Networked Leaders in the Shadow of the Market – A Chinese Experiment in Allocating Land Conversion Rights

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This version: September 2014

Abstract: Concerns over the loss of cultivated land in China have motivated a system of centrally mandated annual land use quotas effective from provincial down to township levels. To facilitate efficient land allocation, a ground-breaking policy in the Zhejiang Province permitted sub-provincial units to trade land conversion quotas. We theoretically model and empirically estimate the drivers of local government participation in this program to shed light more broadly on the drivers of local government decision-making. We find robust support for three sets of factors: market forces, administrative autonomy at the sub-provincial level, and prior network connections of local government leaders.

JEL Classification: H11; H77; P35; R52; D23.

Keywords: land allocation and conservation; quota trading; administrative autonomy; market forces; government leader networks.

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1 Introduction

What drives the decision-making of local government leaders in China? We examine a unique policy experiment in the Zhejiang Province in which sub-provincial level governments were empowered to trade land conversion rights with one another (Zhang et al. 2014, Chau and Zhang 2011, Wang et al. 2010). The program allowed local governments to more flexibly manage urban development and preservation objectives at the local level, while safeguarding province-wide obligation to the central government to preserve agricultural land. This experiment offers a rare look at the endogenous formation of bilateral local government matches as buyer-seller pairs of land conversion quotas. We argue that an examination of the determinants of such matches can generate new insights on the drivers local government decision-making. Does market force matter? Does administrative autonomy matter? Do leader traits such as prior network relationships matter?

Since the onset of fiscal reforms in the 1990's, local government budget revenue and market demand for land has become inextricably linked. Across all provinces between 1999 - 2006, net revenue from land leases for private non-agricultural purposes makes up almost a third of local extra-budgetary revenue on average at the provincial level.[1] Demand and supply conditions for construction land differ greatly from province to province (Chau and Zhang 2011). For example, government revenue from land lease ranging from \$0.34 million yuan per hectare in Xinjiang to \$1.82 million yuan per hectare in Tianjin. Based on these figures alone, beneficial opportunities for arbitrage exist. The Zhejiang experiment, sanctioning for the first time trade in land conversion rights between local governments, contends that these arbitrage opportunities exist even within a province across sub-provincial jurisdictions.

Administrative decentralization is a center stage reform directive in China today (Feigenbaum and Ma 2014, CRI 2013, SCMP 2013), where recent years have seen numerous petitions from lower level governments for more decentralized socio-economic decision-making authority – to erect basic production construction projects, to invest in infrastructure and to implement technical upgrades, for example (Zhejiang Provincial Government 1992, Yu and Gao 2013). The devolution of decision-making power to local level government units is a subject of considerable interest particularly as a determinant of governance effectiveness to deliver public services (Inman and Rubinfeld 1997). A

[1] Revenue that local governments collect from the leasing and the transfer of land use rights for non-agricultural purposes is fully retained within the local government by law (Beijing Local Taxation Bureau 2003) as part of extra-budgetary revenue. Extra-budgetary revenue is made up of a number of revenue items not included as part of provincial budgetary revenue, and hence beyond the monitoring of the National People's Congress. This includes revenues and income of institutional and administrative units, specialized funds held by state-owned enterprizes, and fees and incomes collected from local enterprises.

longstanding literature established that better targeting in the provision of public goods is a key advantage of administrative decentralization (Coase 1960, Besley and Coate 2003, Barankay and Lockwood 2007) as long as accountability of the local leaders is assured (de Melo and Barenstein 2001, Bardhan and Mookherjee 2006). In the context of China, the need for better targeting is acute particularly in land use planning where an elaborate system of planning quotas down to the township level is in place often without particular regards to market forces (Zhang et al. 2014). Indeed, despite drastic differences in local conditions, the centrally mandated farmland preservation rate is set at 85% for most localities with allowable deviations of no more than 1 - 2% (Wang et al. 2010).

In addition to market and decentralization considerations, a growing literature suggests that the personal traits of government leaders matter (Jones and Olken 2005, Göhlmann and Vaubel 2007, Chattopadhyay and Duflo 2004). A relatively little studied but nonetheless influential central government policy directive since 1962 requires that all local government leaders at county level or above be rotated at regular intervals (Huang 2002).[2] Respectively for county-level and prefectural level government leaders, the rotation will be within prefecture, and within province, for example. The system is expected to prevent political capture, promote accountability, and facilitate information exchange (Wu 2010). In the context of land conversion quota trading, where market based incentives for mutually beneficial exchange in land conversion quotas can function only when transaction costs are not too high (Coase 1937, Williams 1975, 1981, Stavins 1995), such mandated leader rotation across regions can play a particularly important role in mitigating transaction costs facing networked leaders.

This paper examines the salience of these three sets of issues as drivers of local government decision-making through the lens of the policy of land conversion quota trading in the Zhejiang province of China. In compliance with the Chinese Constitution, land use allocation is founded on a system of public land ownership either by collectives or by the state, as well as an extensive system of centrally mandated annual quotas that governs the rate of land conversion from agricultural to non-agricultural uses. The land conversion quota trading scheme in Zhejiang in September 1999 was a unique provincial level initiative created to facilitate sub-provincial units with excess demand for land conversion quotas to negotiate directly with units with under-utilized supply (Ministry of Agriculture of the People's Republic of China 2004, Tong and Chen 2008 and Wang et al. 2009).[3]

[2]There are five levels of government in China. The central government, provincial level units, prefecture level units, counties, and townships. In addition, there are also numerous villages below the township level (Lin, Tao, and Liu 2003).

[3]In Fujian, Guangdong, and Jiangsu, programs that allow construction land use quotas to be gained from land

We compile a novel dataset based on internal statistics from the Zhejiang Provincial Department of Land and Resources in the five-year period (1999 - 2003) during which the policy operated without interruption.[4] The data reveal that the trading scheme received popular support, with 570 land conversion quota trade activities across the 99 sub-provincial units (including counties or county level cities, urban districts and urban jurisdictions) in the five year period. However, as will be seen in greater detail in Section 2, participation was by no means universal, and comparing those who participated and those who did not, selection did not appear to be random. We are thus motivated by the question, what drive local government leaders to act?

To this end, we propose a sorting model of land conversion quota trade incorporating administrative autonomy, market forces, and government leader connections as potential drivers. We derive the gains from trade between a matched buyer and seller pair from first principles, and use these to ascertain the likelihood of trade in two settings: (i) a pure competitive equilibrium where transaction costs are uniform across all matched pairs, and (ii) a setting with connected government leaders that can enter into agreement in the shadow of the market.

In a pure competitive equilibrium without leader connection, we show that transaction cost dictates the boundary between trading and non-trading leaders. Among trading leaders, equilibrium assignment of buyers and sellers exhibits negative assortative matching, linking localities with high demand with localities with low demand. We show that equilibrium is constrained efficient, consistent with Becker (1973), given transaction costs. Introducing connected leaders who are privy to private informational advantages can mitigate against precisely these transaction costs associated with trade. Our model shows that these transaction cost savings may nonetheless introduce trade distortions, when location pairs with connected leaders do not agree with the location pairs assigned to trade in a competitive equilibrium. Indeed, we show that factors that motivate unconnected leaders to trade can in fact discourage connected leaders from trading with connected locations. The latter occurs particularly when network induced distortion in buyer and seller pairing is severe, so that those with the highest willingness to trade will in fact opt out of the transaction cost savings made possible by networks.

In the end, our theoretical model singles out the (i) willingness to import of the buyer, and

consolidation efforts can also be found. However, Zhejiang is the only province in which the policy of land conversion quota trading (*tudi zhengli zhedi zhibiao*) was officially sanctioned by the province (Wang et al. 2010).

[4]In 2003, the national Ministry of Land and Resources issued a Notice that prohibited the assignment the land conversion zones without Ministry approval. The number of land conversion quota transaction was drastically reduced from a high of 247 transactions province-wide in 2002 to 2 transactions in 2004. In 2004, the Zhejiang province also set up the equivalent of a land conversion quota bank that allows local governments to better identify the location of available supply, and to seek available buyers.

willingness to export of the seller, (ii) transaction costs depending on leader connections, as well as any (iii) network induced distortion in buyer-seller pairing, as determinants of trade. We empirically test these trade implications of the model in a gravity style setting where the incidence of bilateral trading relationships is evaluated against each of the three sets of considerations. For identification, our baseline empirical model is a proportional hazard model (Cox 1972). This model ascertains the trade hazard rate among buyer-seller locations depending on the characteristics of the two parties. The model is semiparametric, and does not depend on particular assumptions on the distribution of time to trade. This baseline model is followed by a series of robustness checks, incorporating first trade event regressions, logit analysis on the proportion of matches, specifications that account for two-way causality, unobserved heterogeneity, different types of network connections, and fixed effect models to examine within-city and across-city differences in the determinants of trade, for example.

We make three broad sets of observations. First, to control for willingness to import and willingness to export, we construct proxy measures of market demand and supply for each year between 1999 - 2003.[5] Importantly, a 1992 policy notice endowed 13 sub-provincial government with special decision-making authority.[6] We use this information to develop proxy measures for administrative decentralization. We take this measure to indicate the power local leaders have to make independent infrastructure and investment decisions regarding how imported land quotas can be utilized. We find that higher market demand stimulates import of construction land use quotas and discourages exports, while higher supply of agricultural land stimulates export. Decentralized administrative authority stimulates import, but discourages exports. These are among the most robust of our findings and holds for an overwhelming majority of the specifications we have worked with.

To capture transaction cost differences, we collected a novel dataset based on published resumes of each county/district head and county/district party leader (*shuji*) during the period of our analysis. We consider four types of networks: career networks to capture work location experience, birthplace networks, education networks to capture education location linkages, and a

[5]These include local GDP per capita, and the share of cultivated land in total land area.

[6]In 1992, a policy notice from the Zhejiang provincial government that gave a list of 13 sub-provincial governments additional adminsitrative authority over their own socio-economic affairs, including decision making authority on infrastructure projects and the like. These include: Xiaoshan, Yuhang, Yinxian, Cixi, Yuyao, Haining, Tongxiang, Shaoxing, Huangyan, Jiaxing, Pinghu, Haiyan, and Jiaojiang (Yu and Gao 2013, Zhejiang Provincial Government 1992). This policy notice is the first official policy document on the devolution of administrative authority from the Zhejiang Province (Yu and Gao 2013, Zhejiang Provincial Government 1992). The next policy document which targeted a generally broaden of the decentralization of administrative authority was published in 2002 (Yu and Gao 2013, Zhejiang Provincial Government 2002).

fourth one that includes all three. Our findings show that of the four network variables, both the overall network variable and the career network variable contribute positively to the likelihood of a match. This result consistently significant and robust in our estimations.

We then interact the network variable with local GDP per capita to ascertain the possibility of network induced distortion in trader matches. We uncover evidence suggesting that conditional on having a network connection, higher GDP per capita in a buyer locality can in some cases *decrease* the likelihood of match. Based on the theoretical model, this finding provides suggestive evidence that government leader network link leaders that are from relatively affluent localities. Consequently, localities that should otherwise be buyers in a market without transactions may be turned into sellers when trade is mediated via networks. Furthermore, even more affluent buyers may well refrain from network mediated trade, precisely because the associated match distortion from the market based outcome is even greater.

This paper contributes to four distinctive literautres. To the literature on tradeable permits, such as emission permits (Chichilnisky and Heal 1995), development rights allowances (Mills 1980), or land conversion quotas (Tavares 2003, Thornes and Simon 1999) as in our case, we introduce a sorting theory of matching (Becker 1974) in which the price and volume of each transaction is individually and simultaneously negotiated, while matching buyer and seller are drawn endogenously from the same of pool of heterogeneous localities. This is in contrast to the standard sorting setup in which the pool of buyers, the pool of sellers, and the distribution functions of their respective characteristics are exogenously given (Sattinger 1993).

This paper also speaks to the broad literature on jurisdictional competition in the presence of fiscal decentralization (Tiebout 1956, Qian and Roland 1998). Notably, in this literature, local government leaders are typically assumed to possess administrative autonomy in all matters of local socio-economic governance. Our model, as well as the empirical evidence provided here, suggest that in fact such an assumption may not always be taken for granted.

Contributing to the empirical literature on tradeable permits more generally, this paper presents to the best of our knowledge first evidence on the determinants of inter-governmental transactions in tradeable permits. Existing studies in this area are typically concerned with: the productivity / efficiency implications of the trading scheme (Tietenberg 1999); the ability of the program to fulfill preservation and / or environmental goals ((Montero 1999)), and the participation of firms and individuals (Machemer and Kaplowitz 2002). Furthermore, in all cases, the studies concern almost exclusively developed country programs (Johnston and Madison 1997, McConnell, Kopkits and Walls 2005, Talberg and Swoboda 2013). Developing country studies are limited to case studies to date[7] and none has provided econometric evidence on performance of tradeable development rights programs in a developing country.

Finally, this paper extends the literature on the role of leader characteristics in determining policy outcomes (Jones and Olken 2005) by introducing government leader networks as an additional contributing factor. In this regard, a growing literature has already demonstrated the importance of networks in determining the pattern of international trade (Grief 1993), the performance of venture capital funds (Hochberg et al. 2007), the quality of exports (Feenstra et al. 1999), and the cost of search particularly in differentiated product markets (Rauch 1999), for example. Our knowledge base is extremely limited concerning the role of government leader network in driving policy decisions on matters of interdependent concerns. This is particularly interesting in the case of China, where the effectiveness of the rotation system of personnel management has in fact not yet received any rigorous scrutiny to date. We show that linkages to different locations developed over the course of the career of a local leader is of paramount importance in the types of trade we are studying.

