and the age of the earliest archaeological rice relics, some of which date back to 10,000 years ago, which proxy for the historical importance of this crop (Molina et al. 2011, Purugganan and Fuller 2009), as presented in Figure 2.A ($\rho = 0.79$, p-value < 0.01, N = 19). The early 20th century is the earliest period for which we have available information on the importance of paddy, as documented by Buck (1935) who presents measures of both rice and total grain acreage for 23 provinces for the period 1914 - 1918. As shown in Figure 2.B, the correlation between the importance of rice in 1996 and 1914-1918 is again very high ($\rho = 0.95$, p-value < 0.01, N = 23), and it remains unchanged even after large economic and political transformations, such as the land reform movement in the late-1940s, in which land was confiscated and redistributed to smallholders. The correlation between the importance of rice area in 1996 and 1953, when land reform in most parts of mainland China was completed, continues to be extremely high ($\rho = 0.93$, p-value < 0.01, $N = 25$, see Appendix Figure A1).

[Fig. 2. *Evidence for the Stability of the Importance of Paddy Rice Farming in China*]

This evidence reflects both the absence of substantial technological progress in Chinese agriculture until the late 20th century (Perkins 1969, Shiue and Keller 2007) and the fact that several of the variables that shape rice suitability are remarkably stable in China (and, more generally, in tropical Asia), as shown in Giuliano and Nunn (2021). Importantly for the our argument, linking paddy cultivation and prejudice, Giuliano and Nunn (2021) argue that such environmental stability creates the conditions for cultural persistence. As we will also show, the interpretation of our results as reflecting a link between past agricultural technology and contemporary prejudice is strengthened by several robustness tests, including (1) using data on both the age of the archaeological relics of rice and the importance of this crop in 1914-18 (instead of 1996), (2) excluding from the analysis three provinces (Heilongjiang, Jilin and Liaoning) in north-eastern China where the history of paddy production is much more recent and where, consequently, its link with an historical interpretation of our variable of interest is presumably lower and (3) restricting the analysis to the subsample of urban respondents (who don't cultivate paddy).

C. Covariates

In addition to data on prejudice, the WVS contains information on the respondents' age, gender, education, income, marital status, religiosity, and urban residency. Descriptive statistics for the individual characteristics are provided in Table 1. One notable feature of the Chinese data is that all respondents were born, and live, in the province where they were interviewed. The absence of population movements naturally allows us to establish a stronger link between the effect of historical importance of paddy and contemporaneous attitudes.

In addition to the inclusion of individual-level demographic controls, we also have data on a large set of covariates which have been found to be important correlates of prejudice and that are also plausibly linked to the importance of paddy rice. Information on these covariates is also presented in Table 1.

These include measures of economic development (Krosch and Amodio 2014), including both (log) GDP per capita and educational achievement in 2012 as well as other measures of modernization (settlement types, mean size of local communities, and the number of jurisdictional hierarchies beyond the local community) all measured for the pre-industrial ancestors of the current population (Buggle 2020, p. 158). We also control for demographic characteristics, including ethnic heterogeneity through a measure of the share of the Han ethnic population, which, it has been argued, is associated with prejudice in China (Bai et al. 2020, Winter and Zhang 2018) and the share of the urban population (Gu et al. 2016, Nielsen et al. 2006, Nielsen and Smyth 2011). In addition to contemporary data on these variables, we also collect lagged values of the same variables to account for the possibility of a lag between cultural evolution and other changes (see Grossmann and Varnum 2015 for a discussion).

A large literature has also argued that the prevalence of epidemics and violence can be an important factor associated with prejudice, as they create an environment which increases fear of out-groups (Faulkner et al. 2004, Navarrete and Fessler 2006, Park et al. 2007). We control for these factors using measures of pathogen morbidity, famine death rate, warfare and rebellion.

We also control for the importance of agricultural area and of irrigation activities, to ensure that our results indeed reflect a tradition of paddy rice farming, rather than general differences in the importance of either farming or irrigation (e.g., Buggle 2020). Finally, our results are also robust to the inclusion of a large set of geographic variables, addressing concerns that climate leaves imprints on personality (Van de Vliert et al. 2013, Van de Vliert 2017).

III.2 Other Asian Societies

Summary statistics for the other Asian societies, based on the WVS, are presented in Table 2. As in China, we observe large differences in average prejudice, which are shown in Figure 2.A).

[Table 2. *Summary Statistics (Asia)*]

The importance of paddy rice farming is measured by harvested area dedicated to irrigated wetland rice as a percentage of cereal cultivation in each society in 1998 (FAO 2010). There is considerable heterogeneity in the importance of irrigated weland rice ranging from more than 85% (Japan) to less than 20% (Pakistan). The inverse correlation between irrigated wetland rice and prejudice is strong, although the small sample leads to noisy estimates ($\rho = -0.57$, p-value = 0.11, N=12). Finally, consistent with the evidence from China, the suitability and adoption of paddy rice, is highly correlated across the 12 societies ($\rho = 0.68$, p-value = 0.02, N=12, see Figure 2.C) as is the negative correlation between prejudice and rice suitability ($\rho = -0.63$, p-value = 0.03, N=12, see Figure 2.D).

[Fig. 3. *Spatial Distribution of Contemporary Prejudice and Importance of Paddy Farming in Asia*]

We have less information on covariates with prejudice for these 12 societies than for China. We control for economic prosperity (proxied by the human development index in 1998, which jointly evaluates a society's life expectancy, education, and income per capita); demographic characteristics (proxied by ethnic fractionalization in 1997); the historical prevalence of epidemics and violence (proxied by the historical disease prevalence index and the number of episodes of historical warfare during the period from 1918 to 2001). We also control for the importance of agricultural area and of irrigation activities.

IV. The Relationship between Paddy and Contemporary Prejudice in China

A. Main results

We begin the analysis of the relationship between agricultural technology and prejudice in China by using ordinary-least-squares (OLS) to estimate the following statistical model:

$$Prejudice_{i,p} = \alpha + \beta PaddyRice\%_p + X'_{i,p}\delta + X'_p\theta + \epsilon_{i,p} \quad (1)$$

where $Prejudice_{i,p}$ is the summation of prejudice attitudes towards five groups of people by individual i living in province p; $PaddyRice\%_p$ represents the importance of paddy cultivation; the vector $X'_{i,p}$ includes a set of individual-level controls and the vector X'_p includes covariates at the provincial level. We allow for the possibility of within-cluster correlation of residuals ($\epsilon_{i,p}$), and adjust all standard errors for potential clustering at (1) the level of the province (the most aggregate and, consequently, the most conservative estimates); (2) the level of primary sampling unit (PSU) to take into account the survey design of WVS (Abadie et al. 2017 and Deaton 2015), and (3) to account for two-dimensional spatial autocorrelation using the approach proposed by Conley (1999), assuming a window with weights equal to 1 for observations that are less than one degree apart in both latitude and longitude (and 0 otherwise). To account for the relatively small number of clusters in this study, all significance levels are adjusted using the wild-bootstrap approach proposed in Cameron et al. (2008), with 5000 replications.

[Table 3. *Paddy and Prejudice: Main Results in China*]

The OLS estimates are presented in Table 3, where column (1) presents the estimates with no controls and column (2) presents the estimates with the full set of controls discussed above (individual characteristics and provincial controls). On average, greater importance of paddy rice farming is associated with lower prejudice: the estimate without any controls (Column 1) suggests that a one percent point increase in paddy rice farming area (over the total cultivation area) is associated with a 0.88 percent point decrease in prejudice on the five-item scale (0.5% relative to the sample mean). The inclusion of additional controls increases the magnitude of the estimated association between paddy rice farming and prejudice by 30%, with a one percent point increase in paddy rice farming area associated with a 1.15 percent point reduction prejudice on the five item scale (Column 2). In both columns (1) and (2), our conclusions are robust to different assumptions about the nature of the correlation of the error term.

These results do not have a causal interpretation. It is possible, for example, that groups that were initially less prejudiced were more willing to cooperate and to develop the infrastructure that made paddy farming possible, hence, creating a reverse causality problem. However, as previewed in Figure 1.C), and formally shown in Table 3 (Column 3, Panel B), paddy's importance is largely determined by stable ecological factors. That farmers grow rice wherever rice can be grown creates exogenous variation in the importance of this crop that is strong enough to allow us to estimate the causal impact of agricultural technology on prejudice. The IV estimates are larger in magnitude than the OLS estimates, suggesting that the OLS estimates are a lower bound to the causal effect of paddy on prejudice, although the difference is not very large, suggesting that the set of controls included in column (2) are capable of reducing the importance of unobserved confounders. The IV estimate suggests that a one percent point increase in historical paddy cultivation leads to a 1.2 percent point (0.7% relative to the sample mean) decrease in prejudice in contemporary China.

B. Robustness Checks

We present various checks on our conclusion that paddy rice farming causes prejudice to be lower in China. The substantive interpretation of the relationship between agricultural technology and prejudice relies on the historical nature of the importance of this crop and its persistence through time. We start by showing that our conclusions are robust to two major changes in our identification strategy that seek to capture cultural persistence. The first is to measure the importance of paddy rice, using either data on its share of agricultural area in 1914-1918 or based on the date of the earliest archaeological relics for this crop.

The second consists of redefining the estimation sample in ways that plausibly reflect the importance of this crop on cultural norms. Firstly, we exclude regions with a more recent history of paddy cultivation, in which the effect of technology on prejudice would be expected to be smaller. Secondly, we limit the sample to neighbouring provinces along the Yang-tze river that exhibit a pronounced discontinuity in the importance of paddy. Finally, we limit the analysis to the urban subsample, where respondents are not contemporaneously involved in agricultural production. In all cases, our conclusions about a negative causal relationship between the importance of paddy rice farming and prejudice is either unchanged or strengthened. Finally, we also show that our conclusions are robust to alternative ways of measuring prejudice, the use of historical control variables, and the inclusion of a large number of geographical covariates.

Alternative Ways of Measuring the Importance of Paddy Rice Farming. In our main results we use data on paddy rice farming from 1996 because it is the earliest official data and provides the widest geographical coverage (29 provinces). A large literature argues that agricultural technology and China's rice farming pattern are largely unchanged since the late Middle Ages (e.g., Perkins 1969, and Shiue and Keller 2007, p. 1195). The relationships shown in Figure 2 are consistent with this argument. Hence, although the estimates presented in Table 3 rely on relatively contemporary data on the importance of paddy rice, it seems that employing relatively recent data on the importance of paddy rice farming may be a good proxy for the historical importance of the crop.

In Table 4 we examine whether our estimates are robust to using data on the importance of paddy rice farming in 1914-1918 (Column 1) and on the earliest archaeological evidence of the presence of rice in a province (Column 2). The disadvantage of relying on historical data about the importance of paddy rice farming is that we have data on fewer provinces. We have data for 23 provinces in 1914-1918 and for 19 provinces for the archeological relics. In addition, the validity of our instrument (paddy suitability) relies on the additional assumption that there were no substantial changes in its relevance through time and when it was measured (1960-1990). Given what is known both about technological stagnation in Chinese agricultural production, the stability of climatic conditions in China (see, for example, Giuliano and Nunn 2021, p1551-1552 for a discussion of the lack of variation of these variables in China over time), and the relationship between the age of archaeological evidence and environmental suitability (Purugganan and Fuller 2009), this assumption seems reasonable.

[Table 4. *Alternative Measurements of the Importance of Paddy: China*]

The results confirm that contemporary prejudice is lower in regions in which paddy rice has been historically more important, reinforcing the conclusion that the estimates presented in Table 3 reflect a *persistent effect* of technology on prejudice. They also suggest that our earlier estimates of this effect, obtained using the 1996 data and including regions with a more recent history of paddy cultivation, are relatively conservative, and may provide a lower bound to the effect of this relationship.

