Leader Networks and Interjurisdictional Contracting in Land Conversion Quotas

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Abstract: Do network connections between government officials and administrative units facilitate efficient land use contracting across jurisdictions? This paper leverages data from a ground-breaking policy in China where a strict quota-bound land use policy was replaced by an alternative permitting between-county trade in land conversion quotas. We unpack the determinants of the boundary between trading and autarkic jurisdictions, and unveil leader-related drivers of transaction costs between jurisdictions in a gravity-style estimation. We catalogue entire personal and career histories of county-level leaders, and present evidence that leader networks derived from employment history are robustly trade facilitating but non-workplace links are not.

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> "But it is political markets in non-democratic polities that urgently need such transaction cost analysis. The far greater imperfections of such markets in communist and Third World countries are the root cause of their poor economic performance since it is polities which devise and enforce the property rights that are the incentive structure of economics." (North 1990, p.364)

1 Introduction

This study investigates local leader networks as a determinant of the transaction cost of interjurisdictional government contracting in land use quotas. Such contracting activities are critical for a diverse range of economic reforms, including for example contracts that correct for environmental spillovers across jurisdictional boundaries, public good investments and infrastructure projects with regional spillovers, as well as opportunities for mutually beneficial exchange and trade.[1] Traditionally, success in markets for transferable development rights have largely hinged on the degree of participation depending on private incentives and costs, information, and government development objectives, for example (Levinson 1997, Linkous 2017). In our context, where the relevant buyers and sellers of land use rights are local governments instead of private developers, there exists as yet very limited understanding about the corresponding determinants of any barriers to participation and the nature of these barriers.

We study local government responses to a groundbreaking policy in China where a regime of land use bound by universal quotas was replaced by a policy permitting between-county trade in land conversion quotas. The centrally determined land use quotas and the resulting regional imbalances in demand and supply paved the way for gainful trade in land allocation quotas between jurisdictions. Based on observed

contracting activities between county-level governments, we examine the transaction cost drivers that carve the boundary between jurisdictions that participate and those that opt out. We draw attention to leader-specific drivers of transaction costs, controlling for jurisdiction-specific factors. In doing so, this paper introduces the characteristics of the civil service as an institutional feature that has so far received very little attention in our understanding of the effectiveness of efficiency enhancing land use reforms that cross jurisdictional boundaries.

With our focus on transaction cost and the boundary between trading and autarkic jurisdictions, this study shares many parallels with transaction costs based theories on the boundaries of the firm inspired by the seminal studies of Coase (1937), and Williamson (1975, 1981), as well as transaction cost politics (North 1990; Dixit 1996). To date these studies have emphasized the role of transaction costs that span firm-to-firm contracting (e.g., vertical/horizontal integration), firm-to-input contracting (e.g., employment and innovation), and government-to-firm contracting (e.g., government procurement of public goods).[2]

In addition to these private sector and public-private transactions, intergovernmental transactions are replete with examples of transaction cost barriers as well. Ostrom (1990) examines transaction costs incurred in contract monitoring and enforcement associated with managing common and shared resources. Williamson (1999) argues that intergovernmental transactions are particularly prone to asset specificity, where contractual relationships require specialized investment. For example, the cultivation of government bureaucrats as human assets with deep

knowledge of geographic regions, policy issues and localized practices can be costly for such skills are specific only to the particular government activity in question. To date, empirical studies on how transaction costs have impacted actual government contracting are rare however, with only a few exceptions in a developed country setting (Feiock 2013). For example, Brown and Potoski (2003) shows in the context of the United States that transaction costs due both to contract monitoring and asset specificity play an important role in determining how local governments choose public service delivery contracts. The objective of this study is to provide a first look at this issue in the context of land use governance in a developing country setting where efficiency-improving reforms can arguably play a vital role in improving livelihoods (North 1990).

Our approach is two-fold. We begin by establishing a simple theory of interjurisdictional trade in land conversion quotas. We posit that the gains from trade between any given buyer-and-seller pair is the primary reason for trade between a buyer and a seller jurisdiction allowing for jurisdictional pair specific transaction cost. The model yields a closed-form solution to the likelihood of trade, by requiring that a trading jurisdiction pair arises when there is a double coincidence of wants. We then test the implications of this model in a gravity-style estimation in which determinants of trade, inclusive of the transaction cost determinants, are incorporated. For determinants of trade, we assemble a comprehensive county-level data set capturing (i) standard net import demand determinants of the willingness to pay for land conversion quotas in importing and exporting jurisdictions, respectively, and (ii)

jurisdiction pair- and local leader-specific proximity variables to capture transaction costs.