The rest of this paper is organized as follows. In Section 2, we describe in greater detail the policy environment and the specific features of the Zhejiang land conversion quota trading scheme. In Section 3, a sorting theory of land conversion quota trade in presented and the empirical implications of the determinants of trade are explained. Section 4 discusses our identification strategy, and Section 5 discusses the data. Section 6 discusses the main findings results of our baseline estimations. Section 7 is devoted to a series of robustness checks and Section 8 concludes.

2 The Zhejiang Land Conversion Quota Trading Scheme

The 1986 Law of Land Administration is the inaugural piece of comprehensive land legislation enacted in China. An amendment in 1998 focussed on agricultural land use, and by January 1999, a new system of land use planning quotas became effective. These planning quotas governed the permissible allocation of land to non-agricultural uses in all regions and jurisdictions in China. National level planning quotas in effect between 1997 - 2010 for example required at a minimum no less than 128 million hectares of reserved cultivated land in total, while conversions from cultivated to construction land must not exceed 1.97 million hectares (Chau and Zhang 2011). Relevant particularly for local governments that desire flexibility, Article 18 of The Regulations on the

[7] See for example Coria and Sterner (2010) for the case of tradeable emissions permit in Chile.

Implementation of the Land Administration Law states a nation-wide policy directive, aimed at encouraging local governments who wish to expand the allocation of construction land by engaging in raising the supply of cultivated land through land consolidation (Ministry of Agriculture of the People's Republic of China 2004, Wang, Tao and Tong 2009).[8] Specifically, the Article states that

> "People's governments at all local levels should, pursuant to the comprehensive land use planning, take measures to press ahead with land consolidation. Sixty percent of the area of the newly-added cultivated land through land consolidation can be used as compensation quotas for cultivated land occupied for construction."

A similar 1998 Zhejiang province notice flexibly interprets this Article, and stipulates that 72% of the total areas of added effective cultivation can be used as rewarded quota for approved infrastructure, core village, small town and industrial district (Zhang et al. 2014). These decisions created powerful incentives for local governments to engage in land consolidation. Strikingly, the addition of new cultivated land in China during the 1999 - 2006 period reached a total of 3.5 million hectares. This is greater than the amount of land approved for use in construction projects. Nonetheless, accounting for other sources of land loss such as natural hazards, and agricultural reorganization, there was an overall decline in the total amount of arable land (Chau and Zhang 2011). Furthermore, excess demand for land conversion quota continue to persist in some locations, while in other locations, land conversion quotas were under-utilized. The land conversion quota trading scheme in Zhejiang in September 1999 was created specifically to facilitate locations with excess demand for land conversion quotas to negotiate directly with locations with under-utilized supply. Both the price and the volume of these transactions were negotiated between buyers and sellers, subject to approval from the Zhejiang Provincial Department of Land and Resources (Wang et al. 2010, and Zhang et al. 2014).

We collect a novel data set based on internal statistics from the Zhejiang Provincial Department of Land and Resources on both the incidence as well as the buyer-seller pairs that participated in the trade in land conversion quotas. As noted, there are altogether 570 land quota trade activities across counties/districts in Zhejiang province during 1999 to 2003. For each trading activity, the data set records the names of the exporting and importing jurisdiction, the year the trade took place, the areas being traded, and the price being paid. We illustrate in Figure 1 buyer localities, seller localities, localities that both bought and sold, and localities that neither bought nor sold in

[8] According to Article 41 of the Land Administration Law of the People's Republic of China, land consolidation refers to the consolidation of fields, ponds, roads, woods and villages to raise the quality and increase the supply of cultivated land (Zhang et al. 2014).

the five year period between 1999 - 2003. The land conversion quota trade began in 1999, with only 11 trading activities during that year. The number of trade increased significantly to 83 in year 2000, further increased by 149 in 2001, peaked in 2002 at a recorded high of 247 events, and decreased to 80 trading activities in 2003.

As can be seen, the program appears to be well-received, although a number of other features are also notable. First, the number of localities that never traded is small in most years but non-trivial. Second, seller locations and buyer locations are quite stable over time, indicating that location specific forces may be at play. Third, there are multiple localities that both bought and sold during the same year, though not with the same partner. Motivated by these observations, we ask, what factors determine this market-based matching of buyer and seller locations? We first turn to a theoretical examination of these issues.

3 A Model of Trade in Land Conversion Quota

We present a sorting model of trade in land conversion quota based on the institutional details discussed in Section 2. Consider therefore an economy with a continuum of locations (i) of measure one, $i \in [0, 1]$. A government policy mandates that all locations are subject to construction land use quotas. In any given location, additional construction land use quotas can be obtained either by (i) engaging in agricultural land consolidation efforts locally, so that a fraction of the newly-added land area can be counted as permissible construction land use areas, or by (ii) importing unused construction land use quotas elsewhere. Thus, let construction land use in excess of the quota in location i be denoted as $x_i \geq 0$, where x_i gives the sum of construction quota due to local land consolidation efforts $x_i^o \geq 0$, plus any net import of additional land construction quota from a different location, to be denoted as m_i. m_i can take on positive or negative values, depending on whether the location is a net importing or a net exporting location, where

$$x_i = x_i^o + m_i.$$

Let the preference of each location with respect to x_i be approximated by a strictly concave quadratic utility function:

$$U_i(x_i) = \alpha_i + \beta_i x_i - x_i^2/2, \;\; \alpha_i, \beta_i > 0.$$

We allow the baseline utility α_i, the marginal utility evaluated at $x_i = 0$, β_i, as well as any additional construction quota rewarded due to local land consolidation efforts x_i^o to vary across locations. The slope of the marginal utility schedule $\partial U_i(x_i)/\partial x_i$ with respect to x_i is normalized to minus unity for all locations.

Denote the location-specific marginal utility of construction land use quota import as

$$\frac{\partial U_i(x_i)}{\partial x_i}|_{x_i=x_i^o} = \beta_i - x_i^o \equiv \omega_i.$$

ω_i measures the marginal utility of additional construction land use, β_i, accounting for local supply x_i^o rewarded due to land consolidation efforts. Henceforth, we will refer to the difference ω_i as the willingness to import, and $-\omega_i$ the willingness to export. Since β_i as well as x_i^o are location-specific, so is ω_i. Let the cumulative distribution function of ω_i be $F(\omega_i)$ on the interval $[\omega^-, \omega^+] \subset \mathbb{R}$.

Gains from Trade

Consider any arbitrary pair of buyer (b) and seller (s) with willingness to import respectively ω_b and ω_s. Denote $m(\omega_b, \omega_s) \geq 0$ as the match-specific land area traded, $p(\omega_s)$ the competitively determined gains from trade for the seller s, and T a common level of transaction cost to be borne by the buyer, the seller, or both.[9]

We are interested in the determinants of gains from trade in competitive equilibrium, and how such gains are in turn shared between buyer and seller locations. To do so, we will proceed by first evaluating the joint maximal gains from trade that can be achieved for any arbitrarily given pair of buyer and seller, and the associated construction land area traded m_i. We then proceed in the next section to endogenize the matching outcome in a competitive equilibrium, where the corresponding competitive payment schedule $p(\omega_s)$ will also be determined.

Thus, pick any pair of ω_b and ω_s from $[\omega^-, \omega^+]$, and denote the larger of the two ω_b, and the smaller of the two ω_s. If they are the same at some ω, then assign $\omega_b = \omega = \omega_s$. The maximal joint surplus function S below chooses a positive level of land area traded $m(\omega_b, \omega_s)$ between the two parties to maximize the sum of the change in welfare in the two locations:[10]

$$S = \max_m \quad [U_b(x_b^o + m) - U_b(x_b^o)] + [U_s(x_s^o - m) - U_s(x_s^o)] - T \tag{1}$$

The first term in parenthesis is the change in buyer utility gross of any transfer payments to the seller, and the second term in parenthesis the corresponding change in seller utility.[11] The

[9] For now, we treat T as common across all possible pairs of locations. The case of pair specific heterogeneity in transaction cost will be discussed in the following section.

[10] Note that any transfers between the two parties, to be discussed in more details below, are cancelled out in the evaluation of the joint surplus.

[11] It is straightforward to check that (1) above is a strictly concave problem with a unique solution for every ω_s, ω_b pair with $\omega_b \geq \omega_s$.

solution to (1) is given by:

$$m(\omega_b, \omega_s) = \frac{1}{2}(\omega_b - \omega_s) \tag{2}$$

if and only if the difference in willingness to import is large enough to justify the transaction cost, or equivalently, if and only if $T < (\omega_b - \omega_s)^2/2$. Otherwise, $m(\omega_b, \omega_s) = 0$. The associated maximal joint surplus in (1) is given by:

$$S(\omega_b, \omega_s) = \max\{\frac{1}{2}(\omega_b - \omega_s)^2 - T, 0\}. \tag{3}$$

$S(\omega_b, \omega_s)$ gives the maximal possible joint gains from trade given ω_b and ω_s. As shown, $S(\omega_b, \omega_s)$ is strictly positive for all ω_b, and ω_s such that $\omega_b - \omega_s > \sqrt{2T}$, increasing in ω_b, decreasing in ω_s, and submodular in ω_b and ω_s.[12] It follows, therefore, across two potential buyers $\omega_b > \omega_b'$, and two potential sellers $\omega_s > \omega_s'$, aggregate surplus is maximized by matching the buyer with the highest demand parameter with the seller with the lowest demand parameter, followed by the buyer with the next highest demand with the seller with the next lowest demand, for by submodularity,

$$S(\omega_b', \omega_s) + S(\omega_b, \omega_s') > S(\omega_b, \omega_s) + S(\omega_b', \omega_s').$$

In what follows, we check to see if negative assortative matching is borne out in equilibrium.

3.1 Competitive Equilibrium and Assortative Matching

We consider a competitive equilibrium, made up of (i) a set of buyers $\Omega_b \subset [\omega^-, \omega^+]$ and sellers $\Omega_s \subset [\omega^-, \omega^+]$, (ii) an assignment function $w_s(\omega_b)$ which gives the equilibrium assignment of the seller $\omega_s \in \Omega_s$ given buyer characteristic $\omega_b \in \Omega_b$, and (iii) a payment schedule $p(\omega_s)$ which gives the increase in seller utility beyond the no-trade baseline depending on seller characteristics.

In a competitive equilibrium, three conditions are met. First, each potential buyer takes the payment schedule $(p(\omega_s))$ as given, and chooses a seller ω_s to maximize the buyer's share of the maximal gains from trade:[13]

$$\max_{\omega_s} S(\omega_b, \omega_s) - p(\omega_s). \tag{4}$$

Second, economy wide balance of trade requires that the measure of the range of locations that sell construction land quotas is equal to the measure of the range of locations that buy construction land quotas, or, $\int_{\omega \in \Omega_s} dF(\omega) = \int_{\omega \in \Omega_b} dF(\omega)$. Third, locations are free to participate in the trade

[12] To see this, note that for any $\omega_b > \omega_b'$, and $\omega_s > \omega_s'$, $S(\omega_b, \omega_s) + S(\omega_b', \omega_s') < S(\omega_b', \omega_s) + S(\omega_b, \omega_s')$. In standard sorting theories of match formation (Becker 1974, Shimer and Smith 2000), efficient allocation entails negative assortative matching where higher ω_b are matched with low ω_s.

[13] We will assume for now that this maximization problem of a potential buyer is strictly concave. Later on, we will show that this assumption is borne out in equilibrium.

in land conversion quotas and as such equilibrium joint gains from trade must be non-negative for every matched pair with positive trade.

We relegate the details of the proof the properties of the competitive equilibrium to Appendix A. In what follows, we provide an intuitive presentation of four key properties of the competitive equilibrium. These include: (i) an equilibrium assignment function that exhibits negative assortative matching, (ii) a division of locations into inactive / non-trading locations $[\omega^-, \omega^+] - \Omega_b - \Omega_s$, buyer locations Ω_b, and seller locations Ω_s, and (iii) an equilibrium joint surplus that is strictly increasing in buyer willingness to import, and seller willingness to export accounting for equilibrium sorting,[14] and (iv) a division of the equilibrium joint surplus such that the buyers' portion $(S(\omega_b, w_s(\omega_b)) - p(w_s(\omega_b)))$ is increasing in buyers' willingness to import, and the sellers' portion $p(\omega_s)$ is increasing in seller's willingness to export as long as joint gains from trade is positive.

First, for all $\omega_s \in \Omega_s$ and $\omega_b \in \Omega_b$ such that gains from trade $S(\omega_b, \omega_s)$ is strictly positive, the solution to (4) yields an equilibrium assignment function $w_s(\omega_b)$ that takes the form:

$$w_s(\omega_b) = F^{-1}(1 - F(\omega_b)). \tag{5}$$

Thus, $w_s(\omega_b)$ is strictly decreasing in ω_b consistent with negative assortative matching. For example, a buyer location with the highest willingness to import $\omega_b = \omega^+$ is matched with a seller location with the lowest willingness to import, $\omega_s = \omega^-$ or

$$w_s(\omega^+) = F^{-1}(1 - F(\omega^+)) = F^{-1}(0) = \omega^-.$$

The next highest demand buyer is in turn matched with the next lowest demand seller, and so on. A key implication of negative assortative matching is that the competitive equilibrium outcome is efficient, consistent with Becker (1973), where negatively assortative matching is efficient in the presence of a submodular joint surplus function. In fact, a stronger statement can be made. As we show in Appendix B, no alternative bilateral matches negotiated in the shadow of the competitive equilibrium can generate higher joint expected surplus.