Another way of honing in on the historical importance of paddy rice farming is to use the 1996 data, but exclude respondents from the three north-eastern provinces (Liaoning, Jilin, and Heilongjiang, see Appendix Figure A2 for the map), where the history of paddy production is much more recent. Modern technology has allowed farmers in these provinces to farm rice in ways that are quite distinct from more traditional areas, including a greater use of e-commerce and more efficient water allocation systems (Barker 2004, Barker et al. 2014, Barker and Molle 2004). Moreover, the absence of a long history of paddy rice farming in this region means that the link between growing paddy rice and culture is naturally less clear. Excluding these three provinces from the analysis leads to IV estimates of the effect of paddy on prejudice that are slightly larger than for the full sample (see Table 4, Column 3).

Different Ways of Constructing the Estimation Sample. The importance of paddy rice in China exhibits a pronounced discontinuity between provinces on different margins of the Yang-tze River (see Appendix Figure A3 for the map). Limiting the analysis to the ten provinces that border the Yang-tze River provides an additional source of identification of the effect of this technology on the attitudes of respondents. The provinces differ starkly in the importance of paddy rice farming, with the share of paddy farming being lower in provinces north of the river. However, given their geographical proximity, it seems reasonable to assume that other potential correlates with prejudice, such as the degree of economic prosperity, would be very similar across all of the provinces.

We also restrict our sample to urban residents. Although most of the urban population in modern China have never farmed for a living, if cultural differences are, in fact, rooted in past agricultural technology we should expect to find an effect of the importance of paddy rice farming on prejudice among urban residents that is similar to the one identified in rural areas.

The sub-sample estimates are presented in Table 5. The results using data for the 10 provinces bordering the Yang-tze River are qualitatively consistent with those obtained when using the full sample, although the magnitude is relatively lower. The estimates from the sample for the urban population are similar in magnitude to those obtained when using the full sample, suggesting that it is exposure to a "rice culture", rather than paddy farming itself, that is driving our results.

[Table 5. *Different Redefinitions of the Estimation Sample: China*]

The Use of Lagged Data on Covariates. The plausible existence of a lag between cultural evolution and other changes (e.g., economic development, see Grossmann and Varnum 2015) makes historical values of several variables better predictors of cultural differences than more contemporarneous ones (Thomson et al. 2018). As a further check on our main results, when feasible, we replace the relatively contemporaneous values of several covariates, used in Table 3, with their lagged equivalents (GDP, population educational achievement, ethnic diversity, share of urban population and disease prevalence). As reported in Appendix Table A3, this does not meaningfully change our conclusions.

The Use of a Single-Item Prejudice Item In Appendix Table A4, we replace the five item measure of prejudice with each of the five single-item indicators. We find that the estimated effects of farming paddy appear to be stable across the five types of prejudice (~20% of the estimated effect in Table 3, except for prejudice towards immigrants/foreign, which is relatively lower).

Paddy Effect is Independent of Geographical Factors. One may be concerned that our IV (paddy suitability) could be correlated with other geographic characteristics that may influence prejudice through alternative channels. To address this concern, we further control for a plethora of observable covariates, including a province's climate (average temperature, average rainfall and proportion of land in arid and tropical climates), soil (terrain ruggedness) and geography (distance to rivers, coastal province, altitude, latitude and longitude). The results in Appendix Table A5 suggest that the IV estimate in Table 3 is robust to the inclusion of these environmental covariates.

V. Beyond China: The Relationship between Paddy and Prejudice in India, and 12 other Asian Societies

In this section, we present evidence that this relationhip is valid outside of the country in which the importance of "rice culture" was first discussed and holds in a large number of Asian societies, which together represent approximately 50% of the world population.

We start by focusing on India where, contrary to China, the importance of paddy rice changes according to longitude (East vs. West), rather than latitude (North vs. South). The results in Table 6 show that our conclusion regarding the negative causal relation between the importance of paddy farming and contemporary prejudice remains unchanged (see also Appendix Figure A4 for the spatial distribution of prejudice and paddy farming).

[Table 6. *Paddy Rice and Prejudice: Main Results in India*]

We then expand the analysis to estimate the effect of paddy rice farming on current levels of prejudice in 12 tropical Asian societies. Our estimates, reported in Table 7, show that paddy rice farming has a causal negative effect on our measure of contemporary prejudice across all specifications. Similar to the estimates for China, the IV estimate is always larger in magnitude than the OLS one. The effects are important: a one percent point increase in paddy cultivation leads to a 2.35 percent point decrease in contemporary prejudice, measured on a five point scale (1.4% relative to the Asian sample mean, Column 3). The magnitude of this estimated effect is nearly double that for China.

[Table 7. *Paddy Rice and Prejudice: Main Results in Asia*]

VI. Explaining the Effect of Paddy on Prejudice: Markets and Local Cooperation

We now turn to the analysis of the mechanisms that may explain why a history of paddy rice cultivation may have affected attitudes towards others in China. The first mechanism that we examine is the role of local cooperation, stemming from the irrigation and high labour demand needs of paddy rice farming. Given that clans were central to managing intensive cooperation at the local level in premodern China, we measure local cooperation using data on the strength of lineages (clans), proxied by the number of genealogies per capita in each province. This data was compiled in the Ming (1368-1644) and Qing (1644-1912) dynasties, as recorded in *Zhongguo Jiapu Zongmu* (A Comprehensive Catalogue of Chinese Genealogy), and provided in Chen et al. (2020). Genealogy is a good proxy for clan strength because "it is essential to the existence of a lineage and of the sense of belonging [and] hence of …. in-group identity" (Bol 2008, p241). Thus, a larger number of genealogies correspond to stronger clans and stronger in-group preferences (see also Cao et al. 2022 for a similar argument).

The second mechanism that we examine is the the earlier development of grain markets, plausibly reflecting paddy's high yields and the creation of a market surplus. The strength of this development can be quantified by the extent to which different markets are integrated. We benefit from the existence of a comprehensive dataset for rice prices, collected twice per year over the period 1742-1795 in all 121 prefectural markets of the ten central/south-central provinces (see Figure A5), and used in Shiue and Keller (2007) to compare the actual performance of markets (i.e., market integration) in China and Western Europe in the preindustrial period (see also, Keller and Shiue 2007, 2021, and Shiue 2002). By the late eighteenth century, about 120 million people (approximately 60% of China's population at the time) lived in these ten provinces. Although this is the area where rice is the most important crop (over 50% of the area), there are large differences in the degree of market integration, from regions that are almost completely integrated in the rice market (Guangdong, Jiangsu, Zhejiang) to those where market integration is substantially less developed (Guizhou). The maximum distance between any two markets in our sample is about 1,850 kilometers.

We quantify market integration by estimating the extent to which rice prices in one market co-move with the prices in another market. The strength of that relationship is quantified using the Johansen-Juselius co-integration rank test (Johansen 1988; Johansen and Juselius 1990) for all possible (9,395) pairs of prefectural markets over the period 1742-95. The test suggests cointegration when the estimated trace statistic is higher than a critical value (12.53 in this study), and the two series are then said to share a common stochastic long-run trend (i.e., the market pair is integrated). On average, as shown in the Appendix Table A6, 80.61 percent of market pairs in our sample are integrated, with a higher proportion of integrated markets in the Jiangsu and Zhejiang provinces (where more than 90 percent of market pairs are integrated) and lower in Guizhou province (where only 45 percent of the market pairs are integrated).

We quantify the relative importance of these two mechanisms using causal mediation analysis (Imai et al. 2010) in IV regressions (Dippel et al. 2020), estimating the following two equations:

$$M_p(t) = \alpha_m + \beta_m T_p + X'_{i,p}\delta_m + X'_p\theta_m + \epsilon_{m,i,p} \quad (2)$$

$$Y(t,m)_{i,p} = \alpha + \beta T_p + \gamma M_p + X'_{i,p}\delta + X'_p\theta + \epsilon_{y,i,p} \quad (3)$$

where $Y_{i,p}$ stands for our measure of prejudice, $X'_{i,p}$ and X'_p denote the observed covariates at the individual or province level, respectively, M_p stand for each of the proxies for the mechanisms that lie in the causal path between paddy cultivation and prejudice, and T_p is a treatment variable that measures the historical importance of rice. When both equations are estimated using OLS, the effect of the policy via the mediator or average mediator effect (AME) is equivalent to $\beta_m\gamma$, the product of the coefficient on the treatment variable in equation (2) and the coefficient on the mediator in equation (3).

A causal interpretation of AME requires a random allocation of treatment, which is not the case here. Hence, we use the IV approach to mediation analysis presented in Dippel et al. (2020) to obtain the Average Causal Mediated Effect (ACME) of each of the mechanisms discussed above, in which our IV is the environment suitability index for growing paddy rice. Estimates can be interpreted as causal if we assume sequential ignorability. This assumption implies $\text{corr}\left(\epsilon_{m,i,p}, \epsilon_{y,i,p}\right) = 0$, in which a nonzero correlation implies a violation of the assumption and can be interpreted as the existence of an unobserved confounder (that must causally precede T_p) that matters both for the mediator and the outcome even after conditioning on the treatment variable T_p and observed covariates $X'_{i,p}$ and X'_p. While this assumption cannot be directly tested, controlling for factors that may be confounded with both the mediator and the outcome variable helps alleviate this concern.

Given the historical nature of the data we are only able to control for a smaller set of covariates. We choose four controls that naturally correlate with market integration and also potentially affect prejudice: distance to the nearest river and if the province is on the coast (Shiue 2002), an index of floods and droughts in the Ming and Qing periods (e.g., see a recent review by Henrich and Muthukrishna 2021, p. 224) and the prevelance of warfare in the Qing dynasty (e.g., see Keller and Shiue 2021, Turchin 2016). In addition, the point estimates in this sub-sample, having controlled for covariates, is similar to the one obtained when using the full sample, which may bring a degree of validity to estimation.

As our measure of the importance of paddy rice farming, we use the date of the oldest archaeological relic of rice. Although this choice of treatment variable has the obvious advantage that it predates the data on clan strength and market integration, it forces us to exclude three provinces (Guangdong, Fuzhou, Jiangxi), given that data on the age of rice relics is not available for these provinces. However, a comparison of the ATE estimated in the remaining seven provinces and those obtained when using all 19 provinces for which we have data on historical relics suggests that there are no substantive differences between the two samples (see Appendix Table A7).

[Table 8: *Mediation Models: Quantifying Mechanisms*]

The results of the mediation analysis are presented in Table 8. While clan strength and market integration are both greater in areas in which paddy rice has a stronger historical presence (Panel A), consistent with our hypotheses set out in Section II, the two mechanisms operate in opposite directions (Panel B). Greater market integratin has a negative effect on prejudice, while more extensive clans increase prejudice. Panel C summarizes the estimates, in which ACME refers to how much of the ATE can be attributed to a mediator variable, while the average direct effect (ADE) refers the residual that includes the effect of other potential pathways. The ACME for market integration is about five times larger than the ACME for clan strength, suggesting market integration has a much stronger effect on the overall relationship between paddy rice farming and prejudice, which is consistent with the overall effect being negative. The results using single-item measures of prejudice as the outcome variable (rather than the five item measure of prejudice used in the main analysis), reported in Appendix Table A8, are largely consistent with this analysis.