With respect to transaction costs, two sets of considerations are canonically featured following the seminal work of Williamson (1981) and more recently Tadelis and Williamson (2012). The first relates to contracting costs in the presence of informational contractual hazards which contribute to uncertainty and incomplete contracts. The second consideration concerns asset specificity, which arises when the need for upfront investment leads to path dependencies that are costly to correct. To capture these informational and history dependent costs of contracting, we first assemble jurisdiction-specific proxies, including multiple measures of institutional closeness as well as prior trading history between pairs of potential trading jurisdictions. In addition to jurisdiction-specific proxies, we performed a detailed review of the resumés of each of the local leaders (that is, the party secretary (*shuji*) and the county governor (*xianzhang*)) at the county level. Specifically, to ascertain the role of leader networks, we consider four types, including: career networks, birthplace networks, education networks, and a combination of all three networks.

We also assemble a dataset with observations on the incidence of bilateral trade over a period of five years from 1999 - 2003, and the corresponding explanatory variables for these years at the county-pair level. Guided by our theory, our baseline empirical model is a linear probability model with two-way fixed effects to capture time, and buyer-seller specific factors. This model ascertains the likelihood of trade among buyer-seller locations depending on the characteristics of the two parties. The

baseline model is followed by a series of robustness checks incorporating, for example, logit analysis on the proportion of matches, specifications that account for other potential determinants of contracting costs, such as prior trade relationships, controls for age, and leader political cycles (year since appointment in current post). We also separately test the distinctive roles of network ties between county-level officials across counties, and network ties between county- and prefecture-level officials to further nail down the particular types network ties that are consequential for mitigating against transaction costs.

We make several broad sets of observations. At the jurisdiction level, controlling for importer and exporter fixed effects, we explore leader-specific characteristics that may mitigate against transaction costs related to institutional knowledge and asset specificity. Of the four network variables we consider, both overall network and career network contribute positively to the likelihood of a match, but the effect of the overall network variable is driven entirely by the career network variable. This result is consistently significant and robust in our estimations. In addition, we find that while county-to-county leader networks feature prominently as a determinant of trade, county-to-prefecture leader networks do not. We interpret these results as reflective of the trader-pair specific transaction costs as the main driver of trade, rather than other career or promotion motivations per se.

Complementing these findings related to the importance of leader connections, we find that even for counties within the same province, transaction costs related to institutional knowledge (e.g., sharing the same prefecture city) and asset specificity

(e.g., prior trade relations) appear to play an important role in determining the boundaries between counties that embrace trade, and those that do not. Interestingly, once importer and exporter fixed effects, time fixed effects, leader networks, as well as institutional closeness related variables are controlled for, we find that year-on-year changes jurisdiction-level measures of market demand factors, such as secondary and tertiary GDP per unit urban land, are not systematically correlated with trading likelihoods. Taken together, these results are indicative of the primacy of transaction cost drivers in the determination of interjurisdictional trade in land conversion quotas.

The contributions of this study are three-fold. First, we contribute to the empirical literature on the determinants of efficiency improving trade in permits. To the best of our knowledge, this paper presents first evidence on the determinants of intergovernmental 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, only developed country programs are examined (Johnston and Madison 1997; McConnell, Kopkits and Walls 2005; Talberg and Swoboda 2013), while developing country studies have been limited to case studies[3] and none has provided econometric evidence for the performance of tradeable development rights programs in a developing country.

Second, we contribute to the literature on tradeable permits, such as emissions 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 do so by introducing a model of trade in land conversion quota in which the price and volume of each transaction is negotiated individually and simultaneously. An important innovation in our setup, compared to studies following the assortative matching literature (Becker 1973; Sattinger 1993), for example, is that the identity of buyers and sellers is not determined a priori. Rather, the direction of trade depends endogenously on jurisdiction-specific and local leader characteristics.

Third, we extend the broad literature on the role of leader characteristics in determining policy outcomes (Jones and Olken 2005) by introducing government leader networks as a contributing factor to the transaction costs of interjurisdiction contracting. Evidence of the impact of leader networks on transaction costs in the public sphere is rare, and as North (1990) observed, evidence pertaining to non-democratic polities is rarer still. In this context, the case of China is particularly interesting, where job rotation-driven career network building is a stated policy directive with an as yet underappreciated impact on public sector functioning.[4]

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

2 Policy Environment

2.1 The Chinese Civil Service System

The Chinese civil service is an organization covering 34 provincial level units, close to 3,000 county-level units, and more than 47,000 township-level units employing 10 million people.[5] A series of regulatory reforms aimed at improving management of the civil service system effectively began in 1993.[6] These reforms introduced performance-based rewards with explicit performance targets (Li and Zhou 2005; Guo 2009), and a well-enforced system of regular job rotation and training.[7]