Second, for all $T > 0$, a non-degenerate range of inactive / non-trading locations in the mid-range of $[\omega^-, \omega^+]$ can be found. Specifically, the largest ω_s that exports land conversion quotas is given by the seller of the marginal trader-pair which breaks even in the presence of transaction

[14] In other words, $S(\omega_b, w_s(\omega_b))$ rises with ω_b, and $S(w_s^{-1}(\omega_s), \omega_s)$ rises with $-\omega_s$.

cost T, provided that T is not so large as to prohibit trade all together:[15]

$$\omega_s^{max} = \max\{\omega_s | S(w_s^{-1}(\omega_s), \omega_s) - T \geq 0\}. \tag{6}$$

while the smallest ω_b that imports land conversion quotas is given by the buyer of the marginal trader-pair which breaks even with $T > 0$:

$$\omega_b^{min} = \min\{\omega_b | S(\omega_b, w_s(\omega_b)) - T \geq 0\}. \tag{7}$$

Thus, the range of sellers with positive transaction cost is given by $\Omega_s = (\omega^-, \omega_s^{max}]$ and the range of buyers is given by $\Omega_s = (\omega_b^{min}, \omega^+]$, where $\omega_s^{max} \leq \omega_b^{min}$ as along as $T \geq 0$.[16] As a special case, if $T = 0$, all locations engage in trade and strictly gain from doing so, except for the median location where where buyer and seller willingness to import coincide: $\omega_b^{min} = \omega_s^{max} = F^{-1}(1/2)$, and gains from trade is equal to zero.

Using the assignment function $w_s(\omega_b)$, the total gains from trade facing the buyer seller pair $(\omega_b, w_s(\omega_b))$ is thus simply $(\omega_b - w_s(\omega_b))^2/2 - T$, while the total gains from trade facing the equilibrium buyer-seller pairing $(w_s^{-1}(\omega_s), \omega_s)$ is $(w_s^{-1}(\omega_s) - \omega_s)^2/2 - T$. These are respectively strictly increasing in buyer willingness to import, and the seller willingness to import. Furthermore, based on the first order condition associated with (4), as well as the equilibrium assignment function in (5), we show in the appendix that the competitive seller compensation $(p(\omega_s))$ for all $\omega_s \in \Omega_s$ is given by:

$$p(\omega_s) = \int_{\omega_s^{max}}^{\omega_s} -(w_s^{-1}(\omega_s) - \omega_s))d\omega_s, \tag{8}$$

a function that is strictly decreasing in import ω_s[17] while the buyer's portion of the total gains from trade for all $\omega_b \in \Omega_b$,

$$S(\omega_b, w_s(\omega_b)) - p(w_s(\omega_b))$$

is strictly increasing in ω_b using the first order condition associated with (4).[18]

In summary, the difference $(\omega_b - \omega_s)$ in willingness to import in conjunction with transaction cost dictate the gains from trade and the land area traded. Both buyers and sellers partake

[15] From (5), $S(w_s^{-1}(\omega_s), \omega_s) - T$ is monotonically decreasing in ω_s. Let ω^m denote the median willingness to import with $F(\omega^m) = 1/2 = 1 - F(\omega^m)$. Clearly, $S(w_s^{-1}(\omega^m), \omega^m) - T = -T < 0$. By standard arguments, the fixed point in (6) is well-defined as long as $S(w_s^{-1}(\omega^-), \omega_s^-) - T = S(\omega^+, \omega_s^-) > 0$. The proof of the existence of ω_b^{min} in (7) can be done analogously.

[16] To see this, note that by balanced trade, $w_s(\omega_b^{min}) = \omega_s^{max}$. By definition in (7), $S(\omega_b^{min}, w_s(\omega_b^{min})) = (\omega_b^{min} - w_s(\omega_b^{min}))^2/2 = (\omega_b^{min} - \omega_s^{max})^2/2 = T \geq 0$.

[17] To see this, note from () that $\frac{\partial p(\omega_s)}{\partial \omega_s} = -(w_s^{-1}(\omega_s) - \omega_s) < 0$.

[18] The special case of a uniform distribution $F(\omega) = (\omega - \omega^-)/(\omega^+ - \omega^-)$ is illustrative. In this uniform case, the equilibrium assignment function takes the simple form $w_s(\omega_b) = \omega^+ + \omega^- - \omega_b$. In addition, the marginal seller is given by $\omega_s^{max} = (om^+ + \omega^- - \sqrt{(2T)})/2$, while the marginal buyer is given by $\omega_b^{min} = (\omega^+ + \omega^- + \sqrt{(2T)})/2$. Furthermore, the equilibrium competitive payment schedule $p(\omega_s)$ takes the particularly simple form: $[(om^+ + \omega^- - 2\omega_s)^2/2 - T]/2$.

in the gains from trade in a way that reflects their respective willingness to import and export land conversion quotas. Furthermore, the negative assortative equilibrium outcome implies that otherwise decentralized locations are guided to achieve the maximal aggregate gains from trade. The policy of land conversion quota trade and indeed be justified in aggregate efficiency terms. These said, all of the above take the cost of transaction as uniform among all possible buyer-seller matches. What if select buyer and seller pairs enjoy special prior connections, thus potentially mitigating against the transaction cost of trade? We turn to this next.

3.2 Network Mediated Trade

Suppose that a buyer and a seller are connected via networks. Since the competitive assignment dominates any alternative assignment (Appendix B), network connections will only facilitate trade if such links mitigate against transaction costs. Arguably, through better knowledge of government personnel as well as local land market conditions, for example, a lower pair-specific transaction cost relative to the cost of trade between previously unknown parties $T^c < T$ may apply. Given this potential change in transaction cost, a connected buyer / seller has two choices: (i) accept the competitive assignment, thus forgoing the transaction cost savings, or (ii) strike an alternative contract with the connected location. If the latter is chosen, the competitive equilibrium outcome will serve as the next best alternative, which in turn dictates the reservation (threat point) utility of the buyer or seller in question. Denote the reservation utility of a buyer ω_b and a seller ω_s as $\bar{U}(\omega_b)$ and $\bar{U}(\omega_s)$ respectively.

From (6) and (7), any arbitrary pair of connected locations (ω_b, ω_s) can be of one of four types. First, the connected pair of buyer and seller may both be active in a competitive equilibrium, or equivalently $\omega_b \in \Omega_b$ and $\omega_s \in \Omega_s$ and respectively trade with their competitively assigned partners $w_s(\omega_b)$ and $w_s^{-1}(\omega_s)$. It follows that $\bar{U}(\omega_b) = S(\omega_b, w_s(\omega_b)) - p(w_s(\omega_b))$ and $\bar{U}(\omega_s) = p(\omega_s)$ respectively.

If network mediated trade can indeed decrease transaction cost, locations that are previously deterred from trading due to high transaction cost can now participate. Thus, there are three other cases of interest:

- The buyer is active in competitive equilibrium, but the seller is not ($\omega_b \in \Omega_b$ and $\omega_s \notin \Omega_s$). Thus, $\bar{U}(\omega_b) = S(\omega_b, w_s(\omega_b)) - p(w_s(\omega_b))$ and $\bar{U}(\omega_s) = 0$;

- The buyer is inactive in competitive equilibrium, but the seller is active ($\omega_b \notin \Omega_b$ and $\omega_s \in \Omega_s$). Here, $\bar{U}(\omega_b) = 0$ and $\bar{U}(\omega_s) = p(\omega_s)$ for the seller;

- Both parties are inactive in competitive equilibrium, in which case $\bar{U}(\omega_b) = \bar{U}(\omega_s) = 0$.

Let $S^c(\omega_b, \omega_s)$ denote the expected surplus associated with trade in land conversion quotas between a pair of connected localities, with

$$S^c(\omega_b, \omega_s) = \max\{\frac{1}{2}(\omega_b - \omega_s)^2 - T^c, 0\}.$$

Network mediated trade gives rise to higher joint surplus relative to the competitive outcome for ω_b and ω_s if and only if

$$\Delta S(\omega_b, \omega_s) \equiv S^c(\omega_b, \omega_s) - \bar{U}(\omega_b) - \bar{U}(\omega_s) \geq 0$$

By hypothesis, network connection can facilitate trade by virtue of a lower cost of transaction $T^c < T$. However, a connected leader may nonetheless forgo such cost savings if the willingness to trade of the connected party differ significantly from that of the competitive assignment. To assess how these network induced distortions in buyer / seller characteristics can impact trade, Table 1 summarizes the comparative statics responses of $\Delta S(\omega_b, \omega_s)$ with respect to ω_b and ω_s for each of the four distinctive cases elaborated above.

Evidently, the comparative statics of the determinants of trade among connected locations with respect to buyer and seller willingness to import is nuanced, depending on (i) whether network-mediated trade connect localities that are active or inactive in competitive equilibrium, and (ii) whether network-mediated trade introduce distortions in matches relative to the competitive assignment. Consider first the case where both parties are active in a competitive equilibrium, an increase in buyer willingness to pay *decreases* the expected joint surplus if and only if

$$\omega_s > w_s(\omega_b),$$

or equivalently, *only if* the networked seller has a demand parameter that is higher than the competitive determined pairing $w_s(\omega_b)$.[19] In this case, a increase in the buyer demand exacerbates the network induced distortion in trader match,[20] and reduces the likelihood of a network induced match. For analogous reasons, an increase in seller willingness to pay can likewise *decrease* the expected joint surplus *only if*

$$\omega_b > w_s^{-1}(\omega_s),$$

[19] This is easily evident from Table 1, where there are no other combinations of buyer activity in competitive equilibrium and network induced match distortions that can generate this negative impact.

[20] This is the case since the competitive assignment exhibit negative assortative matching

in other words, if the networked buyer has a demand parameter that is higher than the competitive determined pairing $w_s^{-1}(\omega_s)$.[21]

Now suppose instead that both the buyer and the seller locality are inactive in competitive equilibrium. Raising buyer willingness to pay unconditionally increases the likelihood of network mediated trade. Raising seller willingness to pay has the opposite effect of lowering the likelihood of network mediated trade. These agree well with the determinants of trade among unconnected buyers and sellers.

Summarizing the empirical implications of model amended to incorporate leader connections, network connections can only raise the gains from trade by lowering transaction cost since the competitive assignment dominates any alternative assignments. Furthermore, (8), (9) and Table 1 summarize a variety of possible impacts of buyer and seller willingness to trade on any excess gains from trading with connected parties. For example, an increase in buyer demand among networked parties decreases the expected surplus of network mediated trade *only if* the networked seller party has higher demand than the competitive assignment.

4 Identification Strategy

We use a "gravity equation" style model to investigate the possible factors leading to land conversion quota trade. Consequently, our empirical specification include all three sets of variables for both the selling and the buying locations in determining the incidence of trade. Specifically, we employ a proportional hazards model (Cox 1972) to analyze the potential determinants leading to land conversion quota trade. Let t_j denote time elapsed since the policy of land conversion quota trade begin in 1999. For each exporter*importer pair j, let $h(t_j|x_{jt})$ measure the trade hazard rate – the probability of engaging in land conversion quota trade, conditional on not having done so before t_j.

The model is specified in the following form:

$$h(t_j|x_{jt}) = h_0(t_j)exp(\sum_i x_{ijt}a_i) \tag{9}$$

$h_0(t_j)$ is a baseline hazard function and no parametric assumptions are made on h_0. x_{ijt} represents factor i affecting the hazard function for jurisdiction pair j in year t. a_i are the coefficients to be

[21] As a special case, suppose that the connected parties are in fact high willingness to import locations enough so that both are buyers in a competitive equilibrium: ω_b and ω_s are both in Ω_b. In this case, network mediated trade in fact alters the direction of trade for the seller, otherwise a buyer in a competitive equilibrium. In this case, raising buyer willingness to pay decreases the likelihood of network mediated trade for it exacerbates the network induced distortion in the pairing of buyer and seller. Raising seller willingness to pay has the same effect.

estimated from the data.

The model is proportional in that the hazard jurisdiction pair j faces is multiplicatively proportional to the baseline hazard. Therefore, the hazard ratio for a unit change in x_{ijt} is $exp(a_i)$. If a_i is significantly positive, it indicates that one unit increase in x_{ijt} increases the hazard of land conversion quota trade by $exp(a_i) - 1$. If a_i is significantly negative, it indicates that one unit increase in x_{ijt} decreases the hazard of trade by $1 - exp(a_i)$.

The above mentioned proportional hazards model only utilizes the information for the first land conversion quota trade event for a specific jurisdiction pair j. However, this suffers from loss of relevant information since it ignores multiple failures, namely additional land conversion quota trade events in our context. In the dataset, 110 out of 361 trade events are multiple trades which have not been included in the previous set-up of proportional hazards model. Hence, we adopt the counting process approach by Andersen and Gill (1982) to include all the trade events for the proportional hazards model. The modification of Andersen and Gill (1982) to Cox model involves multivariate counting process allowing for recurrent event, which jointly evaluate the log likelihood of n-component multivariate counting process (see section 2.2 of Anderson and Gill (1982)).