Finally, it is also possible that two mediators in our study are correlated with each other, violating the assumption that mediators should be independent from each other. We therefore follow Imai and Yamamoto (2013), who extend the mediation analysis to multiple mediators, and estimated a varying coefficient linear structural equations model as follows:

$$M_{i,p}(t,w) = \alpha_m + \beta_m T_p + \zeta_m W_{i,p} + X'_{i,p}\delta_m + X'_p\theta_m + \epsilon_{m,i,p} \quad (4)$$

$$Y(t,m,w)_{i,p} = \alpha + \beta T_p + \gamma M_{i,p} + \zeta W_{i,p} + X'_{i,p}\delta + X'_p\theta + \epsilon_{y,i,p} \quad (5)$$

where $W_{i,p}$ stands for the alternative mediator. The ACME estimates for the two competing explanations are presented in Appendix Table A9. The conclusions remain unchanged, and the results further reinforce our conclusion that the two mechanisms operate in opposite directions, in which market integration reduces prejudice, while in-group based clans increase prejudice.

VII. Discussions

> "The freedom to exchange words, or goods, or gifts does not need defensive justification in terms of there being favorable but distant effects; they are part of the way human beings in society live and interact with each other" (Sen 2000, p.6)

This paper identifies premodern paddy rice farming as a historical antecedent of prejudice attitudes, expressed through choices on who is disliked as a neighbor. By combining individual-level data on prejudice with data on the importance of paddy rice farming, we document that people in historical paddy rice farming areas exhibit a lower level of prejudice towards outgroup members today. This relationship is driven by historical exposure to market participation, plausibly reflecting paddy's higher land productivity, and the creation of marketable surplusese on which the development of grain markest was built.

While there is little surprise in economists defending markets (irrespective of its need), our conclusions suggest an historical parallel between exchanges of goods and words, also noticed in classical interpretations that lauded markets as a civilizing influence. In our context, markets seem likely to have been capable of promoting understanding between different parties. In that respect, they shared important similarities with contact between out-group members, as envisaged in Allport (1954): purposeful, routine and mutually beneficial exchanges.

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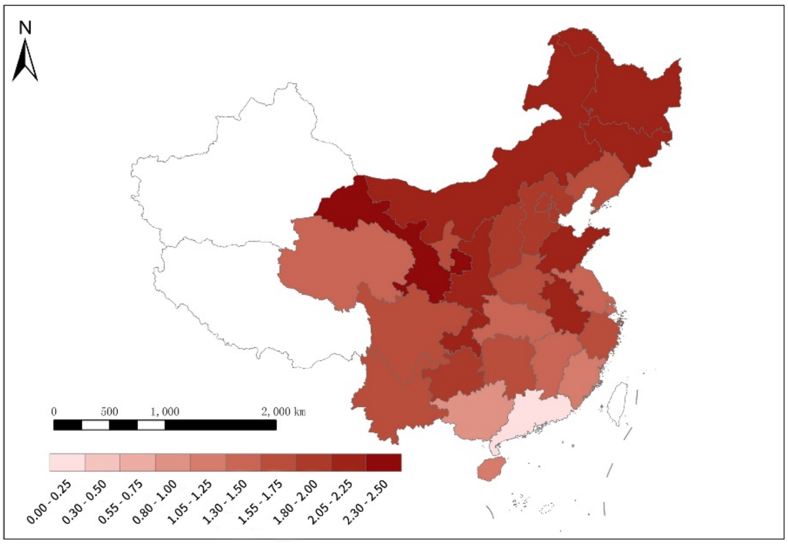
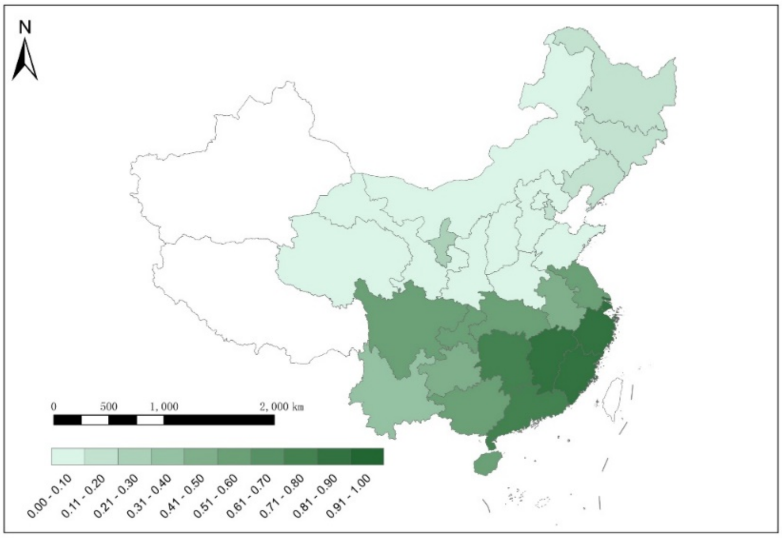
Figures and Tables

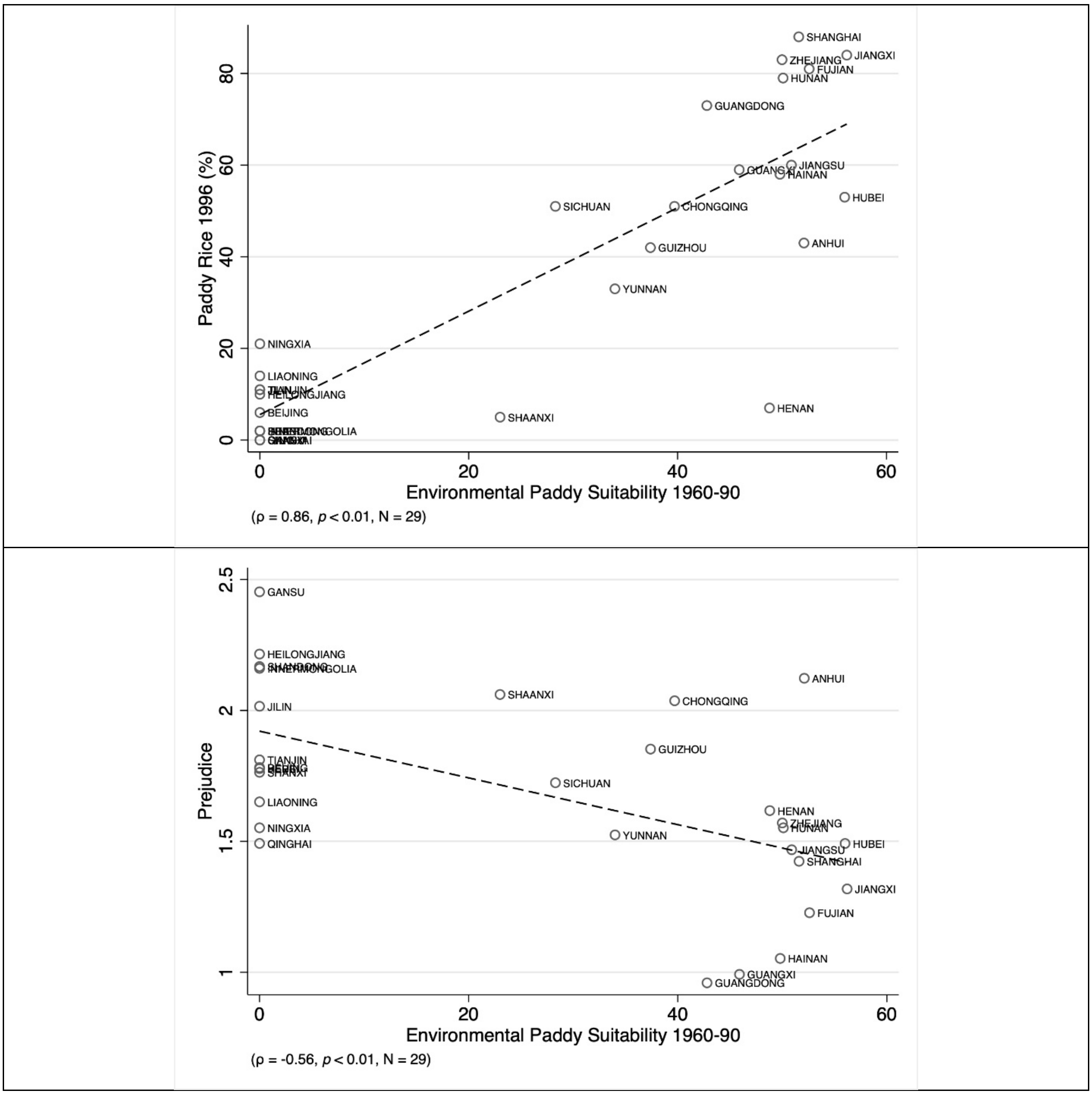
Fig. 1. *Spatial Distribution of Contemporary Prejudice and Importance of Paddy Farming in China*

Prejudice



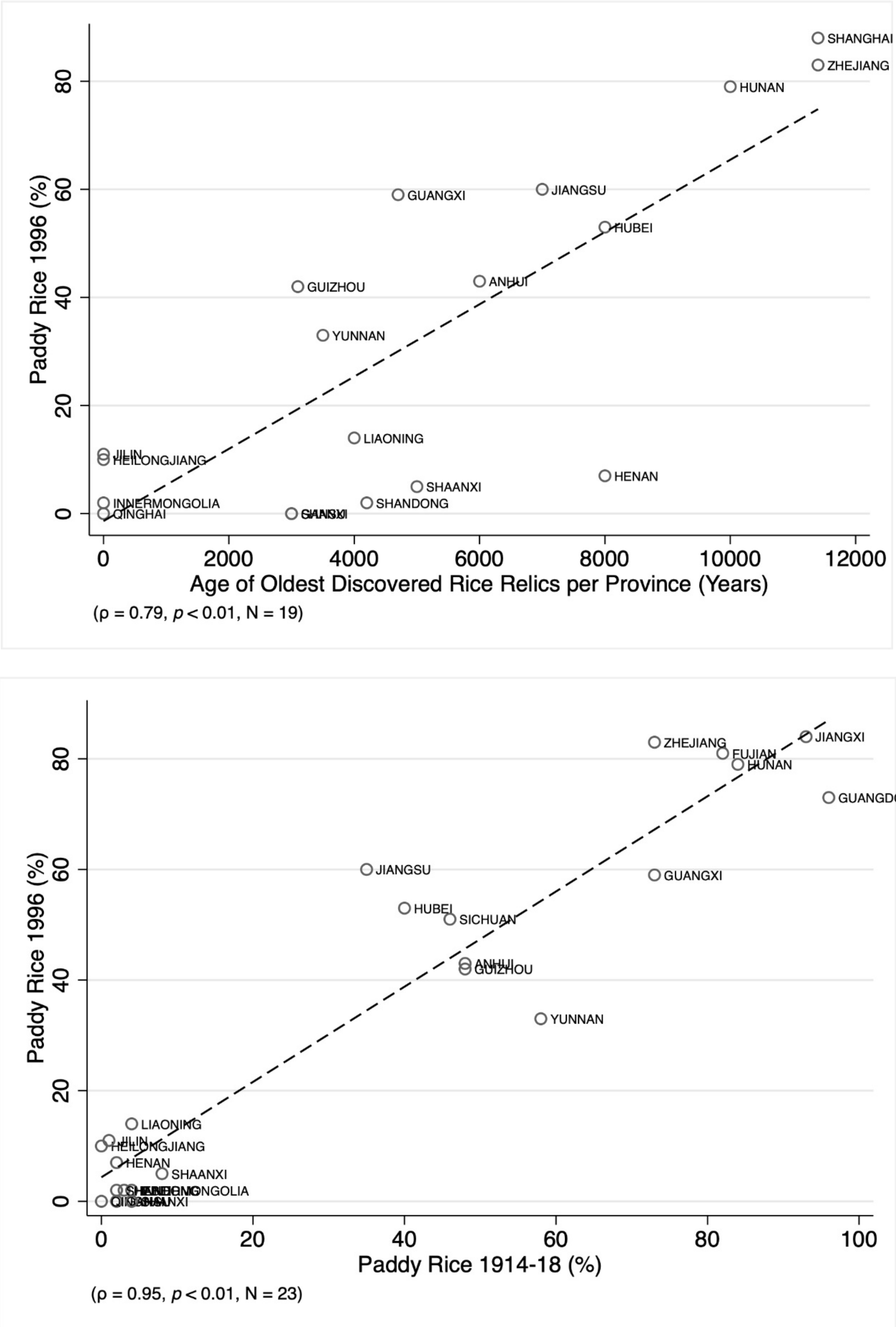
Paddy Cultivation





Notes: Prejudice is measured as the summation of the answers to five questions on characteristics that respondents oppose to have in their neighbours. Importance of paddy farming is measured by the percentage of cultivated land devoted to rice paddy. Darker areas indicate stronger prejudice (panel A) or importance of paddy (panel B). The environmental paddy suitability (IV) is a z score that reflects the United Nations Food and Agriculture Organization's (FAO 2010) evaluations of historical agro-climatic constraints and agro-edaphic suitability for paddy farming. Two provinces in China (Tibet and Xinjiang) are not included, as they were not surveyed by the WVS.