One of the objectives of performance target management was to turn civil servants formerly vested in local interests into leaders incentivized by career concerns and political mobility. There is extensive evidence and research in this area (Maskin, Qian and Xu 2000, Li and Zhou 2005), focusing in particular on inter-jurisdictional competition for mobile resources in the presence of fiscal decentralization. By contrast, the implications of the civil servant job rotation and training system have rarely been studied.[8] The system is expected to prevent political capture, promote accountability, and facilitate information exchange (Wu 2010). Since 1993, a mandatory 5-year leader-rotation system (*ganbu jiaoliu zhidu*) was implemented. In China, the Communist Party of China county committee secretary (henceforth, party secretary), is the highest political office in a county-level administrative unit, responsible for the formulation of local policies. The county governor shares leadership responsibility of a jurisdiction and is charged with leadership and administration of the local government. In what follows, we refer to both the party

secretary and county governor as leaders of a county government.

The job rotation system gives rise to two interrelated sets of issues. Frequent job rotation implies short political cycles, which can in turn distort development planning to focus on short run performance (Guo 2007; Bo 2009). But frequent job rotation can also foster career network building, and whether this network effect can indeed impact economic reforms is an open question.

2.2 Zhejiang Land Conversion Quota Trading Scheme

The 1986 Law of Land Administration is the inaugural piece of comprehensive land legislation in China. An amendment in 1998 focused 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 and 2010 for example, required at a minimum no less than 128 million hectares of reserved cultivated land in total, while conversion from cultivated to construction land could not exceed 1.97 million hectares (Chau and Zhang 2011). The central government first designates the total areas to be protected in each province, while each province further allocates quotas to each city to meet the central mandate. In the case of Zhejiang, this allocation is quite uniform across the board, where each local jurisdiction is required to protect around 85% of their cultivated area (Wang and Tao 2009). It is this uniform allocation despite local differences in demand and supply conditions that sets the stage for possible gains from trade in land conversion quotas between counties.

Relevant particularly for local governments, Article 18 of the Regulations on the Implementation of the Land Administration Law gives a nationwide 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, Zhang et al. 2014). 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".[9]

Figure A1 illustrates a before and after example of a consolidation project. The Article further stipulates 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."

These decisions created powerful incentives for local governments to engage in land consolidation. Strikingly, the addition of new cultivated land in China during 1999-2006 reached a total of 3.5 million hectares. This is greater than the amount of land approved for use in construction projects (Chau and Zhang 2011).[10]

Against this background, a land conversion quota trading scheme in Zhejiang in September 1999 was created precisely to facilitate locations with excess demand for

land conversion quotas to negotiate directly with locations with underutilized supply.[11] In terms of the nature of the land conversion quota market place, trading is completely decentralized and there were no formal fora in which buyers and sellers come together. Within this decentralized setup, 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; Zhang et al. 2014). Buyer locations effectively pay another locality for protecting cultivated land on their behalf to pursue urban expansion. Seller locations directly receive revenue instead of pursuing their own urban development using excess quotas achieved via land consolidation. The argument is thus that an improvement in allocative efficiency can be accomplished without compromising the Province's overall ability to uphold the central mandate to protect and preserve the amount of cultivated land.

We assemble a dataset based on internal statistics from the Zhejiang Provincial Department of Land and Resources on both the incidence and 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 Zhejiang province during 1999 to 2003.[12] For each trading activity, the dataset also records the names of the exporting and importing jurisdictions, and the year the trade took place. We illustrate in Figure A2 buyer localities, seller localities, localities that both bought and sold, and localities that neither bought nor sold in the 5-year period between 1999 and 2003.

A number of features are notable. Evidently, the program was well received.[13]

Although the number of localities that never traded is small in most years, it is non-trivial. Seller locations and buyer locations were quite stable over time, indicating that location specific forces may be at play. We now turn to a model of interjurisdictional trade in land conversion quotas in which we show how these location-specific features across every possible trading jurisdiction play a role in determining the likelihood of trade between any given pair of jurisdictions.

3 A Simple Model of Trade in Land Conversion Quotas

We present a simple model of trade in land conversion quotas, in which the identity of a jurisdiction as a buyer or a seller is endogenously determined depending on the joint characteristics of the jurisdiction pair. Consider therefore an economy with N locations ($i = 1, \dots, N$) A government policy mandates that construction land use in all locations are subject to land use quotas. Specifically, construction land use beyond designated quota limits is only permissible 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 quotas due to local land consolidation efforts $x_i^o \geq 0$, plus any net imports of additional land construction quotas from a different location j, to be denoted as $m_{ij} \geq 0$, where

$$x_i(m_{ij}) = x_i^o + m_{ij}.$$

In return, the buyer transfers $p_{ij} \geq 0$ to the seller. The (money equivalent) utility of

each location with respect to x_i is given by a utility function $U_i(x_i)$.