We use a number of variables on the right hand side of the proportional hazards model as controls. Based on our discussion in section 3, these variables respectively control for (i) the willingness to import of the buyer location and the willingness to export of the seller location, (ii) the cost of transaction accounting for possible leader connections between the buyer and seller locations, (iii) possible network induced distortions in buyer-seller matches, (iv) other variables capturing scale, institutional differences, year fixed effects, city-pair fixed effects, and prior trade effects. These are explained in greater detail below.

5 Data

Zhejiang Jurisdictions, 1999 - 2003

We construct a dataset for all the possible jurisdiction pairs in Zhejiang province during 1999 to 2003. Specifically, there are 99 possible traders within the province, including 60 counties (or county level cities) [22], 28 urban districts [23] and 11 urban jurisdictions (*shixiaqu*). Thus, there are 9,801 (99^2) possible trade pairs in each year. Since we have 5 years, the total number of observations in our dataset is 49,005 (9801*5).

[22] Quxian and Yinxian were upgraded into Quzhou district and Yinzhou district in 2001 and 2002, respectively. In our dataset, we still treat these two jurisdictions as counties instead of urban districts.

[23] Wuxing and Nanhu districts were founded in 2003, therefore not included in our sample.

Trade Incidence

Our key variable of interest in this paper is the land conversion quota trading activities between local governments. This is defined at the "exporter*importer*year" level. The data is collected based on internal statistics from the Zhejiang Provincial Department of Land and Resources. The information contains both the incidence as well as the buyer-seller pairs that participated in the trade in land conversion quotas. There are altogether 570 land quota trade activities across counties/districts in the five year period between 1999 - 2003. Since multiple trade activities can occur between the same pair of exporter and importer in the same year, we collapse multiple trade activities in the same year into one event for each "exporter*importer*year" cell. As a result, there were 352 trading events at the "exporter*importer*year" level during 1999-2003.

Determinants of Trade

As our model indicates, the pattern of land conversion quota trade depends critically on the difference in willingness to import between any pair of buyer and seller, $\omega_b - \omega_s$, and the transaction cost associated with the trade, T. We take ω_i to depend both on market forces, as well as the extent to which a government is at liberty to make local development decisions. The stronger the market demand for land, the higher we expect ω_i to be. Furthermore, the more administrative autonomy a local government possesses in making local investment and infrastructure reforms, the higher will be the incentive to import construction land use rights. Finally, we take T to depend on possible linkages between local government leaders with a potential trading partner:

1. Market forces

   We capture market forces of each localition in two ways, including demand and supply considerations. We use GDP per capita of the subprovincial district to which the locality belongs as contributing to demand, ω_i, in the model. For the years 1999 - 2003, this data is collected from the Statistical Yearbooks of the Zhejiang province (2000-2004). We draw motivation for doing so from the empirical land conversion literature particularly in China. For example, Seto and Kaufmann (2003) presents evidence of a feedback loop that links income growth, consumer demand, and urban expansion in a study of agricultural land conversion in the Pearl River Delta of China. Off-farm wage income is likewise found to be positively associated with agricultural land conversion.[24] From the importer's perspective, our use of per capita income

[24]The study also suggest clearly that foreign direct investment, as well as the relative productivity of agricultural

to capture the demand parameter β is in part motivated by these observations. In addition, from the exporter's standpoint, due to fiscal decentralization reforms since 1994, local governments are increasingly reliant on locally collected revenue to finance public goods (Qian and Roland 1998). A low GDP per capita is thus indicative of a unit with arguably high demand for extra-budgetary revenue for local development purposes. To capture supply side considerations, we introduce the share of cultivated land for each jurisdiction, also collected from the Statistical Yearbooks.

2. Administrative autonomy

   Schneider (2003) discusses various ways to measure local administrative autonomy, including the percentage of local revenue from taxes, the percentage of total grants and revenues not accounted for by central transfers, for example. Unfortunately, data on these measures at the county level is not available. Instead, we refer to a policy notice in 1992 by the Zhejiang Provincial Government that directly gave special power to 13 select administrative units additional authority over socio-economic affairs:

   > "... if it is a nonproduction infrastructure proejct with a total investment of less than 15 million yuan, or if it is a basic production construction project with a total investment of less than 30 million yuan, or if it is a technical upgrading project with a total investment of less than 10 million yuan, it could be examined and approved by the county (or county-level city) governments." (Yu and Gao 2013, Zhejiang Provincial Government 1992)

   The list of administrative units included 4 urban districts (namely Xiaoshan, Yuhang, Huangyan and Jiaojiang) and 9 counties (namely Yinxian, Cixi, Yuyao, Haining, Tongxiang, Shaoxing, Jiashan, Pinghu and Haiyan). As a measure of administrative autonomy, we create a dummy variable with a value of one for the 13 administrative decentralized jurisdictions, and zero otherwise.

3. Connected Leaders

   The literature on the role of political connections on economic performance and policy effectiveness in China is a very nascent area of research. Qin (2013), for example, tests whether firms with political connections receive preferential treatment through centrally funded capital investment and subsidies based on the working experience of top leaders of the State

and industrial land are important determinants of the rate of agricultural land conversion in the Pearl River Delta.

Council and a panel of manufacturing firms. Qian (2008) provides evidence on the relationship between government enforcement effort to weed out counterfeit products and company relationships with the government. Contrary to these studies our network connection variables captures the potential for the prior personal links, career and education experiences of a leader in lowering the transaction costs of trade. In the model, this reduction is given by the difference $T - T^c$.

For this purpose, we collected the published resumes for each county/district head and county/district party secretary (*shuji*) from 1999 to 2003. The network between county/district A (exporter) and B (importer) is defined in three ways: 1) career network due to work experience; 2) birthplace network, and 3) education network. We say that county/district A (exporter) and B (importer) have network connections in year t if: 1) at least one of the two officials in A (B) has worked in B (A); 2) at least one of the two officials in A (B) was born in B (A); or 3) at least one of the two officials in A (B) graduated from the same university/college with any of the two officials in B (A). Since different types of networks may play different roles in land conversion quota trade decisions, we also create individual measures for network connections in A and B due to birthplace, working experience[25] and education.

4. Other variables

   In addition to the above variables, we also control the following variables which may affect the propensity to trade land conversion quotas between jurisdiction pairs, including: 1) scale effects: total land area collected from the Statistical Yearbooks; 2) a dummy variable indicating common border between each possible pair, which measures the geographical closeness of potential trading partners; 3) a dummy variable indicating the same prefecture city for each jurisdiction pair, which measures the institutional closeness; and 4) dummy variables indicating whether the potential exporter and importer are urban areas or not, since the decision making process is likely to differ in urban areas (districts/urban jurisdictions) and surrounding counties.

5.1 Data Summary

Table 2 summarizes the key variables used in the estimation. Among all "exporter*importer*year" cells, around 0.7 percent experienced at least one land conversion quota trade. The average GDP per capita during 1999-2003 in the counties/districts is 14,620 yuan (around 2,360 US Dollars). In

[25] Career experience network is defined based on work history in non-birthplace counties/districts.

terms of network connections, around 12.4 percent of the cells have at least one out of the three types of connections. 2.2 percent of the leaders among all the cells have birthplace connections; 3.5 percent have working experience connections; and 8.2 percent share the same university/college networks.

Table 3 provides the descriptive statistics for the 13 decentralized jurisdictions. Compared to the non-decentralized urban districts, the 4 decentralized districts have higher GDP per capita, larger population and more land (Panel A). Interestingly, decentralized urban districts are more active in importing land conversion quotas from other jurisdictions compared to non-decentralized districts. But none of them export land conversion quotas.

Compared to the non-decentralized counties/county level cities, the 9 decentralized county level jurisdictions have higher GDP per capita, larger population, but smaller land areas as suggested in Panel B. Similar to decentralized urban districts, the 9 decentralized counties/county level cities are more active in importing land conversion quotas but less active in exporting land conversion quotas when comparing to the non-decentralized county level units.

6 Main Findings

Table 4 presents the results for proportional hazards model estimations. Columns 1-2 report the results using the information of the first trade event between jurisdiction pairs, while columns 3-4 report the results allowing for multiple trade events in different years between the same jurisdiction pair, following the approach by Andersen and Gill (1982). In each estimation, we include our proxy measures for both the buyer and seller units respectively on market forces, administrative autonomy, and leader connection as discussed in Section 4. In addition to reporting the main result on leader connection (columns 1 and 3), we also report the interactive effect of connection and GDP per capita of exporters and importers in columns 2 and 4. Doing so allows us to ascertain whether leader networks (i) raises the likelihood of a match by lowering transaction cost, and (ii) create match distortions when connected leaders do not conform with the competitively assigned pairing of locations. Finally, we also introduce a host of other variables as discussed in section 4 in order to control for scale, geographic and institutional closeness, and dummy variables distinguishing between urban areas and surrounding counties.

The estimated coefficients are robust across different specifications in Table 4. From these estimates, we report three broad sets of findings. First, in terms of market forces, lower (higher) GDP per capita counties/districts are associated with higher likelihood of selling (buying) land conversion quotas (rows 1-2). The coefficients on exporter GDP per capita range from -1.863 to -2.028, translating into hazards ratios ranging from 0.13 to 0.16. This indicates that if exporter's GDP per capita is increased by 10 percent, the associated trade hazard decreases by 16.2 percent ($1 - exp(ln(1 + 0.1) * -1.863)$ to 17.6 percent ($1 - exp(ln(1 + 0.1) * -2.028)$. In contrast, the coefficients on importer GDP per capita range from 1.722 to 2.085, which indicates that if importer's GDP per capita is increased by 10 percent, the associated trade hazard increases by 17.8 percent ($exp(ln(1+0.1)*1.722)-1$) to 22.0 percent ($exp(ln(1+0.1)*2.085)-1$). In addition to these demand side considerations, we find that larger share of cultivated land indeed increases the likelihood of selling land conversion quotas (rows 3-4).

Second, administrative decentralized counties/districts are associated with lower likelihood of selling land conversion quotas, and higher likelihood of buying such quotas (rows 5-6). The coefficients on the decentralization status of exporters is around -1, which suggests that if land conversion quota seller is from one of the 13 decentralized jurisdictions, it decreases the hazard of trade significantly by around 63 percent ($1 - exp(-1)$). Similarly, the coefficients on the decentralization status of importers suggest that locating in the 13 decentralized jurisdictions increases the hazard of trade by around 39.1 percent ($exp(0.33) - 1$) to 47.7 percent ($exp(0.39) - 1$). These findings are consistent with a positive relationship between administrative autonomy and ω_i. Thus, administrative autonomy improves the likelihood of trade among importers, and decreases the likelihood of trade among exporters.

Third, network connections significantly increase the likelihood of land conversion quota trade between the two parties (row 7). Two out of the four coefficients are statistically significant at the 10 percent level. The other coefficients are positive though. If we interpret the magnitude of the effect based on the two significant coefficients, it indicates that being connected with at least one type of the networks enhances the hazard of trade by around 185.7 percent ($exp(1.05) - 1$) to 188.6 percent ($exp(1.06) - 1$).

The wide range of magnitude for the network coefficients in different columns is due to the inclusion of interaction terms between network dummy and GDP per capita of the two parties of potential trade (rows 8-9). The interaction terms are negative in all cases here, and significant only in a handful of cases. Based on our discussion of Table 1 in the theory section, the evidence in Table 4, with negative interaction effect between network connection and importer GDP per capita, points to the possibility that network connections (i) impact buyers that have high enough GDP per capita to be active in competitive equilibrium despite transaction costs, but (ii) the buyers are connected with sellers that have higher demand for land than their competitive assignment. The existence of match distortion suggests the possibility that locations that would have otherwise acted as buyers in competitive equilibrium are turned sellers of land conversion quotas to locations with even higher demand for land. This is consistent with the picture illustrated in Figure 1, where some counties simultaneously bought and sold land conversion quotas to different peer counties/ districts in the same year.

In addition to the three main findings, Tables 4 and 5 offer a number of additional observations: 1) jurisdictions from the same prefecture city are more likely to trade land conversion quotas with each other, but geographic closeness is not significantly associated with a higher likelihood of trade (rows 10-11); 2) larger total area increases the likelihood of being both exporter and importer in land conversion quota trade (rows 12 - 13), and 3) counties are more likely to export land conversion quota while districts are more likely to import (rows 14-15).

7 Estimation Issues

In this section, we examine a number of estimation issues that may arise. These include two-say causality, rare events, unobserved heterogeneity, prior trade, different types of network effects, and trade within city pairs.

7.1 Two-Way Causality

Since trade in land conversion quota trade may in turn affect some of the explanatory variables, such as GDP per capita and network variables in subsequent years, one concern is possible bias due to two-way causality. To address this concern, we report the findings from a set of regressions that only uses explanatory variables in the year 1999 – the starting year of the land conversion quota trade project – as controls. By doing so, we ascertain the variations of time to trade solely based on the initial conditions of each jurisdiction pair. Table 5 presents the results. The results are generally similar to the outputs in Table 4. One difference worth noting is that the coefficients for the network variable gain more significance, while the interaction between network and importer GDP per capita become less significant in this new setting. A possible explanation is that the loss of variation of GDP per capita variable when only initial values are used.

7.2 Proportion versus Hazards

While the proportional hazard model ascertains the trade hazard rate, one may be interested instead in the proportion of eligible exporter*importer pairs that ultimately trade with one another. We thus presents a series of logit regressions to confirm whether a switch in emphasis from hazard rates to proportions makes a difference to our analysis.