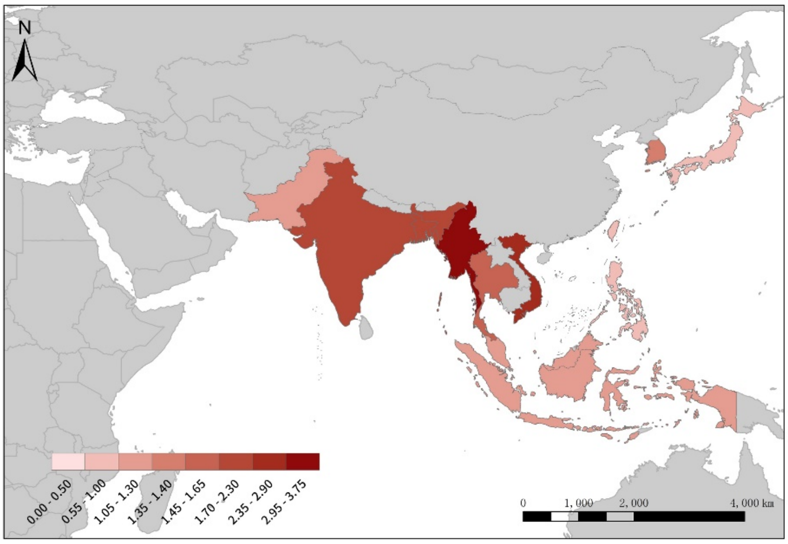
Fig. 2. *Evidence for the Stability of the Importance of Paddy Rice Farming in China*



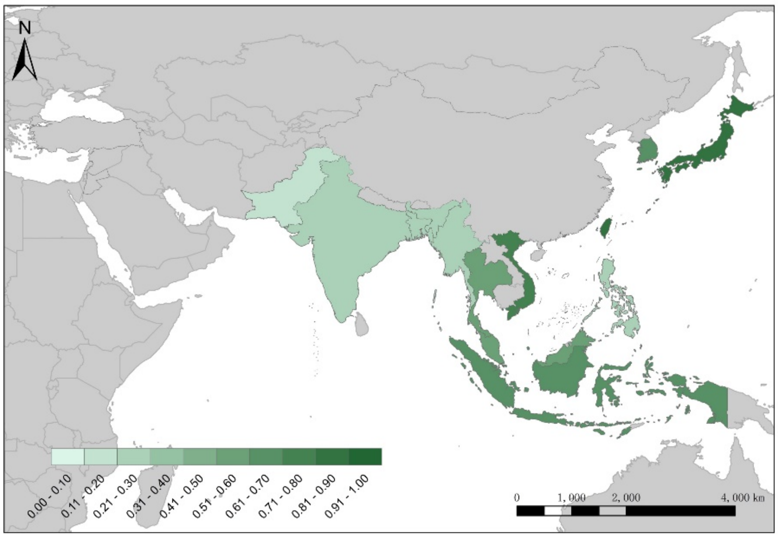
Notes: Importance of paddy farming (either 1996 or 1914-18) is measured by the percentage of cultivated land devoted to rice paddy.

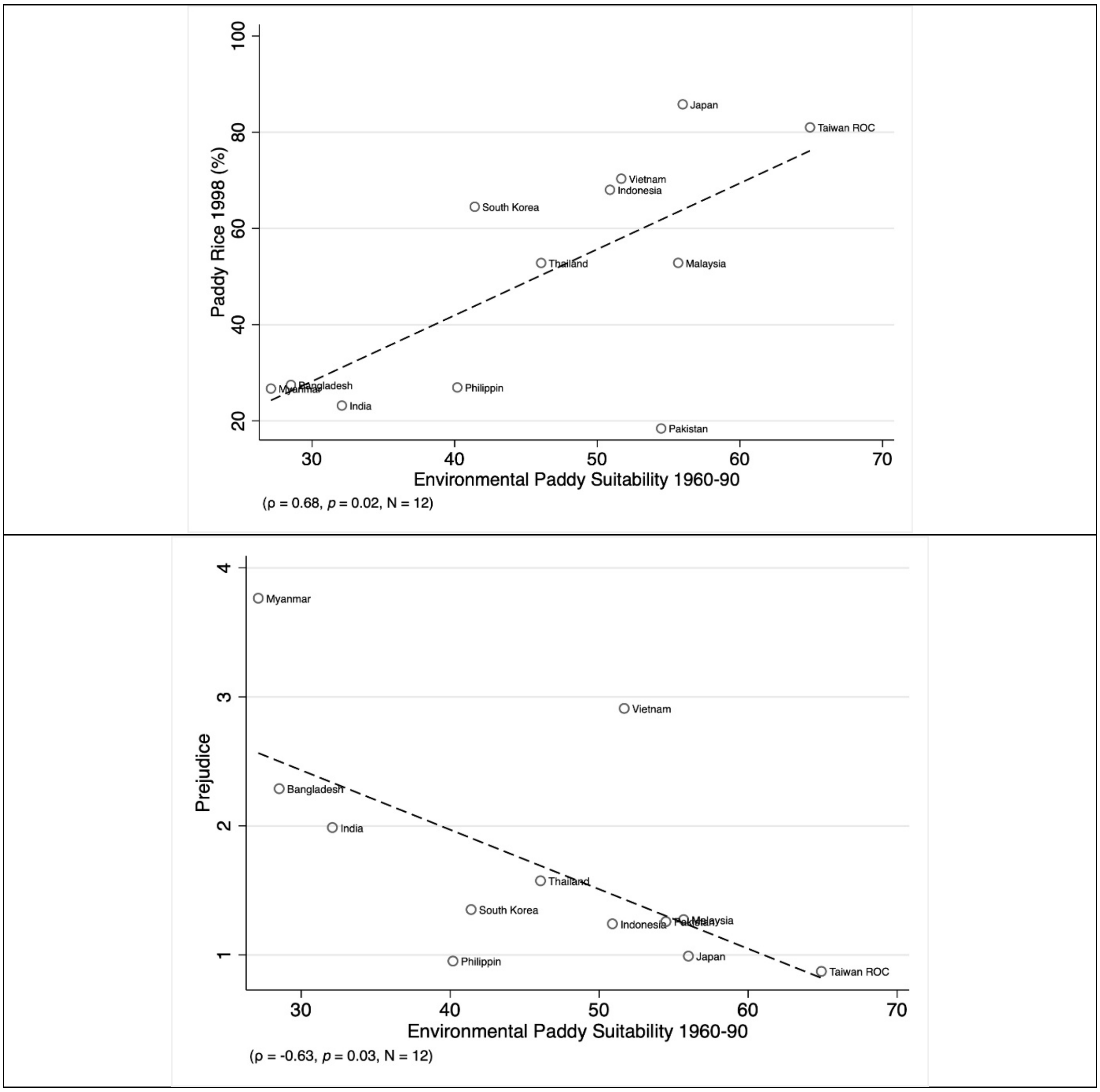
Fig. 3. *Spatial Distribution of Contemporary Prejudice and Importance of Paddy Farming in Asia.*

Prejudice



Paddy Cultivation





Notes: Prejudice is measured as the summation of the answers to five questions on characteristics that respondents oppose to have in their neighbours. Importance of paddy farming is measured by the percentage of cereal cultivation land devoted to irrigated wetland rice. The environmental paddy suitability (IV) is a z score that reflects the United Nations Food and Agriculture Organization's (FAO 2010) evaluations of historical agro-climatic constraints and agro-edaphic suitability for paddy farming. Darker areas indicate stronger prejudice (panel A) or larger importance of paddy (panel B).

Table 1. *Summary Statistics (China)*

Variables	Variables Definition	Observations	Mean	S.D.	Data Sources
Prejudice	Opposing immigrants/foreign workers (=1)	2,915	0.264	0.441	A
	Opposing homosexuals (=1)	2,934	0.716	0.451	A
	Opposing a diff. race (=1)	2,914	0.187	0.390	A
	Opposing a different religion (=1)	2,912	0.309	0.462	A
	Opposing a different language/dialect (=1)	2,915	0.187	0.390	A
	Prejudice	2,924	1.656	1.434	A
Explanatory variable	% paddy fields area/cultivated area 1914-18	2,701	34.53	35.33	B
	% paddy fields area/cultivated area 1996	2,974	34.93	31.01	C
	Earliest date of archaeological relics for paddy (1,000 years)	2,151	5.64	3.12	D
Instrumental variable	Environmental suitability for growing wetland rice, 1960-1990	2,974	31.31	22.24	E
Mediators	Market integration (%)	700	82.76	12.59	M
	Clans (per capita)	700	2.674	1.051	F
Individual-level controls	Age	2,974	44.53	14.48	A
	Male (%)	2,974	44.92	49.75	A
	Urban (%)	2,974	61.63	48.64	A
	Religiosity (%)	2,974	14.29	35.00	A
	Married (%)	2,956	79.91	40.08	A
	Born here (%)	2,957	100	0	A
	Educational level (1-3)	2,945	1.675	0.817	A
	Income level (1-3)	2,949	1.657	0.528	A
Provincial-level controls	GDP 1996 (1k, RMB)	2,974	5.036	2.671	C
	GDP 2012 (1k, RMB)	2,974	42.76	15.55	C
	College graduated 1990 (%)	2,974	1.996	1.635	C
	College graduated 2015 (%)	2,974	14.58	5.490	C
	Urban population 2001 (%)	2,974	37.59	13.84	C
	Urban population 2017 (%)	2,974	58.81	9.162	C
	Han nationality 2000 (%)	2,974	92.25	12.30	C
	Han nationality 2010 (%)	2,974	92.20	12.10	C
	Pathogen morbidity 2000 (average % for 20 human-transmitted diseases)	2,974	8.718	2.990	G
	Pathogen morbidity 2017 (average % for 20 human-transmitted diseases)	2,974	2.211	0.709	G
	Famine Death (%) 1960	2,974	15.32	14.30	H
	# of historical warfare (1644-1912)	2,974	1.572	2.446	I
	Historical rebellion index (1644-1912)	2,974	0.0857	0.510	I
	Cultivation land 2000 (% of cultivated land)	2,974	23.62	13.65	C
	Irrigated land 1999 (% of cultivated land)	2,974	33.18	8.931	C
	Distance from Beijing (capital of China, km)	2,974	1342.9	761.5	J
	Distance to river (inland waterways, km)	2,974	117.9	91.80	K
	Coastal province	2,974	177.1	114.3	M
	Average temperature (average high, low in January and July)	2,974	15.11	4.645	L

Latitude (Average of northernmost and southernmost province latitude)	2,974	32.35	6.243	J
Longitude	2,974	113.6	6.507	J
Altitude	2,974	0.209	0.283	K
Settlement types (1-8, a proxy for historical socio- economic development)	2,974	6.481	1.140	K
Mean size of local communities (1-8, a proxy for the degree of historical urbanization)	2,974	7.182	1.413	K
# jurisdictional hierarchies beyond the local community (political institutions)	2,974	4.522	0.839	K
Terrain ruggedness	2,974	0.766	0.504	K
Average rainfall	2,974	43.17	151.54	K
Land in tropical climate	2,974	0.0302	0.0994	K
Land in arid climate	2,974	0.00386	0.0137	K

Notes: Two provinces (Tibet and Xinjiang) are not included, as they were not surveyed by the WVS. "Religiosity" takes on a value of 1 if the answer to the question "Independently of whether you attend religious services or not, would you say you are" is "a religious person," and 0 otherwise. "Education Level" takes on a value of 1 if respondents have early childhood education or no education, 2 for any non-tertiary education, and 3 for tertiary education. "Income Level" is self-reported position in the income distribution, and 1 indicates the lowest income group and 3 the highest income group.