Consider any pair of buyer ($b = 1, \dots, N$) and seller ($s = 1, \dots, N, s \neq b$). Denote $W_b - p_{bs} + \epsilon_{bs}^b$ as the gains from trade for buyer b:

$$W_b(x_b^o + m_{bs})) - p_{bs} + \epsilon_{bs}^b = U_b(x_b^o + m_{bs}) - U_b(x_b^o) - p_{bs} + \epsilon_{bs}^b,$$

While the gains from trade for seller s is denoted $W_s + p_{bs} + \epsilon_{bs}^s$, with

$$W_s(x_s^o - m_{bs})) + p_{bs} + \epsilon_{bs}^s = U_s(x_s^o - m_{bs}) - U_s(x_s^o) + p_{bs} + \epsilon_{bs}^s,$$

ϵ_{bs}^b and ϵ_{bs}^s are respectively idiosyncratic trade preference shifters. Now, let T_{bs} denote a cost of transaction to be jointly born by the buyer and the seller. The maximal gains from trade $W_{bs} - T_{bs}$ is obtained by choosing a level of land area traded m_{bs} between the buyer and seller in order to maximize the sum of the change in welfare in the two locations net of transaction cost:

$$W_{bs} - T_{bs} = \max\{\max_{m_{bs}}[\, W_b(x_b^o + m_{bs}) + W_s(x_b^o - m_{bs})] - T_{bs}, 0\}. \qquad (1)$$

We assume that equation (1) is a concave problem, and the unique solution m_{bs}^* maximizes the joint gains from trade from the buyer and the seller.

This leaves the level of transfers p_{bs} to be determined. Rather than imposing any more structure to fit a particular solution concept via, for example, Nash bargaining or competition, we assume instead that the manner in which p_{bs} is determined may depend on the particular individual characteristics of the buyer seller pair. In particular, we let $\beta_{bs}^b \in [0, 1]$ and $\beta_{bs}^s = \left(1 - \beta_{bs}^b\right) \in [0, 1]$ represent the shares of the aggregate gains from trade that are respectively relegated to the buyer and the seller, such that

$W_b(x_b^o + m_{bs}^*)) - p_{bs} = \beta_{bs}^b(W_{bs} - T_{bs}), W_s(x_s^o - m_{bs}^*)) + p_{bs} = \beta_{bs}^s(W_{bs} - T_{bs})$.

The share β_{bs}^b measures how willing a buyer is to make concessions in order to consummate trade. The lower β_{bs}^b is, the more willing the buyer is to make trade possible by raising the transfer price p_{bs}.

Assessing Trade Likelihoods

Assume that the preference shifters for each buyer, seller, and their pairing $\epsilon_{ij}^k, i, j = 1, \dots, n, k = \{i, j\}$, are Type I extreme value distributed, with cumulative distribution function:

$$F(\epsilon_{ij}^k) = exp(-exp(-\epsilon_{ij}^k)).$$

It is straightforward to verify that for any buyer b, seller s offers the highest gains from trade withprobability:[14]

$$\rho_{bs}^b = \frac{exp(\beta_{bs}^b(W_{bs} - T_{bs}))}{\sum_{n=1}^N exp(\beta_{bn}^b(W_{bn} - T_{bn}))}. \quad (2)$$

Thus, the likelihood that buyer location b prefers seller location s over all other locations depends on (i) pair-specific and bilateral gains from trade $\left(\beta_{bs}^b(W_{bs} - T_{bs})\right)$, normalized by (ii) a buyer-specific term $(\sum_{n=1}^N exp(\beta_{bn}^b(W_{bn} - T_{bn})))$, which is a multilateral aggregate of the possible gains from trade from all seller locations for b.

Meanwhile, buyer b offers the highest gains from trade for s with probability

$$\rho_{bs}^s = \frac{exp(\beta_{bs}^b(W_{bs} - T_{bs}))}{\sum_{n=1}^N exp(\beta_{ns}^s(W_{ns} - T_{ns}))} \quad (3)$$

Thus, the likelihood that b is the preferred buyer location for seller s is likewise

dependent on pair specific gains from trade $\left(exp\left(\beta_{bs}^{s}(W_{bs}-T_{bs})\right)\right)$ and the seller-specific multilateral aggregate of the potential gains from trade for s, $\sum_{n=1}^{N} exp(\beta_{ns}^{s}(W_{ns}-T_{ns}))$.