7.3 Rare Event

While many counties/districts in Zhejiang participated in land conversion quota trading, there are many zero entries among all the exporter*importer pairs as shown in Table 2. The relatively few number of trade matches lead to potential concern for biased estimates in maximum likelihood estimations with rare events (King and Zeng 2001). Hence, we estimate a Firth logit regression (Firth 1993; Heinze and Schemper 2002) which applies penalized maximum likelihood regression to reduce bias introduced by rare events in maximum likelihood estimates in generalized linear models (similar to King and Zeng (2001)'s approach in modeling rare events in logistic regressions).

7.4 Unobserved Heterogeneity

While we have attempted to account for the influence of decentralization policies, markets, and individual leader characteristics in the likelihood of trade, it is nonetheless possible that the baseline likelihood of trade at the buyer-seller pair level may be governed by unobserved variables that we have not been able to collect information for. These include personal connections not captured in the network variables, other existing relationships whether in rivalry or in cooperation that are not correlated with other explanatory variables. Therefore, we estimate a random effect logit regression which allows a random coefficient for each jurisdiction pair j, which is specified as follows:[26]

$$P(Y_t = 1|x_{ji,t-1}) = F(a_0 + \sum_i x_{ji,t-1}a_i + \eta_j) \tag{10}$$

where η_j is the random intercept for jurisdiction pair j which follows a normal distribution with mean zero and standard deviation of φ. $x_{ji,t-1}$ stands for the same covariates being used in the proportional hazards model, but with one year lag to avoid two-way causality.

7.5 Prior Trade

From our panel data of trade in land conversion quotas, we can also determine whether any particular trade event is preceded by a prior trade event. Such an event may help to mitigate against

[26] $F(v) = F_{logit}(v) = \dfrac{e^v}{1+e^v}$.

transaction costs in subsequent periods. In the Firth logit model and random effect logit model, we control for the effect of land conversion quota trade occurred prior to year t on the probability of trade in the current year.

Table 6 presents the results using Firth logit model (columns 1-2) and random effect logit model (columns 3-4). All the time-variant explanatory variables are lagged one year in order to avoid two-way causality. The results are very similar to the results reported using proportional hazards model. In addition, the coefficients on prior trade are significantly positive, which suggest that prior trade enhances the chances of trade in later periods with the same partner.

7.6 Unpacking the Effects of Networks

Different types of networks can have different impact on trade. We unpack these in three ways: 1) being connected due to working experience; 2) being connected due to birthplace; and 3) being connected due to university/college education. In order to examine the potential heterogeneous impacts of the three different types of networks on trade, we replace the network variable in previous results with these three separate measures and perform the analysis in Tables 7-9.

Table 7 presents the results using career specific network. Here we display the findings using both proportional hazards models and logit models. The results are very consistent with the results using the broad measure of networks (Tables 4 and 6). However, when we replace the network variable with birthplace specific network (Table 8) and education specific network (Table 9), almost none of the coefficients on the network variables and the interactions between network and GDP per capita are significant. Based on these results, it would appear that career specific network is the primary determinant of network linkages on trade in land conversion quotas.

7.7 Trade Patterns within City Pairs

Earlier we discussed the issue of unobserved heterogeneity across jurisdiction pairs and provided the results based on random effect logit models. Another way to deal with the unobserved heteorogeneity is to get rid of the pair-specific coefficient η_j by conditioning them out of the likelihood function. Therefore, we adopt the conditional logit approach based on McFadden (1973). The conditional logit model is derived from a random utility framework. Suppose there are J jurisdictions, for each seller a, the utility selling land quota to buyer b must be the highest among all the possible J choices. Under certain assumptions,[27] the probability of jurisdiction a selling land conversion

[27] The disturbance term for each choice among the J jurisdictions are independent and identically distributed with the Weibull distribution.

quotas in year to another jurisdiction b in year t is

$$P(Y_{a,t} = b) = \frac{exp(\beta_i x_{ji,t-1})}{exp(\sum_k \beta_i x_{ji,t-1})} \tag{11}$$

where jurisdiction pair j denotes the seller-buyer pair (a,b), $x_{ji,t-1}$ stands for the lagged covariates specific to jurisdiction pair j in year t, while k in the denominator denotes all the jurisdictions possible for quota trade. Conditional logit estimation allows us to stratify / group the sample to identify traded pairs and their comparable non-traded pairs. Since the identification relies on within group variations, grouping at the jurisdiction pair level would drop all the jurisdiction pairs who did not trade with each other during the sample period. Hence, grouping at the prefecture city pair level is more appropriate in our case since it gives us more within group variations due to the relatively small number of events compared to the sample size. Equivalently, we assume that the unobserved heterogeneity is at the prefecture city pair level instead of jurisdiction pair level.

Table 10 shows the conditional logit estimation results for the full sample with all the four definitions of network connections. The number of observations shrinks to only around 8,000 since city pairs with no trade during 1999-2003 have been dropped due to no within-group variation. The results identified from within prefecture city pairs entail two significant changes compared to the previous estimation results. First, even though the coefficients on lagged GDP per capita of exporters remain negative, the standard errors of such coefficients significantly increase. Second, the coefficients on network connections are not always positive and significant. The patterns of the interaction terms between network and GDP per capita are also different from previous estimations.

One possible explanation for these results is that the factors affecting land conversion quota trade are heterogeneous across different types of trade. Motivated by such considerations, we conduct the same conditional logit estimations for two sub-samples: one with the city pairs both from the same prefecture level city; the other with the city pairs simply from different prefecture level cities. Interestingly, we find that the market force and network connections play different roles in the two sub-samples (as suggested in Table 11 and 12): network connections have a positive impact for the trade within the same city pairs, but not for the trade across cities. In contrast, market forces play a more important role for across-city trade, compared to trade within the same city. These observations suggest that the leader connections across city-pairs may be insufficient to overcome the transaction cost of trade, while market forces and administrative autonomy tend to dominate instead.[28]

[28]In addition to the conditional logit models, we also include export city and import city fixed effects (instead

8 Conclusion

What drive the decision-making of local government leaders in China? From the Zhejiang experiment in land conversion quota trading, we draw three main lessons. First, we find that market forces indeed matter. Similar to the predictions of a model in which a continuum of heterogeneous local governments compete in the trade of land conversion quota to maximize the local welfare, we find that our proxies for market demand for construction land predicts both the buyer and the seller behavior of land conversion quotas. Second, we find that this responsiveness can be further enhanced by administrative decentralization reform, where local governments are given more autonomy to make decisions concerning local investment and infrastructural projects. We also find that the personal characteristics of leaders matter as well, and in our context, the prior career experience of a leader in a different locality is shown to be of paramount importance in determining trade outcomes, consistent with transaction cost view that network connections confer informational advantages. Finally, we find that connected pairs of traders may not conform with the competitive assignment, and as such trade mediated by network connections can potentially give rise to match distortions. This may explain some of the observations involving simultaneous two-way trade in select counties/districts in our data.

As policy implications, this study has shown that land conversion quota trade has indeed facilitated in the allocation of land conversion quotas from low demand areas to high demand areas. Interestingly, this efficiency improvement is coupled with improvement in distribution as well as revenue flowed from high income localities to low income localities. Nonetheless, concerns regarding the program's effectiveness remain. For example, there is no study to date on the quality of land consolidation, and furthermore, the agricultural productivity impact of the reform. Second, the Zhejiang example shows a provincial level program is sensible in terms of minimizing the cost of transaction. A natural question is thus whether a provincial level trading program can be scaled up to achieve efficiency and distributional gains more broadly throughout the country.

of city pairs due to the convergence problem in likelihood estimation due to too many dummies) for proportional hazards model, firth logit, and random effect logit models. The coefficient patterns are quite similar to the conditional logit estimations in Table 10. The estimation results using these models are available upon request.

Appendix A

Properties of the Competitive Equilibrium

I. Negative Assortative Matching: The first order condition of the maximization problem in (4) evaluated at the equilibrium assignment $w_s(\omega_b)$ is:

$$-(\omega_b - w_s(\omega_b)) = p'(w_s(\omega_b)). \tag{12}$$

Totally differentiating the first order condition in (11) with respect to ω_b, the equilibrium assignment $w_s(\omega_b)$ is negatively assortative, or

$$w_s'(\omega_b) = \frac{1}{1 - p''(w_s(\omega_b))} < 0. \tag{13}$$

where it can be confirmed that $1 - p''(w_s(\omega_b)) < 0$ if the second order condition of the maximization problem is to be satisfied.

The negative assortative matching in (13) above implies that in a competitive equilibrium, the highest $\omega_b = \omega^+$ would match with the lowest $\omega_s = \omega^-$. As for the rest of the assignment schedule, ω_s is matched in equilibrium to ω_b if and only if the mass of $\omega \geq \omega_b$ is equal to the mass of $\omega \leq \omega_s$. Thus,

$$F(\omega_b) = 1 - F(w_s(\omega_b)) \quad \Leftrightarrow w_s(\omega_b) = F^{-1}(1 - F(\omega_b))$$

as displayed in (5).

II. Equilibrium Locational Division into Buyer/Seller/Inactive Regions: As stated in Section 3, with transaction costs T, the largest ω_s that exports is given by

$$\omega_s^{max} = \max\{\omega_s | S(w_s^{-1}(\omega_s), \omega_s) - T \geq 0\}$$

while the smallest ω_b that import is given by

$$\omega_b^{min} = \min\{\omega_b | S(\omega_b, w_s(\omega_b)) - T \geq 0\}.$$

III. Equilibrium Allocation of Gains from Trade. Let the equilibrium gains from trade for the marginal seller $p(\omega_s^{max})$ be equal to zero. For all other infra-marginal sellers:

$$p(\omega_s) - p(\omega_s^{max}) = \int_{\omega_s^{max}}^{\omega_s} p'(\omega) d\omega = \int_{\omega_s^{max}}^{\omega_s} -(w_s^{-1}(\omega) - \omega)) d\omega.$$

for $\omega_s < \omega_s^{max}$, and zero otherwise.

Appendix B

We show here that no trade in the shadow of the competitive equilibrium can achieve higher joint surplus. Thus, pick any two locations, say ω_b and ω_s. Suppose these two locations opt to negotiate an alternative arrangement separate from the market determined assignment $w_s(\omega_b)$. The joint surplus of such a pair is $S(\omega_b, \omega_s) = \max\{(\omega_b - \omega_s)^2/2 - T, 0\}$ as shown already in (3). Meanwhile, buyer ω_b's utility in competitive equilibrium based on the assignment $w_s(\omega_b)$ is

$$S(\omega_b, w_s(\omega_b)) - p(w_s(\omega_b))$$

while seller ω_s's utility in competitive equilibrium is simply

$$p(\omega_s).$$

Thus, if there exist a pair ω_b and ω_s in $[\omega^-, \omega^+]$ such that the difference

$$S(\omega_b, \omega_s) - [S(\omega_b, w_s(\omega_b)) - p(w_s(\omega_b)) + p(\omega_s)] \tag{14}$$

is positive, then the competitive equilibrium is inefficient. Using (3), as well as the assignment function in (5), it can be readily verified that (14) is strictly negative almost always, and equal to zero if and only if $\omega_s = w_s(\omega_b)$ and $\omega_b = -w_s^{-1}(\omega_s)$.[29]

[29] To see this, use the first order condition (12) to verify that $S(\omega_b, \omega_s) - [S(\omega_b, w_s(\omega_b)) - p(w_s(\omega_b)) + p(w_s^{-1}(\omega_s))]$ is strictly concave in w_b and w_s for the assignment function $w_s(\omega_b)$ is negatively sloped. Furthermore, totally differentiate (12) to show that the (14) attains a maximum at $\omega_s = w_s(\omega_b)$ and $\omega_b = w_s^{-1}(\omega_s)$. Substituting, $S(\omega_b, \omega_s) - [S(\omega_b, w_s(\omega_b)) - p(w_s(\omega_b)) + p(\omega_s)] = S(\omega_b, \omega_s) - [S(\omega_b, \omega_s) - p(\omega_s) + p(\omega_s)] = 0$.