Sources: (A) World Values Survey (2018); (B) Buck (1935); (C) China Statistical Yearbook; (D) Talhelm et al. (2014); (E) Food and Agriculture Organization of the United Nations (GAEZ v4 Database); (F) Chen et al. (2020); (G) China's Health Statistics Yearbook; (H) Cheng et al. (2021); (I) Dincecco and Wang (2018) (J) Google Maps; (K) Buggle (2020); (L) Zuzu Che Weather Records; (M) Estimated by authors.

Table 2. *Summary Statistics (Asia)*

Variables	Variables Definition	Observations	Mean	S.D.	Data Sources
Prejudice	Opposing immigrants/foreign workers (=1)	19,833	0.352	0.478	A
	Opposing homosexuals (=1)	19,836	0.611	0.488	A
	Opposing a diff. race (=1)	19,856	0.239	0.426	A
	Opposing a different religion (=1)	19,854	0.241	0.427	A
	Opposing a different language/dialect (=1)	19,843	0.250	0.433	A
	Average prejudice	19,752	1.687	1.511	A
Explanatory variable	% Irrigated wetland rice harvest area/cereal cultivation land 1998	19,912	48.22	23.17	B, C
Instrumental variable	Environmental suitability for growing wetland rice, 1960-1990	19,912	44.45	11.20	B
Individual-level controls	Age	19,883	42.06	15.20	A
	Male (%)	19,900	0.495	0.500	A
	Religiosity (%)	19,035	0.847	0.360	A
	Married (%)	19,898	0.738	0.440	A
	Native residents (%)	19,887	0.994	0.0784	A
	Educational level (1-3)	19,861	1.108	0.549	A
	Income level (1-3)	19,711	1.795	0.589	A
Society-level controls	Human development index 1998 (combining life expectancy, education, and income per capita)	19,912	0.680	0.131	D
	Ethnic diversity index 1997	19,912	0.413	0.250	E
	Historical disease prevalence index	19,912	0.490	0.326	F
	# historical warfare (1918-2001)	19,912	11.91	7.788	G
	Cultivation land 1996 (% of total land)	19,912	36.15	18.45	B, C
	Irrigated land 2000 (% of cultivated land)	19,912	81.72	22.91	B, C
	Latitude	19,912	17.93	11.41	H
	Longitude	19,912	102.9	19.60	H

Notes: "Religiosity" takes on a value of 1 if the answer to the question "Independently of whether you attend religious services or not, would you say you are" is "a religious person" and 0 otherwise. "Education Level" takes on a value of 1 if respondents have early childhood education or no education, 2 for any non-tertiary education, and 3 for tertiary education. "Income Level" is self-reported position in the income distribution, and 1 indicates the lowest income group and 3 the highest income group.
Sources: (A) World Value Survey (2012-2020); (B) Food and Agriculture Organization of the United Nations (GAEZ v4 Database); (C) World Bank Database; (D) Human Development Report; (E) Alesina et al. (2003); (F) Murray and Schaller (2010); (G) Brecher and Wilkenfeld (2003); (H) Google Maps.

Table 3. *Paddy and Prejudice: Main Results in China*

Dep. Var: Prejudice		(1)	(2)	(3)
Panel A:		OLS	OLS	IV
Paddy rice 1996 (%)	B	-0.00879	-0.0115	-0.0120
	SE-Province	(0.00224) ***	(0.00167) ***	(0.00181) ***
	SE-PSU	[0.00166] ***	[0.00186] ***	[0.00253] ***
	SE-Conley	{0.00221}***	{0.00178}***	{0.00208}***
Panel B: IV First Stage, Dep. variable is paddy rice 1996 (%)				
Paddy Rice Suitability	B			0.881
	SE- Province			(0.116) ***
Kleibergen-Paap rk LM stat (*p-value*)				0.0003
Kleibergen-Paap Wald rk *F-stat*				60.59
Individual Controls			√	√
Provincial Controls			√	√
Provinces		29	29	29
PSU		50	50	50
Observations		2,924	2,867	2,867

Notes: This table reports OLS and IV estimates for China. The dependent variable is the summation of five prejudice measures of each respondent, and each measure is a dummy that equals to one if a respondent answered that she/he would NOT like to have people of a different race, immigrants/foreign workers, homosexuals, people of a different religion, or people who speak a different dialect as neighbours. The IV is a z score that reflects the United Nations Food and Agriculture Organization's (FAO 2010) evaluations of historical agro-climatic constraints and agro-edaphic suitability for paddy farming. The Kleibergen-Paap rk LM test is an underidentification test, where the null hypothesis is that the equation is underidentified. The Kleibergen-Paap Wald rk test is a weak-instrument test, which tests for the significance (F-statistic) of excluded instrument. All regressions include constant. Individual controls include age, gender, education, income, marital status, religiosity, and indicator of urban residency. The provincial controls include (log) GDP per capita and educational achievement in 2012, the share of Han ethnic population in 2010 and of the share of urban population in 2017, pathogen morbidity rate in 2017, famine death rate in 1960, the number of warfare and rebellion in the Qing dynasty (1644-1912), and the importance of agricultural area and of irrigation activities (over the total cultivated area) in 2000. All responses were weighted in the analysis, using the sampling (inverse probability) weights provided in the WVS. Below each coefficient (*B*), standard error (*SE-Province*) clustered at provincial-level are reported in parentheses, whereas standard errors clustered at the level of primary sampling unit (*SE-PSU*), provided in the WVS, are reported in brackets, which takes account for the survey designs (Abadie et al. 2017 and Deaton 2015). Conley (1999) standard errors (*SE-Conley*) adjusted for two-dimensional spatial autocorrelation are reported in braces. Conley standard errors are constructed assuming a window with weights equal to 1 for observations less than one degree apart and 0 for observations further apart. To account for the relatively small number of clusters in this study, all significant levels are adjusted for wild-bootstrap p-values (Cameron et al. 2008). * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 4. *Alternative Measurements of the Importance of Paddy (China)*

Dep. Var: Prejudice		(1) Paddy Rice 1910s (%)	(2) Age of Paddy Relics (,000 Years)	(3) Paddy Rice 1996 (%) Excl. Three Provinces
Panel A:		IV	IV	IV
Importance of Paddy Farming	B	-0.0129	-0.105	-0.0122
	SE-Province	(0.00276) **	(0.0132) **	(0.00160) ***
	SE-PSU	[0.00375] ***	[0.0274] ***	(0.00266) ***
	SE-Conley	{0.00296} ***	{0.0147} ***	{0.00199} ***
Panel B: IV First Stage, Dep. variable is the importance of paddy farming				
Paddy Rice Suitability	B	0.707	0.105	0.869
	SE-Province	(0.159) ***	(0.00978) ***	(0.117) ***
Kleibergen-Paap rk LM stat (*p-value*)		0.0024	0.0100	0.0004
Kleibergen-Paap Wald rk *F-stat*		19.79	116.14	56.37
Individual Controls		√	√	√
Provincial Controls		√	√	√
Provinces		23	19	26
PSU		44	34	47
Observations		2,571	2,072	2,679

Notes: All columns replicate the most demanding specification from the baseline results, i.e., the final column of Table 3, with different measurements of the importance of paddy farming (shown in columns (1)-(3)), and see the notes in Table 3 for details on the regressions. The explanatory variable in column (1) is paddy rice 1910s (%), which is measured by the percentage of cultivated land devoted to rice paddy in 1914-18. The explanatory variable in column (2) is age of paddy relics (,000 years) which is measured by the age of the oldest discovered rice relics in 1,000 years. The explanatory variable in column (3) is paddy rice 1996 (%), measured by the percentage of cultivated land devoted to rice paddy in 1996, while it excludes the respondents from the three north-eastern provinces (Liaoning, Jilin, and Heilongjiang), where the history of paddy production is much more recent * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 5. *Different Redefinitions of the Estimation Sample (China)*

Dep. Var: Prejudice		(1) Rice-Wheat Border Provinces	(2) Urban Population
Panel A:		IV	IV
Paddy rice 1996 (%)	B	-0.00801	-0.0122
	SE-Province	(0.00135) *	(0.00213) **
	SE-PSU	[0.00623]	[0.00326] ***
	SE-Conley	{0.00135}***	{0.00260}***
Panel B: IV First Stage, Dep. variable is paddy rice 1996 (%)			
Paddy Rice Suitability	B	0.651	0.877
	SE-Province	(0.0920) ***	(0.107) ***
Kleibergen-Paap rk LM stat (*p-value*)		0.0544	0.0009
Kleibergen-Paap Wald rk *F-stat*		57.13	68.81
Individual Controls		√	√
Provincial Controls		√	√
Provinces		10	23
PSU		25	38
Observations		1,469	1,774

Notes: All columns replicate the most demanding specification from the baseline results, i.e., the final column of Table 3, with redefinitions of the estimation sample, and see the notes in Table 3 for details on the regressions. Column (1) limits the analysis to the ten provinces that border the Yang-tze River, in which they differ starkly in the importance of paddy rice farming (lower in provinces north of the river). Column (2) restricts the analysis to the subsample of urban respondents who don't cultivate paddy for a living.