At each point in time, we assume that trade occurs between b and s when they are each other's most preferred trade partner. Equivalently, trade occurs between b and s with probability

$$\begin{aligned} P_{bs} &= \rho_{bs}^{b}\rho_{bs}^{s} \\ &= \left(\frac{exp\left(\beta_{bs}^{b}(W_{bs}-T_{bs})\right)}{\sum_{n=1}^{N} exp(\beta_{bn}^{b}(W_{bn}-T_{bn}))}\right)\left(\frac{exp\left(\beta_{bs}^{s}(W_{bs}-T_{bs})\right)}{\sum_{n=1}^{N} exp(\beta_{ns}^{s}(W_{ns}-T_{ns}))}\right) \\ &= \frac{exp\ (W_{bs}-T_{bs})}{\left(\sum_{n=1}^{N} exp(\beta_{bn}^{b}(W_{bn}-T_{bn}))\right)\left(\sum_{n=1}^{N} exp(\beta_{ns}^{s}(W_{ns}-T_{ns}))\right)} \end{aligned}$$

Thus, the gravity-style likelihood of trade can be succinctly written as

$$P_{bs} = exp(W_{bs} - T_{bs} + B_b + S_s), \tag{4}$$

where $B_b = -\ln\left(\sum_{n=1}^{N} exp(\beta_{bn}^{b}(W_{bn}-T_{bn}))\right)$ and $S_s = -\ln\left(\sum_{n=1}^{N} exp(\beta_{ns}^{s}(W_{ns}-T_{ns}))\right)$, are buyer- and seller-specific shifters that reflect respectively the overall gains from trading with all other alternative locations for the two trading partners. Note that a buyer or a seller in this setting need not participate in trade at all. The likelihood that the buyer does not engage in trade is $\bar{p}_b = 1 - \sum_{n\neq b} P_{bn}$, while the likelihood that seller s does not engage in trade is $1 - \sum_{n\neq s} P_{ns}$.

It follows that the likelihood of trade between b and s conditional on b and s trading, henceforth P_{bs}^{*}, is given by

$$P_{bs}^{*} = \frac{P_{bs}}{\left(\sum_{n\neq b}^{N} P_{bn}\right)\left(\sum_{n\neq s}^{N} P_{ns}\right)}$$

Or equivalently,

$$P^*_{bs} = exp(W_{bs} - T_{bs} + B^*_b + S^*_s), \tag{5}$$

where $B^*_b = -\ln\left(\sum^N_{n\neq b} exp(P_{bn})/B_b\right)$ and $S^*_s = -\ln\left(\sum^N_{n\neq s} exp(P_{ns})/S_s\right)$.

Equation (4) predicts bilateral trading probabilities among any pair of location chosen from within the set of all possible trading locations $i \in [1, \dots, N]$. Meanwhile, equation (5) predicts bilateral trading probabilities among the subset of buyers and sellers that trade. To use equations (4) - (5) in our empirical work to ascertain the unconditional likelihood of trade P_{bs}, and the likelihood of a buyer-seller match among trading buyers and sellers P^*_{bs}, we make two observations, related to (i) the need to control for buyer and seller fixed effects, and (ii) the interpretation of the estimated coefficients.

To start, note from equations (4) and (5) that the log likelihoods $\ln P_{bs}$ and $\ln P^*_{bs}$ are linear in the gains from trade W_{bs} and fixed effects B_b and S_s terms. Henceforth let t denote time periods, $\mathrm{x}_{\mathrm{bs_t}}$denote a vector of buyer-seller pair characteristics at time t, $\mathrm{y}_{\mathrm{b_t}}$, $\mathrm{y}_{\mathrm{s_t}}$ respectively denote time-varying buyer- and seller-specific controls, B_b and S_s as buyer and seller fixed effects respectively, and D_t time fixed effects. Equations (4) and (5) naturally lend themselves to empirical specifications in the familiar gravity form:

$$\ln P_{bs_t} = \alpha_o + \alpha_x \mathrm{x}_{bs_t} + \alpha_{y_b}\mathrm{y}_{b_t} + \alpha_{y_s}\mathrm{y}_{s_t} + B_b + S_s + D_t + \varepsilon, \tag{6}$$

to include all locations whether traders or non-traders, and analogously

$$\ln P^*_{bs_t} = \alpha^*_o + \alpha^*_x \mathrm{x}_{bs_t} + \alpha^*_{y_b}\mathrm{y}_{b_t} + \alpha^*_{y_s}\mathrm{y}_{s_t} + B^*_b + S^*_s + D^*_t + \varepsilon^*, \tag{7}$$

for the sub-population of locations that exhibit positive trades.