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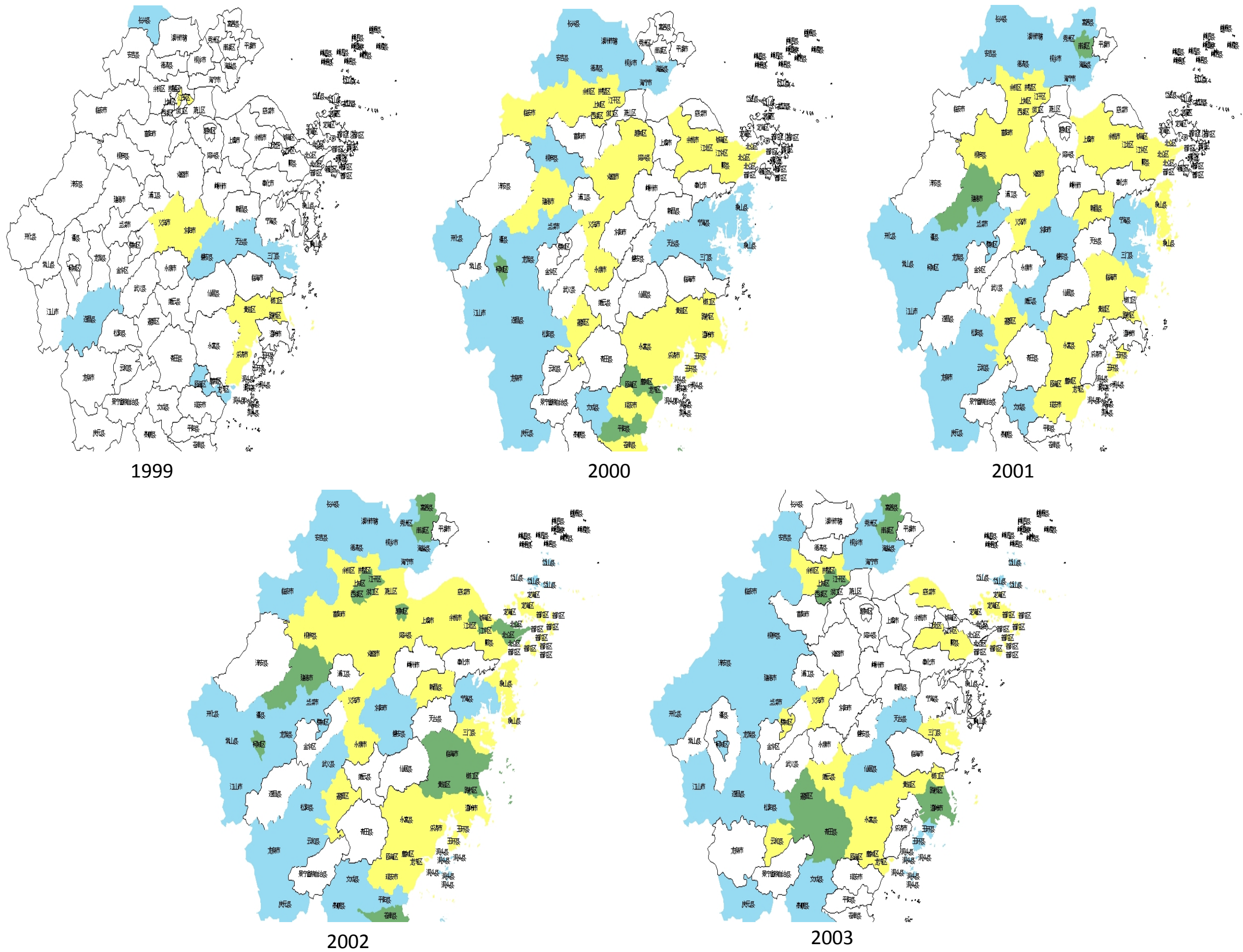
Figure 1: Land Conversion Quota Trade: 1999-2003 [30]



[30]Note: Export counties are marked in blue; import counties are marked in yellow; counties both exporting and importing are marked in green.

Table 1. Comparative Statics of $\Delta S(\omega_b, \omega_s)$ with respect to ω_b and ω_s:

	Both Trade $\omega_b \in \Omega_b, \omega_s \in \Omega_s$	Only Buyer Trades $\omega_b \in \Omega_b, \omega_s \notin \Omega_s$	Only Seller Trades $\omega_b \notin \Omega_b, \omega_s \in \Omega_s$	Neither Trades $\omega_b \notin \Omega_b, \omega_s \notin \Omega_s$
ω_b	$\text{sgn}(w_s(\omega_b) - \omega_s)$	$\text{sgn}(w_s(\omega_b) - \omega_s)$	+	+
ω_s	$\text{sgn}(w_s^{-1}(\omega_s) - \omega_b)$	-	$\text{sgn}(w_s^{-1}(\omega_s) - \omega_b)$	-

Table 2: Summary of Statistics

Year: 1999-2003; Total number of jurisdictions: 99					
Variables	Obs	Mean	Std. Dev.	Min	Max
Trade activity dummy	48,488	0.007	0.085	0	1
GDP per capita (in 10,000 yuan)	42,804	1.462	0.873	0.295	5.507
Share of cultivated land	41,642	0.195	0.143	0.025	0.839
Decentralization (dummy)	48,488	0.131	0.338	0	1
Birthplace networks (dummy)	48,478	0.082	0.329	0	1
Career networks (dummy)	46,744	0.022	0.148	0	1
Education networks (dummy)	46,744	0.035	0.184	0	1
Either of the three networks (dummy)	46,744	0.124	0.274	0	1
Adjacency (dummy)	48,488	0.051	0.220	0	1
Belonging to the same city (dummy)	48,488	0.091	0.288	0	1
Total Area (in sq. kilometer)	48,488	1221.1	829.79	18.1	4452
Urban district (dummy)	48,488	0.444	0.497	0	1

Note: Please refer to Section 4 for the data sources of each variable in this table.

Table 3: Descriptive Statistics of Decentralized Jurisdictions

	Panel A: Decentralized Urban Districts *(Yuhang; Xiaoshan; Huangyan; Jiaojiang)*	
	Decentralized Jurisdictions	Non-Decentralized Jurisdictions
GDP per capita (year 2003, 10,000 yuan)	2.74	2.1
Population (year 2003, 10,000 persons)	75.05	36.86
Land area (sq. kilometers)	980.25	405.94
Average number of trade events as importer per jurisdiction (1999-2003)	11.75	2.83
Average number of trade events as exporter per jurisdiction(1999-2003)	0	0.87
	Panel B: Decentralized Counties/County Level Cities *(Cixi; Haining; Haiyan; Jiashan; Pinghu; Shaoxing; Tongxiang; Yuyao; Yinxian)*	
	Decentralized Jurisdictions	Non-Decentralized Jurisdictions
GDP per capita (year 2003, 10,000 yuan)	2.88	1.41
Population (year 2003, 10,000 persons)	64.67	52.45
Land area (sq. kilometers)	925.78	1581.22
Average number of trade events as importer per jurisdiction (1999-2003)	4.44	1.94
Average number of trade events as exporter per jurisdiction(1999-2003)	0.66	5.15

Notes: 1. Among urban districts, 4 out of 28 of them were decentralized in 1992. Among counties and county level cities, 9 out of 60 were decentralized in 1992. 2. The 11 urban jurisdictions (*shixiaqu*) are excluded from the comparison since they are not comparable to an independent county or district.

Table 4: Factors Affecting Land Conversion Quota Trade Between Jurisdiction Pairs

	Proportional Hazards Model			
	(First Trade Event)		**(All Trade Events)**	
Explanatory Variables	[1]	[2]	[3]	[4]
Ln (GDP per capita) of exporter in year t	-1.943	-1.863	-2.028	-1.946
	(0.316)***	(0.334)***	(0.326)***	(0.354)***
Ln (GDP per capita) of importer in year t	1.817	2.085	1.722	1.987
	(0.248)***	(0.267)***	(0.265)***	(0.275)***
Share of cultivated land of exporter in year t	4.968	4.967	5.882	5.877
	(0.532)***	(0.527)***	(0.595)***	(0.592)***
Share of cultivated land of importer in year t	-0.386	-0.371	-0.386	-0.383
	(0.614)	(0.608)	(0.732)	(0.709)
Decentralization dummy for exporter	-1.049	-1.043	-1.039	-1.033
	(0.284)***	(0.283)***	(0.299)***	(0.298)***
Decentralization dummy for importer	0.342	0.331	0.391	0.381
	(0.214)	(0.212)	(0.233)*	(0.230)*
Connected (Three types) in year t	0.091	1.063	0.102	1.050
	(0.151)	(0.515)**	(0.151)	(0.534)**
Ln (GDP per capita) of exporter		-0.094		-0.086
* Connected (Three types) in year t		(0.547)		(0.599)
Ln (GDP per capita) of importer		-0.808		-0.762
* Connected (Three types) in year t		(0.371)**		(0.383)**
Adjacent or not	-0.063	-0.048	0.131	0.134
	(0.245)	(0.242)	(0.283)	(0.279)
Belonging to the same prefecture city	1.740	1.706	1.624	1.597
	(0.180)***	(0.183)***	(0.203)***	(0.206)***
Ln (Total area) of exporter in year t	0.429	0.427	0.500	0.501
	(0.106)***	(0.109)***	(0.120)***	(0.123)***
Ln (Total area) of importer in year t	0.461	0.484	0.492	0.519
	(0.098)***	(0.100)***	(0.108)***	(0.111)***
District dummy for exporter	-0.565	-0.565	-0.751	-0.751
	(0.220)**	(0.218)***	(0.226)***	(0.225)***
District dummy for importer	0.827	0.832	1.045	1.046
	(0.185)***	(0.186)***	(0.195)***	(0.197)***
N	33,524	33,524	33,878	33,878

Notes: 1. The coefficients (instead of hazard ratios) are provided for the results of proportional hazards models; 2. Robust clustered standard errors at jurisdiction pair level are provided in parentheses; 3. Year fixed effects are included in all the columns. 4. *** p<0.01; ** p<0.05; * p<0.1.

Table 5: Robustness Check Using Covariates in Year 1999 Values

	Proportional Hazards Model			
	(First Trade Event)		**(All Trade Events)**	
Explanatory Variables	[1]	[2]	[3]	[4]
Ln (GDP per capita) of exporter in 1999	-1.121	-0.839	-1.013	-0.567
	(0.317)***	(0.336)**	(0.320)***	(0.340)*
Ln (GDP per capita) of importer in 1999	1.652	1.827	1.527	1.754
	(0.219)***	(0.229)***	(0.233)***	(0.227)***
Share of cultivated land of exporter in 1999	2.565	2.532	3.091	3.039
	(0.379)***	(0.375)***	(0.405)***	(0.400)***
Share of cultivated land of importer in 1999	-0.081	-0.045	-0.028	0.042
	(0.546)	(0.545)	(0.622)	(0.616)
Decentralization dummy for exporter	-0.774	-0.770	-0.728	-0.720
	(0.261)***	(0.260)***	(0.275)***	(0.275)***
Decentralization dummy for importer	0.487	0.483	0.524	0.516
	(0.213)**	(0.213)**	(0.233)**	(0.232)**
Connected (Three types) in 1999	0.262	1.394	0.467	1.952
	(0.178)	(0.524)***	(0.190)**	(0.526)***
Ln (GDP per capita) of exporter		-0.901		-1.318
* Connected (Three types) in 1999		(0.707)		(0.740)*
Ln (GDP per capita) of importer		-0.596		-0.677
* Connected (Three types) in 1999		(0.416)		(0.459)
Adjacent or not	-0.059	-0.029	0.098	0.142
	(0.244)	(0.240)	(0.283)	(0.274)
Belonging to the same prefecture city	1.600	1.594	1.390	1.384
	(0.196)***	(0.194)***	(0.225)***	(0.220)***
Ln (Total area) of exporter in 1999	0.324	0.327	0.353	0.360
	(0.087)***	(0.089)***	(0.093)***	(0.095)***
Ln (Total area) of importer in 1999	0.570	0.581	0.593	0.608
	(0.097)***	(0.099)***	(0.107)***	(0.111)***
District dummy for exporter	-0.703	-0.665	-0.944	-0.886
	(0.231)***	(0.227)***	(0.241)***	(0.238)***
District dummy for importer	0.890	0.903	1.108	1.122
	(0.179)***	(0.182)***	(0.187)***	(0.191)***
N	34,674	34,674	35,030	35,030

Notes: 1. The coefficients (instead of hazard ratios) are provided for the results of proportional hazards models; 2. Robust clustered standard errors at jurisdiction pair level are provided in parentheses; 3. Year fixed effects are included in all the columns. 4. *** $p<0.01$; ** $p<0.05$; * $p<0.1$.

Table 6: Robustness Check Using Logit Models

Models	**Firth Logit Model**		**Random Effect Logit Model**	
Explanatory Variables	[1]	[2]	[3]	[4]
Ln (GDP per capita) of exporter in year t-1	-0.761	-0.75	-0.862	-0.847
	(0.282)***	(0.328)**	(0.312)***	(0.356)**
Ln (GDP per capita) of importer in year t-1	1.498	1.773	1.712	1.905
	(0.266)***	(0.306)***	(0.308)***	(0.336)***
Share of cultivated land of exporter in year t-1	1.653	1.664	1.671	1.672
	(0.358)***	(0.359)***	(0.395)***	(0.392)***
Share of cultivated land of importer in year t-1	0.526	0.513	0.478	0.475
	(0.375)	(0.377)	(0.407)	(0.405)
Decentralization dummy for exporter	-0.171	-0.163	-0.222	-0.212
	(0.235)	(0.235)	(0.262)	(0.259)
Decentralization dummy for importer	0.310	0.294	0.297	0.285
	(0.157)**	(0.156)*	(0.177)*	-0.174
Connected (Three types) in year t-1	0.321	1.135	0.355	1.007
	(0.174)*	(0.562)**	(0.191)*	(0.611)*
Ln (GDP per capita) of exporter		0.076		0.078
* Connected (Three types) in year t-1		(0.497)		(0.544)
Ln (GDP per capita) of importer		-0.840		-0.702
* Connected (Three types) in year t-1		(0.443)*		(0.491)
Adjacent or not	0.181	0.168	0.125	0.121
	(0.225)	(0.227)	(0.257)	(0.255)
Belonging to the same prefecture city	1.099	1.091	1.279	1.245
	(0.203)***	(0.203)***	(0.239)***	(0.235)***
Ln (Total area) of exporter in year t-1	0.349	0.349	0.370	0.366
	(0.122)***	(0.123)***	(0.130)***	(0.130)***
Ln (Total area) of importer in year t-1	0.303	0.311	0.321	0.326
	(0.095)***	(0.095)***	(0.104)***	(0.103)***
District dummy for exporter	-0.568	-0.572	-0.630	-0.630
	(0.180)***	(0.181)***	(0.197)***	(0.196)***
District dummy for importer	0.917	0.917	0.940	0.937
	(0.153)***	(0.154)***	(0.168)***	(0.166)***
Prior trade dummy	3.307	3.287	2.814	2.87
	(0.175)***	(0.176)***	(0.329)***	(0.315)***
N	26,376	26,376	26,376	26,376

Notes: 1. The coefficients (instead of odds ratios) are provided for the results of logit models; 2. Standard errors are provided in parentheses; 3. Year fixed effects are included in all the columns. 4. *** $p<0.01$; ** $p<0.05$; * $p<0.1$.