Table 6. *Paddy Rice and Prejudice: Main Results in India*

Dep. Var: Prejudice		(1)	(2)	(3)
Estimation sample: India				
		OLS	OLS	IV
Panel A: OLS				
Paddy rice 2008 (%)	B	-0.00744	-0.00797	-0.00734
	SE-State	(0.00253)**	(0.00205)***	(0.00283)**
	SE-Conley	{0.00251}***	{0.00184}***	{0.00247}***
Panel B: IV First Stage, Dep. variable is Paddy rice 2008 (%)				
Paddy Rice Suitability	B			0.0191
	SE			(0.00280)***
Kleibergen-Paap rk LM stat (*p-value*)				0.0274
Kleibergen-Paap Wald rk *F-stat*				46.60
Individual Controls			√	√
State Controls			√	√
Provinces		17	17	17
Observations		4,078	3,924	3,924

Notes: All regressions include constant. Individual controls include age, gender, education, income, marital status, religiosity, and indicator of urban residency and whether the respondent is an immigrant. State controls consist of GDP per capita 2011, literacy rate 2001, urban population ratio 2011 Cultivation Land and irrigation land (%) 2004, and latitude. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 7. *Paddy and Prejudice: Main Results in Asia*

Dep. Var: Prejudice		(1)	(2)	(3)
Panel A:		OLS	OLS	IV
Paddy rice 1998 (%)	B	-0.0103	-0.0232	-0.0235
	SE-Society	(0.00522) *	(0.00134) ***	(0.00139) ***
	SE-PSU	[0.00249] ***	[0.00521] ***	[0.00688] ***
	SE-Conley	{0. 00517}**	{0.00127}***	{0.00148}***
Panel B: IV First Stage, Dep. variable is paddy rice 1998 (%)				
Paddy Rice Suitability	B			0.750
	SE			(0.159) ***
Kleibergen-Paap rk LM stat (*p-value*)				0.0191
Kleibergen-Paap Wald rk *F-stat*				22.64
Individual Controls			√	√
Society Controls			√	√
Survey Year FE		√	√	√
Societies		12	12	12
PSU		225	225	225
Observations		19,752	18,648	18,648

Notes: This table reports OLS and IV estimates for China. The dependent variable is the summation of five prejudice measures of each respondent, and each measure is a dummy that equals to one if a respondent answered that she/he would NOT like to have people of a different race, immigrants/foreign workers, homosexuals, people of a different religion, or people who speak a different dialect as neighbours. The IV is a z score that reflects the United Nations Food and Agriculture Organization's (FAO 2010) evaluations of historical agro-climatic constraints and agro-edaphic suitability for paddy farming. The Kleibergen-Paap rk LM test is an underidentification test, where the null hypothesis is that the equation is underidentified. The Kleibergen-Paap Wald rk test is a weak-instrument test, which tests for the significance (F-statistic) of excluded instrument. All regressions include constant. Individual controls include age, gender, education, income, marital status, religiosity, and being born in the current society. Society controls include human development index in 1998 (which jointly evaluates a society's life expectancy, education, and income per capita), an index of ethnic fractionalization in 1997, the historical disease prevalence index, the number of historical warfare during the period from 1918 to 2001, and the importance of agricultural area and of irrigation activities. All responses were weighted in the analysis, using the multi-society sampling (inverse probability) weights provided in the WVS. Below each coefficient (*B*), standard error (*SE-Society*) clustered at society-level are reported in parentheses, whereas standard errors clustered at the level of primary sampling unit (*SE-PSU*), provided in the WVS, are reported in brackets, which takes account for the survey designs (Abadie et al. 2017 and Deaton 2015). Conley (1999) standard errors (*SE-Conley*) adjusted for two-dimensional spatial autocorrelation are reported in braces. Conley standard errors are constructed assuming a window with weights equal to 1 for observations less than five degree apart and 0 for observations further apart. To account for the relatively small number of clusters in this study, all significant levels are adjusted for wild-bootstrap p-values (Cameron et al. 2008). * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 8. *Mediation Models: Quantifying Mechanisms*

	(1) Market integration	(2) Clan (per capita)
Panel A: "first-stage" of mediation, dep. var. is mediator		
Age of rice	0.0462	0.152
	(0.00210) ***	(0.0351) ***
Panel B: "second-stage" of mediation, dep. var. is prejudice.		
Mediator	-13.93	0.834
	(2.33) ***	(0.139) ***
Age of rice	0.546	-0.224
	(0.0934) ***	(0.0354) ***
Panel C: mediation results		
ACME	-0.643	0.127
	(0.111) ***	(0.0361) ***
ADE	0.546	-0.224
	(0.0934) ***	(0.0354) ***
ATE	-0.0978	-0.0978
	(0.0352) ***	(0.0352) ***
KP F-statistic for excluded instruments	35.96	
Individual Controls	√	√
Provincial Controls (Four)	√	√
Observations	700	700

Notes: The dependent variable is the summation of five prejudice measures of each respondent, and each measure is a dummy that equals to one if a respondent answered that she/he would NOT like to have people of a different race, immigrants/foreign workers, homosexuals, people of a different religion, or people who speak a different dialect as neighbours. The IV is a z score that reflects the United Nations Food and Agriculture Organization's (FAO 2010) evaluations of historical agro-climatic constraints and agro-edaphic suitability for paddy farming. The Kleibergen-Paap Wald rk test is a weak-instrument test, which tests for the significance (F-statistic) of excluded instrument. All regressions include constant. Individual controls include age, gender, education, income, marital status, religiosity, and indicator of urban residency. Four provincial controls are distance to the nearest river, coastal province dummy, historical environmental threats (an index of floods and droughts in the Ming-Qing period) and warfare in the Qing dynasty. Standard errors are clustered at provincial-level are reported in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. ACME refers to the average causal mediated effect, whereas ADE and ATE refer to the average direct effect and average total effect.

Supplementary Materials for

Paddy and Prejudice:

Evidence on the Agricultural Origins of Prejudice from China and 12 other Asian Societies

An Huang, Paulo Santos and Russell Smyth

This Version: 10 Jan 2023

This document consists of:

Fig. A1. *Evidence for the Stability of the Importance of Paddy Rice Farming in China*

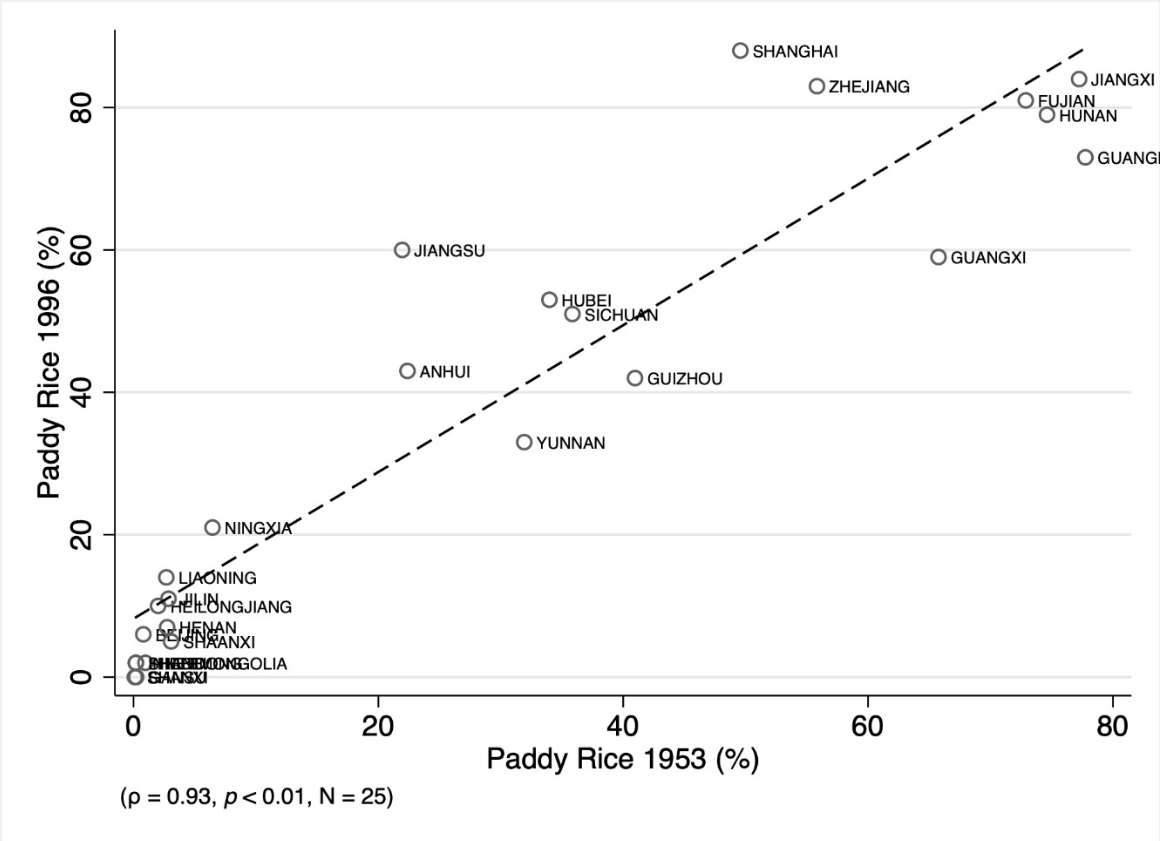


Fig. A2. *The Ten Border Provinces with High Concentrations of Paddy Rice Farming*

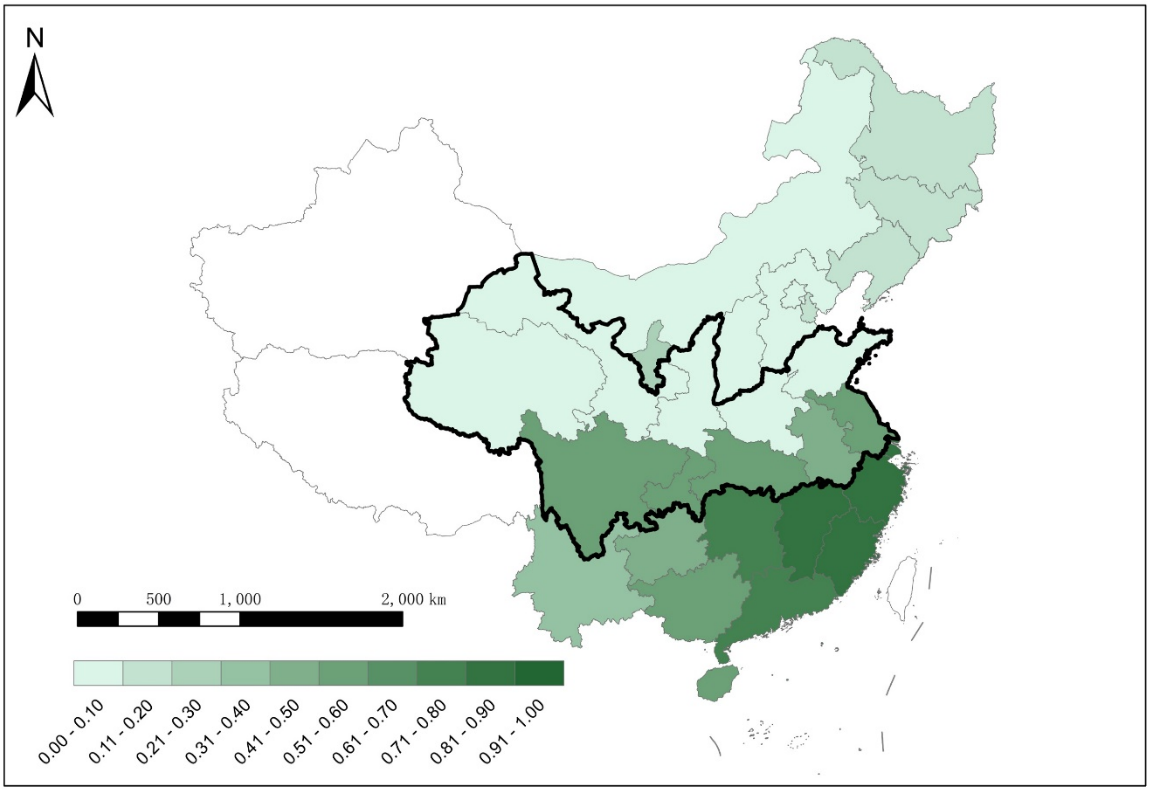


Fig. A3. *The Three North-Eastern Provinces (Liaoning, Jilin, and Heilongjiang) with More Recent History of Paddy Production*