In terms of interpretation, from equations (4) and (5)

$$P_{bs} = exp(W_{bs} - T_{bs} + B_b + S_s)\,,\ P^*_{bs} = exp(W_{bs} - T_{bs} + B^*_b + S^*_s).$$

In our application of the above, we use pair-specific variables x_{bs_t} as well as buyer- and seller-specific variables, y_{b_t} and y_{s_t}, as controls to directly capture pair-wise gains from trade, or equivalently, the $W_{bs} - T_{bs}$ term conditional on buyer and seller fixed effects. The interpretation of the buyer- and seller- specific variables deserve particular attention. From equations (4) and (5), buyer and seller fixed effects are the cross-products of two arguments: the gains from trade from all potential trade partners $W_{ij} - T_{ij}$, and the weights to apply to each trade pairing depending on how the gains from trade is shared $\beta^k_{ij}, k = b, s$. Since both W_{ij} and β^k_{ij} are possibly functions of buyer-specific and seller-specific controls, a priori, the effect of $\mathrm{y}_{\mathrm{b_t}}$ and $\mathrm{y}_{\mathrm{s_t}}$ on the likelihood of trade should be interpreted broadly as changing the likelihood of trade either through changing how the gains from trade is shared, or the size of the gains from trade terms, or both.

To put this in context, take the level of economic development of a jurisdiction as a candidate for y_{b_t}. Now a highly developed jurisdiction may be more likely to participate in land quota trading because of higher gains from buying land development quotas (through W_{bs}). Alternatively, the local government leader in a highly developed jurisdiction may be more inclined to make trade possible to reach self-serving career goals in the government hierarchy by facilitating business development. Such local government leaders are accordingly more ready to pay a

higher price for more land development quotas, or equivalently, they tend to make larger concessions in negotiating their shares β_{bs}^{b} of the total surplus.[15] Since both of these scenarios are consistent with our model, henceforth, we will refer to a buyer- or seller-specific characteristic as trade facilitating, or not, with the understanding that the mechanics can include a combination of both economic, and bargaining related reasoning.

4 Data

4.1 Zhejiang Jurisdictions, 1999-2003

We construct a dataset for all the possible jurisdiction pairs in Zhejiang province during 1999-2003. Specifically, there are 96 possible traders within the province, including 59 counties (or county level cities), 26 urban districts[16] and 11 urban jurisdictions (*shixiaqu*). Thus, there are 9,120 (96×95) possible trade pairs in each year. Since there are 5 years in our dataset, the total number of observations is 45,600 (9120*5).

4.2 Trade Incidence

The key variable of interest in this study 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 and buyer-seller pairs that participated. There are altogether 570 land quota trade activities across counties/districts in the 5-year period between 1999 and 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 are 349 trading events at the "exporter*importer*year" level during 1999-2003.

4.3 Determinants of Trade

As our model indicates, the pattern of land conversion quota trade depends critically on the transaction cost, T_{bs}, and the gains from trade for any pair of buyer and seller W_{bs}. We take T_{bs} to depend on the connection between local government leaders with a potential trading partner, in additional to institutional familiarity and trading history. We take gains from trade to depend both on market forces. Specifically, the list of determinants of trade includes the following:

Connected Leaders

The literature on the role of political connections on economic performance and policy effectiveness in China is a 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 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, connectedness features prominently here in the determination of transaction cost T_{bs} via its ability to facilitate information exchange. Thus, network connections can potentially mitigate against contract

uncertainty (Tadelis and Williamson 2012), and thereby lower the cost of monitoring between jurisdictions. Furthermore, network connections may foster institutional familiarity and accordingly decrease the cost of writing complete contracts. Naturally, there are various ways in which such information exchange can occur for decision-making leaders. To capture these, we catalog the personal and career histories of local leaders based on the published resumes for each county/district governor and county/district party secretary from 1999 to 2003. The network between county/district A (exporter) and B (importer) is defined in four ways: 1) career network due to work experience; 2) birthplace network, 3) education network, and 4) at least one of the above mentioned types of connectedness. We consider 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);[17] 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 as any of the two officials in B (A).

Institutional Knowledge and History

In addition to leader networks, we furnish other controls and possible determinants of the extent of informational hazards (e.g., geographical and institutional distance) in intergovernmental contracting, and furthermore, we control for the role of prior trading relationship to establish if the full history of land conversion quota trade in a county matters (Tadelis and Williamson 2012). Specifically, we include: 1) a dummy variable indicating common border between each possible pair, which measures the geographical closeness of potential trading partners; 2) a dummy variable indicating

the same prefecture city for each jurisdiction pair, which measures the institutional closeness; and 3) a dummy variable indicating whether prior trade in land conversion quotas has taken place between jurisdiction pairs.