Table 7: Robustness Check using Career Network

Models	**Proportional Hazards Model**				**Firth Logit Model**		**Random Effect Logit Model**	
	(First Trade Event)		**(All Trade Events)**					
Explanatory Variables	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
Ln (GDP per capita) of exporter	-1.946	-1.877	-2.017	-1.920	-0.765	-0.691	-0.884	-0.790
	(0.316)***	(0.321)***	(0.324)***	(0.343)***	(0.283)***	(0.309)**	(0.317)***	(0.336)**
Ln (GDP per capita) of importer	1.796	2.013	1.701	1.901	1.526	1.831	1.767	1.967
	(0.247)***	(0.256)***	(0.259)***	(0.265)***	(0.266)***	(0.293)***	(0.313)***	(0.324)***
Share of cultivated land of exporter	5.013	4.940	5.918	5.829	1.688	1.687	1.730	1.710
	(0.531)***	(0.524)***	(0.587)***	(0.588)***	(0.361)***	(0.362)***	(0.403)***	(0.396)***
Share of cultivated land of importer	-0.437	-0.489	-0.429	-0.475	0.530	0.512	0.473	0.474
	(0.616)	(0.610)	(0.727)	(0.695)	(0.376)	(0.378)	(0.412)	(0.406)
Decentralization dummy for exporter	-1.024	-1.019	-1.015	-1.01	-0.151	-0.154	-0.197	-0.195
	(0.289)***	(0.288)***	(0.303)***	(0.303)***	(0.236)	(0.236)	(0.265)	(0.260)
Decentralization dummy for importer	0.378	0.376	0.435	0.433	0.333	0.315	0.324	0.308
	(0.216)*	(0.213)*	(0.234)*	(0.232)*	(0.157)**	(0.157)**	(0.180)*	(0.175)*
Connected (Career)	1.041	1.895	1.12	1.956	0.896	2.265	1.070	2.250
	(0.242)***	(0.586)***	(0.248)***	(0.602)***	(0.250)***	(0.635)***	(0.287)***	(0.703)***
Ln (GDP per capita) of exporter		0.071		-0.041		0.020		-0.049
* Connected (Career)		(0.686)		(0.780)		(0.581)		(0.654)
Ln (GDP per capita) of importer		-0.855		-0.723		-1.387		-1.204
* Connected (Career)		(0.433)**		(0.460)		(0.526)***		(0.597)**
Adjacent or not	-0.201	-0.197	0.008	0.002	0.143	0.139	0.057	0.076
	(0.253)	(0.247)	(0.286)	(0.279)	(0.229)	(0.230)	(0.266)	(0.260)
Belonging to the same prefecture city	1.268	1.278	1.062	1.075	0.818	0.828	0.968	0.933
	(0.230)***	(0.231)***	(0.255)***	(0.257)***	(0.232)***	(0.234)***	(0.265)***	(0.260)***
Ln (Total area) of exporter	0.438	0.420	0.512	0.499	0.369	0.353	0.399	0.378
	(0.105)***	(0.106)***	(0.118)***	(0.120)***	(0.122)***	(0.124)***	(0.133)***	(0.132)***
Ln (Total area) of importer	0.438	0.438	0.46	0.462	0.302	0.298	0.322	0.315
	(0.099)***	(0.099)***	(0.110)***	(0.110)***	(0.095)***	(0.095)***	(0.105)***	(0.103)***
District dummy for exporter	-0.614	-0.629	-0.8	-0.808	-0.594	-0.608	-0.668	-0.670
	(0.225)***	(0.220)***	(0.232)***	(0.230)***	(0.181)***	(0.182)***	(0.200)***	(0.197)***
District dummy for importer	0.761	0.754	0.961	0.946	0.866	0.844	0.896	0.871
	(0.184)***	(0.185)***	(0.194)***	(0.195)***	(0.154)***	(0.155)***	(0.170)***	(0.168)***
Prior trade dummy					3.269	3.261	2.702	2.824
					(0.177)***	(0.177)***	(0.344)***	(0.322)***
N	33,524	33,524	33,878	33,878	26,376	26,376	26,376	26,376

Notes: 1. The coefficients (instead of hazard ratios) are provided for the results of proportional hazards models (Column 1-4); 2. The coefficients (instead of odds ratios) are provided for Firth Logit and Random Effect Logit models. 3. Covariates in year t are used in column 1-4; Covariates in year $t-1$ are used in column 5-8; 4. Robust clustered standard errors are provided in parentheses for column 1-4; Standard errors are provided for column 5-8; 5. Year fixed effects are included in all the columns; 6. *** p<0.01; ** p<0.05; * p<0.1.

Table 8: Robustness Check using Birthplace Network

Models	**Proportional Hazards Model**				**Firth Logit Model**		**Random Effect Logit Model**	
	(First Trade Event)		**(All Trade Events)**					
Explanatory Variables	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
Ln (GDP per capita) of exporter	-1.981	-1.974	-2.061	-2.001	-0.801	-0.760	-0.898	-0.866
	(0.320)***	(0.331)***	(0.331)***	(0.330)***	(0.283)***	(0.291)***	(0.313)***	(0.322)***
Ln (GDP per capita) of importer	1.820	1.778	1.730	1.659	1.485	1.440	1.703	1.652
	(0.246)***	(0.250)***	(0.258)***	(0.259)***	(0.266)***	(0.271)***	(0.308)***	(0.314)***
Share of cultivated land of exporter	5.012	5.031	5.933	5.962	1.659	1.664	1.677	1.682
	(0.530)***	(0.530)***	(0.585)***	(0.581)***	(0.356)***	(0.355)***	(0.393)***	(0.392)***
Share of cultivated land of importer	-0.411	-0.441	-0.39	-0.414	0.516	0.523	0.468	0.469
	(0.618)	(0.619)	(0.739)	(0.736)	(0.377)	(0.377)	(0.407)	(0.409)
Decentralization dummy for exporter	-1.050	-1.057	-1.041	-1.059	-0.158	-0.165	-0.208	-0.218
	(0.282)***	(0.283)***	(0.296)***	(0.298)***	(0.235)	(0.235)	(0.261)	(0.262)
Decentralization dummy for importer	0.349	0.357	0.389	0.405	0.308	0.319	0.296	0.308
	(0.214)	(0.215)*	(0.235)*	(0.237)*	(0.157)**	(0.157)**	(0.177)*	(0.178)*
Connected (Birthplace)	0.316	-0.174	0.227	-0.513	0.526	0.435	0.540	0.131
	(0.241)	(0.959)	(0.256)	(1.010)	(0.251)**	(1.003)	(0.286)*	(1.118)
Ln (GDP per capita) of exporter		-0.235		-0.879		-0.511		-0.532
* Connected (Birthplace)		(0.912)		(0.995)		(0.843)		(0.975)
Ln (GDP per capita) of importer		0.620		1.259		0.502		0.820
* Connected (Birthplace)		(0.625)		(0.752)*		(0.796)		(0.913)
Adjacent or not	-0.051	-0.043	0.139	0.184	0.198	0.221	0.148	0.167
	(0.242)	(0.247)	(0.281)	(0.288)	(0.224)	(0.227)	(0.256)	(0.259)
Belonging to the same prefecture city	1.705	1.702	1.623	1.601	1.146	1.134	1.333	1.329
	(0.198)***	(0.199)***	(0.219)***	(0.223)***	(0.190)***	(0.191)***	(0.229)***	(0.231)***
Ln (Total area) of exporter	0.421	0.417	0.496	0.488	0.341	0.340	0.364	0.363
	(0.106)***	(0.105)***	(0.120)***	(0.118)***	(0.122)***	(0.122)***	(0.130)***	(0.130)***
Ln (Total area) of importer	0.458	0.453	0.496	0.486	0.315	0.318	0.332	0.333
	(0.098)***	(0.098)***	(0.106)***	(0.106)***	(0.094)***	(0.095)***	(0.103)***	(0.103)***
District dummy for exporter	-0.560	-0.566	-0.748	-0.764	-0.556	-0.556	-0.612	-0.617
	(0.219)**	(0.220)**	(0.225)***	(0.228)***	(0.179)***	(0.179)***	(0.196)***	(0.197)***
District dummy for importer	0.842	0.833	1.061	1.041	0.965	0.966	0.983	0.982
	(0.184)***	(0.185)***	(0.196)***	(0.196)***	(0.153)***	(0.153)***	(0.167)***	(0.167)***
Prior trade dummy					3.321	3.313	2.842	2.820
					(0.175)***	(0.175)***	(0.333)***	(0.340)***
N	33,524	33,524	33,878	33,878	26,376	26,376	26,376	26,376

Notes: 1. The coefficients (instead of hazard ratios) are provided for the results of proportional hazards models (Column 1-4); 2. The coefficients (instead of odds ratios) are provided for Firth Logit and Random Effect Logit models. 3. Covariates in year t are used in column 1-4; Covariates in year $t-1$ are used in column 5-8; 4. Robust clustered standard errors are provided in parentheses for column 1-4; Standard errors are provided for column 5-8; 5. Year fixed effects are included in all the columns; 6. *** p<0.01; ** p<0.05; * p<0.1.

Table 9: Robustness Check using Education Network

Models	**Proportional Hazards Model**				**Firth Logit Model**		**Random Effect Logit Model**	
	(First Trade Event)		**(All Trade Events)**					
Explanatory Variables	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
Ln (GDP per capita) of exporter	-1.970	-2.129	-2.049	-2.222	-0.714	-0.668	-0.794	-0.751
	(0.334)***	(0.325)***	(0.341)***	(0.345)***	(0.285)**	(0.305)**	(0.312)**	(0.331)**
Ln (GDP per capita) of importer	1.871	1.880	1.759	1.784	1.549	1.575	1.740	1.748
	(0.249)***	(0.260)***	(0.269)***	(0.274)***	(0.267)***	(0.279)***	(0.305)***	(0.314)***
Share of cultivated land of exporter	5.128	5.173	5.996	6.042	1.656	1.650	1.665	1.659
	(0.559)***	(0.549)***	(0.613)***	(0.608)***	(0.362)***	(0.363)***	(0.396)***	(0.397)***
Share of cultivated land of importer	-0.412	-0.454	-0.465	-0.527	0.436	0.440	0.400	0.405
	(0.635)	(0.634)	(0.759)	(0.750)	(0.384)	(0.385)	(0.412)	(0.412)
Decentralization dummy for exporter	-1.020	-1.032	-1.013	-1.031	-0.192	-0.193	-0.234	-0.234
	(0.281)***	(0.283)***	(0.295)***	(0.297)***	(0.237)	(0.237)	(0.261)	(0.261)
Decentralization dummy for importer	0.339	0.350	0.400	0.411	0.314	0.308	0.301	0.298
	(0.213)	(0.213)	(0.233)*	(0.233)*	(0.157)**	(0.157)*	(0.175)*	(0.175)*
Connected (Education)	-0.302	-0.948	-0.079	-0.585	-0.027	0.455	-0.033	0.250
	(0.225)	(0.719)	(0.195)	(0.594)	(0.206)	(0.795)	(0.223)	(0.866)
Ln (GDP per capita) of exporter		0.973		0.841		-0.245		-0.258
* Connected (Education)		(0.773)		(0.655)		(0.624)		(0.682)
Ln (GDP per capita) of importer		-0.110		-0.142		-0.253		-0.086
* Connected (Education)		(0.538)		(0.478)		(0.610)		(0.674)
Adjacent or not	-0.072	-0.087	0.152	0.133	0.196	0.200	0.145	0.149
	(0.247)	(0.248)	(0.286)	(0.286)	(0.228)	(0.228)	(0.257)	(0.256)
Belonging to the same prefecture city	1.776	1.784	1.645	1.656	1.246	1.249	1.424	1.423
	(0.189)***	(0.191)***	(0.220)***	(0.222)***	(0.178)***	(0.178)***	(0.215)***	(0.215)***
Ln (Total area) of exporter	0.447	0.437	0.513	0.503	0.372	0.374	0.393	0.394
	(0.110)***	(0.110)***	(0.124)***	(0.123)***	(0.125)***	(0.125)***	(0.132)***	(0.132)***
Ln (Total area) of importer	0.483	0.485	0.502	0.504	0.312	0.315	0.331	0.332
	(0.099)***	(0.100)***	(0.109)***	(0.110)***	(0.095)***	(0.095)***	(0.103)***	(0.103)***
District dummy for exporter	-0.554	-0.587	-0.751	-0.786	-0.563	-0.553	-0.620	-0.612
	(0.219)**	(0.223)***	(0.227)***	(0.233)***	(0.180)***	(0.181)***	(0.195)***	(0.196)***
District dummy for importer	0.809	0.811	1.016	1.016	0.896	0.898	0.920	0.920
	(0.187)***	(0.187)***	(0.200)***	(0.200)***	(0.154)***	(0.154)***	(0.167)***	(0.167)***
Prior trade dummy					3.312	3.312	2.883	2.891
					(0.175)***	(0.176)***	(0.319)***	(0.318)***
N	32,396	32,396	32,746	32,746	25,420	25,420	25,420	25,420

Notes: 1. The coefficients (instead of hazard ratios) are provided for the results of proportional hazards models (Column 1-4); 2. The coefficients (instead of odds ratios) are provided for Firth Logit and Random Effect Logit models. 3. Covariates in year t are used in column 1-4; Covariates in year $t-1$ are used in column 5-8; 4. Robust clustered standard errors are provided in parentheses for column 1-4; Standard errors are provided for column 5-8; 5. Year fixed effects are included in all the columns; 6. *** p<0.01; ** p<0.05; * p<0.1.