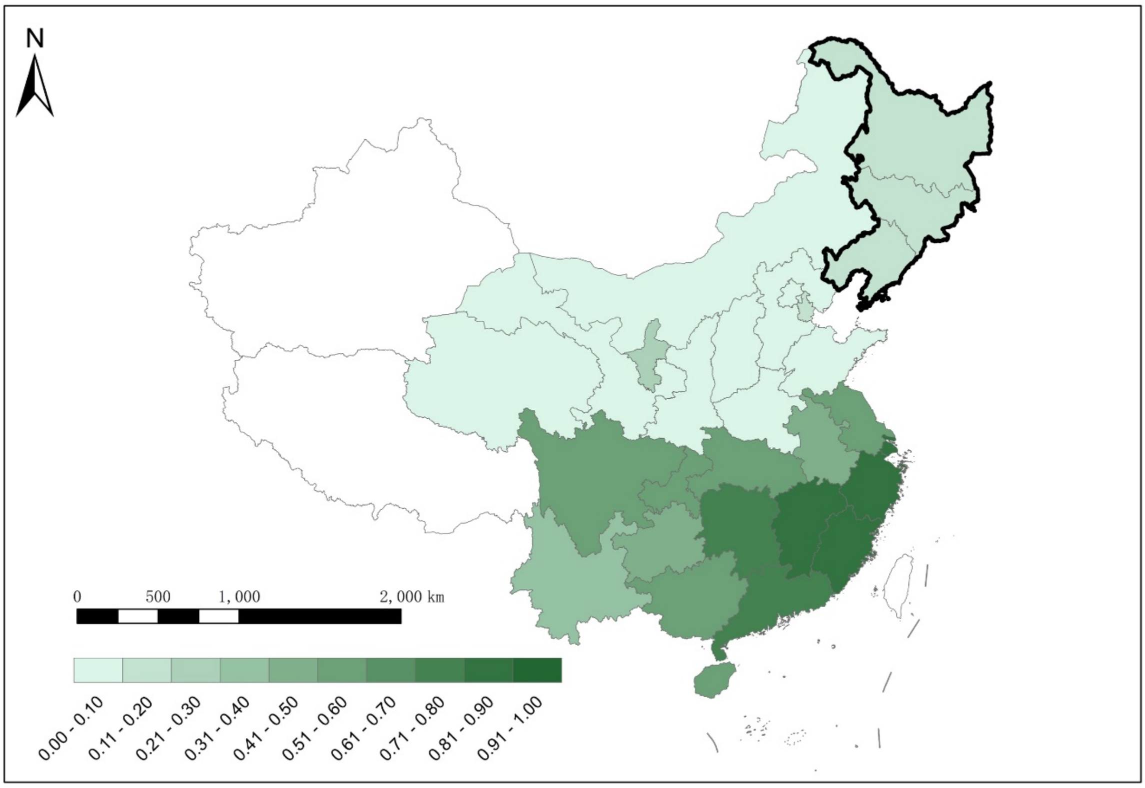
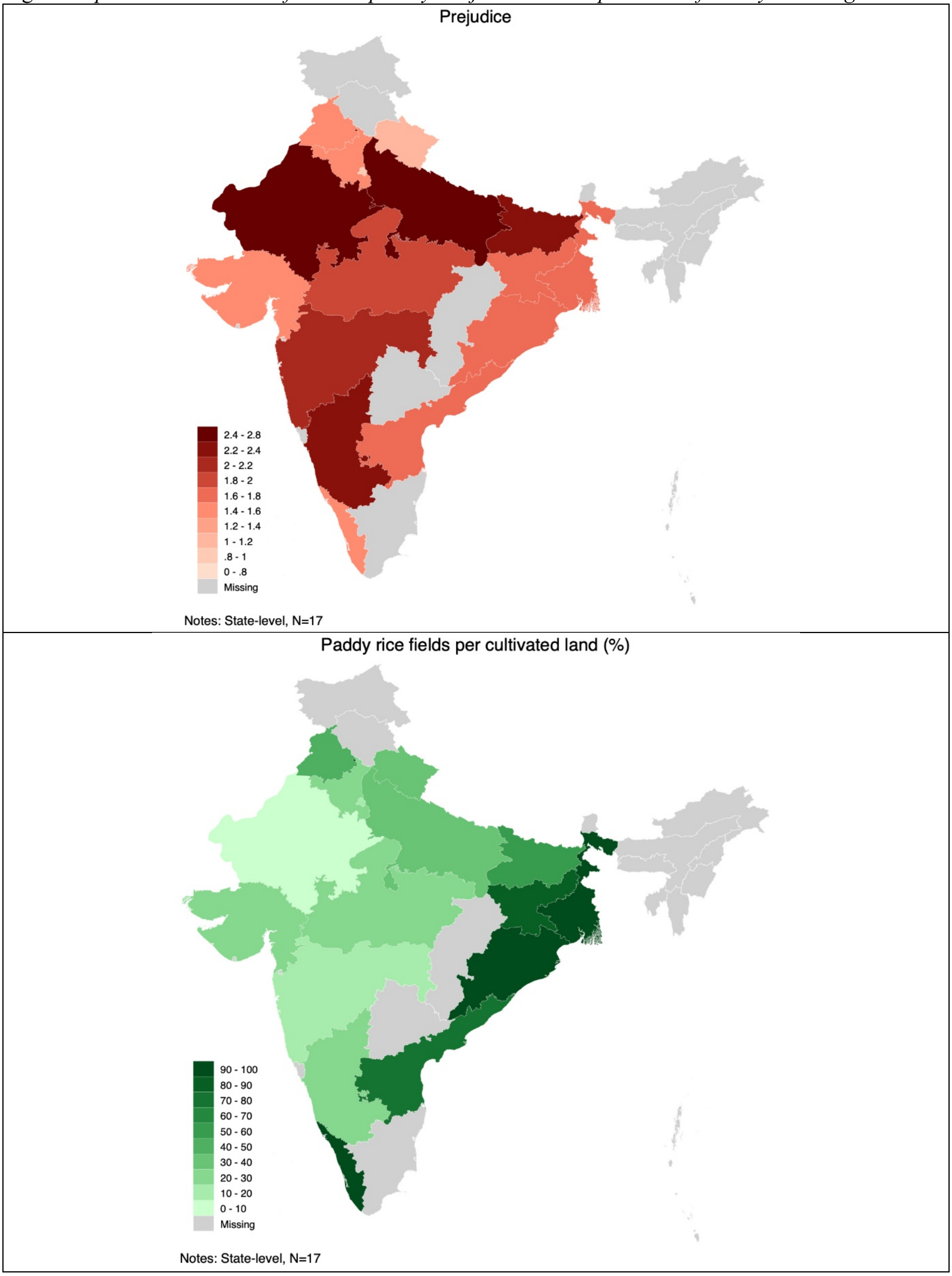
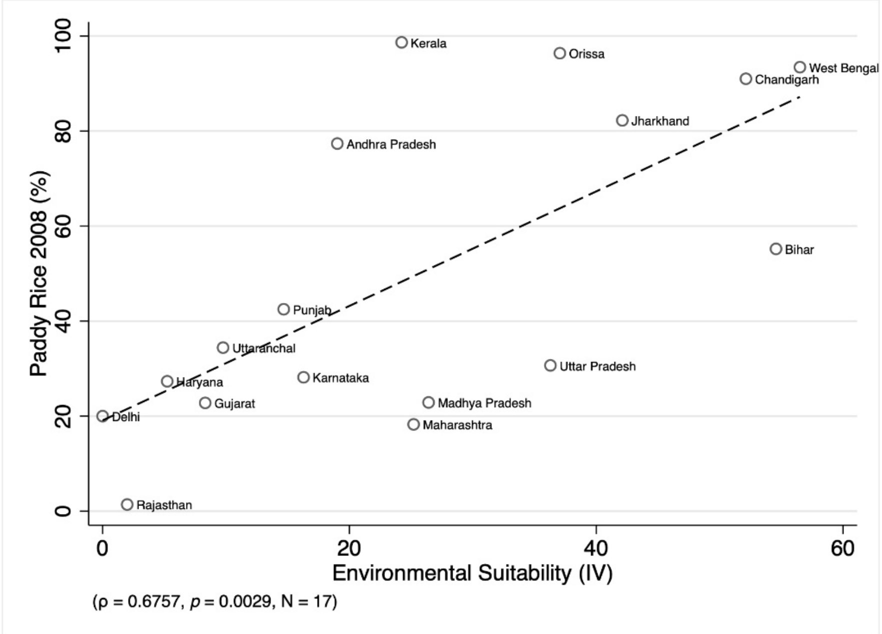


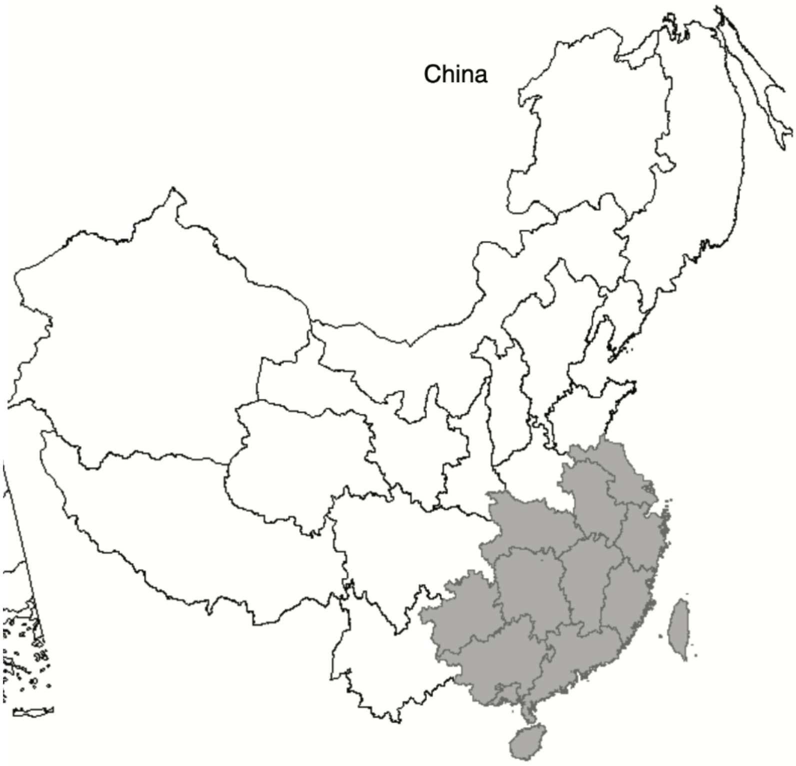
Fig. A4. *Spatial Distribution of Contemporary Prejudice and Importance of Paddy Farming in India*





Notes: Prejudice is measured as the summation of the answers to five questions on characteristics that respondents oppose to have in their neighbours (Wave 6, WVS). Importance of paddy farming is measured by the percentage of cultivated land devoted to rice paddy. Darker areas indicate stronger prejudice (panel A) or importance of paddy (panel B). Several states in India are not included, as they were not surveyed by the WVS.

Fig. A5. *Geographical Coverage for the Data of Historical Market Integration (1742-95)*



Source: Shiue and Keller (2007, p1195).