Market Forces

We capture the impact of market forces on import demand using the value of developed land – the sum of secondary and tertiary GDP divided by total land area to capture demand in the model. The construction of such a measure is motivated by Lichtenberg and Ding (2009), who argue that the value of developed land is the appropriate measure of the incentive for farmland conversion, and proxy that value by dividing the sum of (lagged) secondary and tertiary GDP by urban land area. For 1999-2003, these data are collected from the Statistical Yearbooks of the Zhejiang province (2000-2004).[18]

Table 1 summarizes the key variables used in the estimation. Among all "exporter*importer* year" cells, around 0.8 percent experienced at least one land conversion quota trade. The domestic product from secondary and tertiary sector per unit land area during 1999-2003 in the counties/districts is 11 million yuan per square kilometre. In terms of network connections, around 12.2 percent of the cells have at least one out of the three types of connections: 2.3 percent of the leaders among all the cells have birthplace connections; 3.6 percent have working experience connections; and 7.9 percent share the same university/college networks.

Juxtaposing the leader network and land conversion quota trade data, Figure A3 shows the kernel density plots of the average number of career network links between

the two leaders at the time of trade by trade status (importer, exporter, two-way trader, and no trade). As shown, exporting jurisdictions and autarkic jurisdictions are similar, with both tending to have the least number of network links. Pure importers constitute the next group in terms of the number of network links. Finally, jurisdictions that have taken on the roles of buyers and sellers tend to have the highest number of career network links.

Table 2 shows additional variables by trade status. Evidently, two-way traders have the highest number of network connections in all four categories, followed by importers, exporters and then non-traders with the exception of education networks, with exporters in fact having a higher number of education network links than importers on average. In addition, among traders, importers on average enjoy higher GDP per unit urban area, followed by two-way traders, and exporters. Interestingly, based on this measure of market demand, many non-traders that should have high demand for land did not participate in land conversion quota trade. Since this group also has the least number of network links, the raw statistics in Table 2 suggest the potential importance of leader connections in facilitating efficient allocation of land resources within the context of the land conversion trading policy.

Other Leader-specific Variables

Arguably, the number of network connections grows with seniority in the presence of a civil service job rotation system. Thus, we control for the average age of the county leaders collected from individual leader resumes in order to determine whether it is the experience of the leader that reduces transaction cost, or the actual bilateral

connections. Furthermore, we control for political cycle effects in order to account for any leader-specific change in incentives to improve performance, depending on time until the next job rotation. Due to data limitations, we have only limited observations on leader age, and political cycles, and regressions inclusive of these effects are included later on in our robustness discussion.

In addition, another possibility is that the networks that matter are county officials' ties to officials in their prefecture, since prefecture level officials may have some strategic concerns regarding how land quotas should be traded across the sub-jurisdictions.[19] Therefore, we also construct two variables regarding county leaders' network with prefecture level officials for exporter and importer counties. Specifically, we define a county as connected with prefecture level officials if the municipal or party secretary (*shuji*) is born in the county, or has ever worked in the county, or shares the same education background with the county governor or party secretary.

In Table A1, we summarize the mean age, mean political cycle, and mean number of career network links per year (the number of times the two leaders have worked in a county-level unit different from the current post in an average year) in the 96 county-level units in Zhejiang from 1999-2003. As shown, the mean age of the average leader is slightly more than 43 years. The mean political cycle at 1.49 years is significantly less than the mandatory 5 years according to our discussion in section 2.1. These observations are consistent with a number of prior studies in this area in provinces other than Zhejiang (Guo 2007; Bo 2009). The mean number of career

network links ranges from a minimum of 0, to a maximum of 12.2, averaging 3.4.

Next, we report the findings of our econometric estimations, which simultaneously account for the effects of leader networks, market forces, and the other variables discussed above on the determination of the incidence of land conversion quota trade.

5 Specifications and Main Findings

We first estimate equation (6) covering all buyer-seller jurisdiction pairs. We employ a linear probability specification, which estimates equation (6) using OLS with buyer and seller fixed effects as well as time fixed effects. We then estimate equation (7) covering buyer and seller jurisdictions that have positive trades in a given year using a linear probability specification as well. Alternatively, we could also employ a logit specification. However, since non-trading buyer and non-trading seller jurisdiction fixed effects perfectly predict trade outcomes, a logit specification is only able to estimate equation (7) effectively as non-trading jurisdiction are dropped from the regression. We cluster standard errors at the jurisdiction pair level.