Table 10: Conditional Logit Estimation for Different Types of Networks (Full Sample)

Conditional Logit (Different City)	Network Measure: All Types		Network Measure: Birthplace		Network Measure: Career		Network Measure: Education	
Ln (GDP per capita) of exporter in year t-1	-0.52	-1.48**	-0.4	-0.12	-0.42	-0.77	-0.44	-0.62
	(0.570)	(0.730)	(0.570)	(0.630)	(0.560)	(0.710)	(0.580)	(0.610)
Ln (GDP per capita) of importer in year t-1	1.17***	1.00***	1.17***	0.98***	1.21***	1.15***	1.24***	1.16***
	(0.330)	(0.360)	(0.330)	(0.340)	(0.340)	(0.350)	(0.330)	(0.340)
Share of cultivated land of exporter in year t-1	-0.27	0.05	-0.26	-0.2	-0.06	0.05	-0.32	-0.25
	(1.070)	(1.020)	(1.070)	(1.060)	(1.050)	(1.050)	(1.070)	(1.050)
Share of cultivated land of importer in year t-1	0.79**	0.77**	0.81**	0.80**	0.78**	0.77**	0.74*	0.74*
	(0.380)	(0.380)	(0.380)	(0.380)	(0.380)	(0.390)	(0.390)	(0.390)
Decentralization dummy for exporter	-0.2	-0.16	-0.28	-0.35	-0.16	-0.13	-0.2	-0.2
	(0.410)	(0.410)	(0.410)	(0.420)	(0.410)	(0.410)	(0.410)	(0.420)
Decentralization dummy for importer	0.39**	0.44**	0.35*	0.38**	0.42**	0.43**	0.39**	0.41**
	(0.180)	(0.180)	(0.180)	(0.180)	(0.180)	(0.180)	(0.180)	(0.180)
Connected (lagged)	0.61***	-1.11*	0.50*	-1.75	0.97***	-0.01	0.39*	-0.74
	(0.200)	(0.640)	(0.260)	(1.110)	(0.250)	(0.750)	(0.220)	(0.860)
Ln (GDP per capita) of exporter * Connected (lagged)		1.49**		-0.47		0.71		0.56
		(0.670)		(0.930)		(0.780)		(0.720)
Ln (GDP per capita) of importer * Connected (lagged)		0.72		2.61***		0.5		0.69
		(0.490)		(0.890)		(0.620)		(0.650)
Adjacent or not	0.03	-0.04	0.06	0.05	-0.01	-0.02	0.06	0.05
	(0.230)	(0.240)	(0.230)	(0.240)	(0.240)	(0.240)	(0.240)	(0.240)
Ln (Total area) of exporter in year t-1	0.16	0.15	0.16	0.14	0.18	0.18	0.17	0.16
	(0.160)	(0.160)	(0.160)	(0.160)	(0.160)	(0.160)	(0.160)	(0.160)
Ln (Total area) of importer in year t-1	0.38***	0.37***	0.41***	0.42***	0.38***	0.38***	0.38***	0.38***
	(0.100)	(0.100)	(0.100)	(0.100)	(0.100)	(0.100)	(0.100)	(0.100)
District dummy for exporter	-0.63***	-0.64***	-0.65***	-0.68***	-0.69***	-0.70***	-0.64***	-0.65***
	(0.190)	(0.190)	(0.190)	(0.190)	(0.190)	(0.190)	(0.190)	(0.190)
District dummy for importer	1.12***	1.13***	1.19***	1.20***	1.05***	1.06***	1.09***	1.08***
	(0.180)	(0.180)	(0.180)	(0.180)	(0.180)	(0.180)	(0.180)	(0.180)
Prior trade dummy	1.95***	1.97***	1.99***	1.96***	1.92***	1.92***	1.95***	1.94***
	(0.180)	(0.180)	(0.180)	(0.180)	(0.180)	(0.190)	(0.180)	(0.180)
N	8,028	8,028	8,028	8,028	8,028	8,028	7,765	7,765

Notes: 1. The coefficients (instead of odds ratios) are provided for the results of conditional logit models; 2. The fixed effect is at the prefecture city pair level. 3. Standard errors are provided in parentheses; 4. Year fixed effects are included in all the columns. 4. *** p<0.01; ** p<0.05; * p<0.1.

Table 11: Conditional Logit Estimation for Different Types of Networks (Same Prefecture City Sample)

Conditional Logit (Different City)	Network Measure: All Types		Network Measure: Birthplace		Network Measure: Career		Network Measure: Education	
Ln (GDP per capita) of exporter in year t-1	0.11	-1.16	0.24	0.61	0.29	-0.03	0.33	0.86
	(0.750)	(1.660)	(0.750)	(0.820)	(0.750)	(1.060)	(0.760)	(0.890)
Ln (GDP per capita) of importer in year t-1	2.59***	2.80**	2.85***	2.47***	2.78***	3.83***	2.94***	2.73***
	(0.770)	(1.280)	(0.770)	(0.820)	(0.770)	(0.960)	(0.780)	(0.810)
Share of cultivated land of exporter in year t-1	-0.42	-0.36	-0.59	-0.39	-0.36	-0.27	-0.8	-1.1
	(2.030)	(2.010)	(2.020)	(1.960)	(2.040)	(1.960)	(2.110)	(2.200)
Share of cultivated land of importer in year t-1	1.95	1.93	1.97	1.99	1.97	1.91	2.15*	2.20*
	(1.240)	(1.250)	(1.240)	(1.250)	(1.240)	(1.280)	(1.210)	(1.170)
Decentralization dummy for exporter	-0.63	-0.61	-0.72	-0.76	-0.66	-0.62	-0.6	-0.68
	(0.600)	(0.610)	(0.620)	(0.620)	(0.600)	(0.600)	(0.620)	(0.630)
Decentralization dummy for importer	-0.86	-0.81	-0.94*	-0.85	-0.96*	-0.92*	-0.74	-0.8
	(0.540)	(0.550)	(0.540)	(0.540)	(0.540)	(0.550)	(0.550)	(0.550)
Connected (lagged)	1.00***	0.34	0.47	0	0.70**	2.05**	0.27	0.02
	(0.380)	(1.120)	(0.290)	(1.050)	(0.290)	(0.940)	(0.360)	(1.180)
Ln (GDP per capita) of exporter * Connected (lagged)		1.37		-0.9		0.29		-1.4
		(1.600)		(1.020)		(1.040)		(1.100)
Ln (GDP per capita) of importer * Connected (lagged)		-0.27		1.15		-1.67*		1.28
		(1.160)		(0.910)		(0.870)		(1.030)
Adjacent or not	-0.55*	-0.58*	-0.56*	-0.57*	-0.57*	-0.54*	-0.63**	-0.59*
	(0.310)	(0.310)	(0.300)	(0.300)	(0.300)	(0.300)	(0.310)	(0.310)
Ln (Total area) of exporter in year t-1	0.41*	0.41*	0.40*	0.38	0.43*	0.39	0.45*	0.51**
	(0.240)	(0.240)	(0.240)	(0.230)	(0.240)	(0.240)	(0.250)	(0.250)
Ln (Total area) of importer in year t-1	0.98***	0.98***	1.08***	1.10***	1.00***	1.11***	1.08***	1.00***
	(0.290)	(0.300)	(0.290)	(0.300)	(0.290)	(0.310)	(0.300)	(0.300)
District dummy for exporter	-0.36	-0.37	-0.25	-0.3	-0.44	-0.45	-0.23	-0.21
	(0.400)	(0.400)	(0.400)	(0.400)	(0.400)	(0.400)	(0.410)	(0.410)
District dummy for importer	1.55***	1.57***	1.71***	1.72***	1.45***	1.43***	1.73***	1.72***
	(0.350)	(0.350)	(0.350)	(0.350)	(0.360)	(0.360)	(0.360)	(0.360)
Prior trade dummy	1.06***	1.06***	1.20***	1.19***	1.05***	1.05***	1.13***	1.11***
	(0.340)	(0.340)	(0.340)	(0.340)	(0.330)	(0.340)	(0.340)	(0.350)
N	2,321	2,321	2,321	2,321	2,321	2,321	2,239	2,239

Notes: 1. The coefficients (instead of odds ratios) are provided for the results of conditional logit models; 2. The fixed effect is at the prefecture city pair level. 3. Standard errors are provided in parentheses; 4. Year fixed effects are included in all the columns. 4. *** p<0.01; ** p<0.05; * p<0.1.

Table 12: Conditional Logit Estimation for Different Types of Networks (Different Prefecture City Sample)

Conditional Logit (Different City)	Network Measure: All Types		Network Measure: Birthplace		Network Measure: Career		Network Measure: Education	
Ln (GDP per capita) of exporter in year t-1	-2.12*	-2.20*	-2.12*	-2.12*	-2.12*	-2.23**	-2.19**	-2.28**
	(1.120)	(1.120)	(1.110)	(1.110)	(1.110)	(1.120)	(1.120)	(1.130)
Ln (GDP per capita) of importer in year t-1	1.53***	1.52***	1.55***	1.55***	1.53***	1.50***	1.57***	1.61***
	(0.420)	(0.430)	(0.420)	(0.420)	(0.420)	(0.420)	(0.420)	(0.430)
Share of cultivated land of exporter in year t-1	0.91	1.08	0.79	0.79	0.9	1.11	0.96	1.09
	(1.600)	(1.620)	(1.600)	(1.600)	(1.600)	(1.620)	(1.610)	(1.620)
Share of cultivated land of importer in year t-1	0.52	0.52	0.52	0.52	0.53	0.54	0.48	0.48
	(0.420)	(0.420)	(0.420)	(0.420)	(0.420)	(0.420)	(0.430)	(0.430)
Decentralization dummy for exporter	0.28	0.26	0.27	0.27	0.28	0.29	0.33	0.31
	(0.660)	(0.660)	(0.660)	(0.660)	(0.660)	(0.660)	(0.660)	(0.660)
Decentralization dummy for importer	0.79***	0.80***	0.77***	0.77***	0.79***	0.79***	0.75***	0.76***
	(0.220)	(0.220)	(0.220)	(0.220)	(0.220)	(0.220)	(0.210)	(0.220)
Connected (lagged)	-0.04	-0.81	-12.98	-10.46	-0.25	-56.16	0.08	-0.09
	(0.320)	(1.490)	(540.440)	(5100.910)	(1.110)	(43.270)	(0.330)	(1.460)
Ln (GDP per capita) of exporter * Connected (lagged)		0.99		-0.81		-0.01		0.96
		(1.300)		(3749.160)		(9.670)		(1.310)
Ln (GDP per capita) of importer * Connected (lagged)		0.14		-2.09		41.63		-0.4
		(1.090)		(6618.620)		(34.290)		(1.050)
Adjacent or not	1.19**	1.19**	1.30***	1.30***	1.20**	1.29**	1.26**	1.26**
	(0.500)	(0.500)	(0.500)	(0.500)	(0.500)	(0.500)	(0.500)	(0.500)
Ln (Total area) of exporter in year t-1	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.01
	(0.270)	(0.270)	(0.270)	(0.270)	(0.270)	(0.270)	(0.270)	(0.270)
Ln (Total area) of importer in year t-1	0.20*	0.20*	0.20*	0.20*	0.20*	0.20*	0.20*	0.21*
	(0.120)	(0.120)	(0.120)	(0.120)	(0.120)	(0.120)	(0.120)	(0.120)
District dummy for exporter	-0.63***	-0.64***	-0.63***	-0.63***	-0.63***	-0.64***	-0.63***	-0.64***
	(0.230)	(0.230)	(0.230)	(0.230)	(0.230)	(0.230)	(0.230)	(0.230)
District dummy for importer	0.68***	0.68***	0.65***	0.65***	0.68***	0.69***	0.62***	0.63***
	(0.230)	(0.230)	(0.230)	(0.230)	(0.230)	(0.230)	(0.230)	(0.230)
Prior trade dummy	2.34***	2.34***	2.32***	2.32***	2.33***	2.34***	2.30***	2.30***
	(0.240)	(0.240)	(0.240)	(0.240)	(0.240)	(0.240)	(0.240)	(0.240)
N	5,707	5,707	5,707	5,707	5,707	5,707	5,526	5,526

Notes: 1. The coefficients (instead of odds ratios) are provided for the results of conditional logit models; 2. The fixed effect is at the prefecture city pair level. 3. Standard errors are provided in parentheses; 4. Year fixed effects are included in all the columns. 4. *** $p<0.01$; ** $p<0.05$; * $p<0.1$.