SM Table A1. *Pairwise Correlation Matrix of Prejudice Measures*

Panel A: China

Prejudice *of*	Race	Immigrants/Foreign Workers	Homosexuals	Religion	Dialect	Prejudice
Race	1.0000 (n=2,970)					
Immigrants/Foreign Workers	0.4737 (n=2,957)	1.0000 (n=2,970)				
Homosexuals	0.1621 (n=2,953)	0.1972 (n=2,954)	1.0000 (n=2,993)			
Religion	0.4172 (n=2,951)	0.3898 (n=2,955)	0.2395 (n=2,953)	1.0000 (n=2,970)		
Dialect	0.3841 (n=2,957)	0.3909 (n=2,961)	0.1243 (n=2,953)	0.4028 (n=2,956)	1.0000 (n=2,971)	
Prejudice	0.7045 (n=2,924)	0.7284 (n=2,924)	0.5305 (n=2,924)	0.7381 (n=2,924)	0.6655 (n=2,924)	1.0000 (n=2,924)

Panel B: Asia

Prejudice *of*	Race	Immigrants/Foreign Workers	Homosexuals	Religion	Language	Prejudice
Race	1.0000 (n=19,856)					
Immigrants/Foreign Workers	0.4014 (n=19,816)	1.0000 (n=19,833)				
Homosexuals	0.1570 (n=19,809)	0.1887 (n=19,800)	1.0000 (n=19,836)			
Religion	0.5164 (n=19,829)	0.3709 (n=19,821)	0.1499 (n=19,817)	1.0000 (n=19,854)		
Language	0.4657 (n=19,813)	0.3593 (n=19,806)	0.1462 (n=19,795)	0.4582 (n=19,817)	1.0000 (n=19,843)	
Prejudice	0.7376 (n=19,752)	0.6973 (n=19,752)	0.5103 (n=19,752)	0.7238 (n=19,752)	0.7079 (n=19,752)	1.0000 (n=19,752)

Notes: $p<0.01$ across all pairwise correlations, and they are robust to Sidak-adjusted significance level.

SM Table A2. *Multiple correspondence analysis: Factor scores, squared cosines, and contributions for the observations (I-set).*

Panel A: China

Prejudice *of*	Race	Immigrants/Foreign Workers	Homosexuals	Religion	Dialect
Factor			Squared Cosines		
1	0.937	0.941	1.112	0.954	0.971
0	0.937	0.941	1.112	0.954	0.971
Factor			Contributions		
1	0.197	0.179	0.020	0.163	0.172
0	0.045	0.063	0.050	0.072	0.040

The proportion of explained inertia: 95.95%
The pairwise correlation between the predicted component and the summation measure of prejudice: 0.99 ($p<0.01$)

Panel B: Asia

Prejudice *of*	Race	Immigrants/Foreign Workers	Homosexuals	Religion	Language
Factor			Squared Cosines		
1	0.915	1.000	1.159	0.924	0.949
0	0.915	1.000	1.159	0.924	0.949
Factor			Contributions		
1	0.200	0.129	0.020	0.192	0.177
0	0.062	0.070	0.031	0.060	0.059

The proportion of explained inertia: 95.16%
The pairwise correlation between the predicted component and the summation measure of prejudice: 0.98 ($p<0.01$)

Notes: Coordinates of factors are used to create scatter plots. Squared cosines show the importance of a predicted MCA component for a given observation (vector of original variables). Contribution indicate how each factor contributes in explaining the variations in the data set. The eigenvalues and proportions of explained inertia are corrected using Benzécri/Greenacre formula.

SM Table A3. *The Use of Lagged Data on Covariates – China*

Dep. Var: Prejudice		(1)	(2)	(3)	(4)
		OLS		IV	
Paddy rice 1996 (%)	B	-0.0115	-0.00657	-0.0120	-0.0107
	SE-Province	(0.00167)***	(0.00193)**	(0.00181)***	(0.00278)**
	SE-PSU	[0.00186]***	[0.00210]**	[0.00253]***	[0.00312]***
	SE-Conley	{0.00178}***	{0.00152}***	{0.00208}***	{0.00253}***
Individual Controls		√	√	√	√
Provincial Controls		√		√	
Provincial Controls (Lagged)			√		√
Provinces		29	28	29	28
PSU		50	49	50	49
Observations		2,867	2,815	2,867	2,815

Notes: For the lagged data on provincial control, we replace the contemporary data on GDP (in 2012), population educational achievement (in 2012), ethnic diversity (in 2010), college graduates (in 2015), pathogen morbidity (in 2017) and share of urban population (in 2017) with other measures of pre-industrial ancestors' modernization (settlement types - a proxy for historical socio-economic development; mean size of local communities a proxy for the degree of historical urbanization, and the number of jurisdictional hierarchies beyond the local community - a measure of political institutions), and ethnic diversity (in 1990), college graduates (in 1990), pathogen morbidity (in 2000), and share of urban population (in 1996).

SM Table A4. *The Use of Single-Item of Prejudice Measure – China (IV Estimates)*

		(1)	(2)	(3)	(4)	(5)
Dep. Var.: prejudice *of*		Race	Immigrants/Foreign Workers	Homosexuals	Diff. Religion	Diff. Dialect
Paddy rice 1996 (%)	B	-0.00280	-0.00126	-0.00250	-0.00285	-0.00277
	SE-Province	(0.000679)**	(0.0000479)*	(0.000557)***	(0.000605)***	(0.000408)***
	SE-PSU	[0.000766]***	[0.000804]	[0.000591]***	[0.000688]***	[0.000615]***
	SE-Conley	{0.000818}***	{0.000531}**	{0.000732}***	{0.000665}***	{0.000279}***
Individual Controls		√	√	√	√	√
Provincial Controls		√	√	√	√	√
Provinces		29	29	29	29	29
PSU		50	50	50	50	50
Observations		2,909	2,912	2,933	2,910	2,911

Notes: All columns replicate the most demanding specification from the baseline results, i.e., the final column of Table 3, and see the notes in Table 3 for details on the regressions. Dependent variables in columns (1)-(5) are dummies which equal to one if a respondent answered that she/he would NOT like to have people of a different race, immigrants/foreign workers, homosexuals, people of a different religion, or people who speak a different dialect as neighbours, respectively. For First stage IV statistic see table 3. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

SM Table A5. *Paddy Effect is Independent from Geographical Factors*

Dep. Var: Prejudice		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Panel A:		IV	IV	IV	IV	IV	IV	IV	IV	IV	IV
Paddy rice 1996 (%)	B	-0.0126	-0.0119	-0.0114	-0.00859	-0.0117	-0.0123	-0.0119	-0.0135	-0.00954	-0.0121
	SE-Province	(0.00172)***	(0.00188)***	(0.00185)**	(0.00346)	(0.00315)*	(0.00218)**	(0.00217)**	(0.00172)***	(0.00364)	(0.00183)***
	SE-PSU	[0.00312]***	[0.00261]***	[0.00333]***	[0.00565]	[0.00443]**	[0.00415]***	[0.00380]***	[0.00342]***	[0.00505]*	[0.00262]***
	SE-Conley	{0.00192}***	{0.00212}***	{0.00220}***	{0.00366}**	{0.00346}***	{0.00259}***	{0.00236}***	{0.00215}***		
Panel B: IV First Stage, Dep. variable is paddy rice 1996 (%)											
Paddy Rice Suitability	B	0.767	0.867	0.793	0.571	0.752	0.662	0.718	0.721	0.655	0.869
	SE	(0.0869)***	(0.0716)***	(0.0919)***	(0.0549)***	(0.118)***	(0.0485)***	(0.0589)***	(0.0592)***	(0.0812)***	(0.113)***
KP rk LM stat (*p-value*)		0.0027	0.0005	0.0051	0.0141	0.0014	0.0115	0.0056	0.0014	0.0045	0.0003
KP Wald rk *F-stat*		79.73	156.35	75.58	112.56	44.82	198.75	153.88	157.85	72.41	62.44
Individual Controls		√	√	√	√	√	√	√	√	√	√
Provincial Controls		√	√	√	√	√	√	√	√	√	√
Distance to Rivers		√									
Coastal Province			√								
Terrain Ruggedness				√							
Average Rainfall					√						
Average Temperature						√					
Land in Tropical Climate							√				
Land in Arid Climate								√			
Altitude									√		
Latitude										√	
Longitude											√
Provinces		28	29	28	28	29	28	28	28	29	29
PSU		49	50	49	49	50	49	49	49	50	50
Observations		2,815	2,867	2,815	2,815	2,867	2,815	2,815	2,815	2,867	2,867

Notes: All columns replicate the most demanding specification from the baseline results, i.e., the final column of Table 3, and see the notes in Table 3 for details on the regressions. See Table 1 for measurements of additional controls. * *p < 0.10,* ** *p < 0.05,* *** *p < 0.01.*

SM Table A6. *The Number and Percentage Share of Integrated Market Pairs in China*

Province	Number of markets	Number of market pairs	Number of integrated market pairs	Percentage of integrated market pairs
ANHUI	13	1482	1238	83.54%
GUIZHOU	13	1482	669	45.14%
GUANGXI	12	1374	1127	80.02%
HUBEI	10	1155	933	80.78%
HUNAN	13	1482	1330	89.74 %
JIANGSU	10	1155	1055	91.34%
ZHEJIANG	11	1265	1185	93.68%

Notes: The Johansen-Juselius co-integration rank test is performed for each market pair, with a critical value of 12.53 to determine whether two markets are cointegrated (Osterwald-Lenum 1992).

SM Table A7. *ATE Comparison (China)*

Dep. Var: Prejudice		(1) OLS	(2) IV
Age of rice (1,000 years)	B	-0.0920	-0.105
19 Provinces	SE-Province	(0.0115)**	(0.0132)**
	SE-PSU	[0.0227]***	[0.0274]***
	SE-Conley	{0.0137}***	{0.0147}***
KP rk LM stat (*p-value*)			0.0100
KP Wald rk *F-stat*			116.14
Age of rice (,000 years)	B	-0.0478	-0.0978
7 Provinces	SE-Province	(0.0342)	(0.0352)***
	SE-PSU	[0.0360]	[0.0422]**
	SE-Conley	{0.0314}	{0.351}***
KP rk LM stat (*p-value*)			0.0339
KP Wald rk *F-stat*			35.96
Individual controls		Yes	Yes
Province controls (four)		Yes	Yes

Notes: Four provincial controls in the bottom panel are distance to the nearest river, coastal province dummy, historical environmental threats (an index of floods and droughts in the Ming-Qing period) and warfare in the Qing dynasty. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

SM Table A8. *Quantifying Mechanisms: The Use of Single-Item of Prejudice Measure*

		(1)	(2)
Mediator *of*		Market integration	Clan (per capita)
Race	ACME	-0.0305	0.00599
		(0.0264)	(0.00536)
	ADE	0.0183	-0.0182
		(0.0228)	(0.00873) **
	ATE	-0.0122	-0.0122
		(0.00452) ***	(0.00452) ***
Immigrants/Foreign Workers	ACME	-0.116	0.0228
		(0.0201) ***	(0.00652) ***
	ADE	0.0826	-0.0563
		(0.0169) ***	(0.00642) ***
	ATE	-0.0335	-0.0335
		(0.00563) ***	(0.00563) ***
Homosexuals	ACME	-0.188	0.0370
		(0.0166) ***	(0.00902) ***
	ADE	0.166	-0.0592
		(0.0131) ***	(0.00407) ***
	ATE	-0.0222	-0.0222
		(0.00841) ***	(0.00841) ***
Different Religion	ACME	-0.192	0.0378
		(0.0442) ***	(0.0122) ***
	ADE	0.180	-0.0502
		(0.0374) ***	(0.0145) ***
	ATE	-0.0125	-0.0125
		(0.0109)	(0.0109)
Different Dialect	ACME	-0.117	0.0229
		(0.0340) ***	(0.00847) ***
	ADE	0.0991	-0.0404
		(0.0294) ***	(0.0107) ***
	ATE	-0.0175	-0.0175
		(0.00770) **	(0.00770) **
Individual Controls		√	√
Provincial Controls (Four)		√	√
Observations		700	700

Notes: This table replicates the mediation analysis in Table 7 by using the each of the single-item of prejudice measure as the outcome variable. See the notes in Table 7 for details on the regressions. Dependent variable for each measure is a dummy which equal to one if a respondent answered that she/he would NOT like to have people of a different race, immigrants/foreign workers, homosexuals, people of a different religion, or people who speak a different dialect as neighbours, respectively. For KP F-statistic for excluded instruments see table 7. Standard errors clustered at provincial-level are reported in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.