To gauge any impacts that trade in land conversion quota may have on some of the control variables, such as GDP per capita and network variables in subsequent years, all time-varying explanatory controls have one year lags. Arguably, the locational designation of local leaders may be systematic, and as such, two locations with similar unobserved characteristics (e.g., relative importance of select industries) may be designated leaders who share similar characteristics in terms of career experiences, education or birthplace background, for example. Omitted variables of

this nature in which connected leaders tend to be located in similar locations will introduce bias in our estimation. That said, since trade in our setting matches localities that are different in the presence of negative assortative matching, we expect this type of bias to in face *underestimate* the role of networks. In other words, we can treat our results as lower bound estimates of the true impact of the presence of networks on the incidence of trade.

We display results from OLS as well as logit specifications in Table 3. These regressions include the full set of explanatory variables discussed in Section 4.3 capturing cross-jurisdictional and within province leader connections, institutional knowledge and market forces other than time-invariant buyer/seller characteristics, are included as controls, as the effects of time-invariant controls are already subsumed in buyer and seller fixed effects. In Table 4, we adopt the network definition by dimension, i.e., career network, birthplace network and educational network. We present four broad sets of observations. Respectively, these are concerned with the following as determinants of trade likelihood: (i) leader networks, (ii) institutional knowledge and priori trading relationships, (iii) other leader-specific considerations, and (iv) market forces.

First, network connections in general significantly increase the likelihood of land conversion quota trade between the two parties (column 1 Table 3). Such effect remains and exhibits an even larger magnitude in a restricted sample that only include jurisdiction pairs that ever trade (column 2 Table 3). In addition, the result remains similar if we employ a logit model instead of a linear probability model (column 3

Table 3).

The main specification in Table 3 employs the most inclusive definition of leader networks, combining career, birthplace and education networks. If transaction costs indeed arise due to institutional knowledge constraints and lack of prior trading relations, we would expect that network connections that may not enhance a leader's information about institution (e.g. birthplace networks without a corresponding history of work experience) or history of direct contracts (e.g. education location networks that are short term and do not involve work experience) to have relatively little impact on trade propensities. That said, career network connection appears to play the most prominent role, and its effect on trade likelihood is always significant and positive (column 1, Table 4), while birthplace and education networks are in fact insignificant when considered separately (columns 2 and 3, Table 4). If we interpret the magnitude of the effect based only on career network effect in Table 4 (column 1), the estimated coefficient indicates that being connected based on the career history of the local government increases the probability of land quota trade by 3.8 percentage points.

The other connectedness variables are also highly significant and exhibit the expected signs. In particular, jurisdictions from the same prefecture city are more likely to trade land conversion quotas with each other, although geographic closeness alone is not significantly associated with a higher likelihood of trade. Thus, institutional closeness is an important determinant of the transaction cost of trade between two jurisdictions, but physical distance is not. Interestingly, we find that

having prior trade relations significantly increases the likelihood of future trade. This path dependence supports asset specificity as a determinant of the transaction costs of trade in this Chinese experiment.

As mentioned in Section 4.3, another possibility is that the networks that matter are county officials' ties to officials in their prefecture, since prefecture level officials may have some strategic concerns regarding how land quotas should be traded across the sub-jurisdictions. However, we do not find empirical support for this conjecture because the coefficients on these two variables (rows 5 and 6, Table 3) are insignificant across various specifications, which indicated the limited role of leader connection with higher ranked officials.

Next, we also add the leader's age as a proxy for the individual's experience in the political hierarchy. As discussed, we do so to allay concerns regarding the conflation of years of experience with the number of network connections as a determinant of transaction cost. Furthermore, we introduce political cycle effects, as measured by the number of years since the leader assumes the current duty, which have been shown in the context of other countries to feature importantly in the decision-making of local leaders in some cases (e.g., Alesina, Roubini, and Cohen 1997) but not others (e.g., Iyer and Mani 2012).

These results are reported in Table 5 (Panels A and B). In Panel A, we introduce the average age and average age squared of the leaders of the county in question, separately for exporting counties and importing counties. In Panel B, we introduce the average number of years and average number of years squared that the leaders of the

county in question have been in office. Interestingly, we find that the importance of leader networks remains robust upon introducing these leader-specific characteristics (the marginal effect in the logit model is not statistically significant in some specifications though but maintains the correct sign). In addition, the age and political cycle effects are in fact insignificant in most of our specifications. The only exception occurs in the OLS specifications that address importer leader-political cycle effects, where the number of years since the leader assumes duty in the importer county is shown to have a U shaped relationship with the incidence of trade, with the minimum effect at around 2.5 years ($\cong -0.005/(-0.001 \times 2)$).

Our baseline results in the previous tables combine the network connections of party secretaries and county governors. These effects can be separately assessed. To do so, we generate two career network variables for each county and each year, one pertaining to the party secretary's career history, and the other to that of the county governor. Here, we seek to examine whether the network connections of the party secretary and the county governor wield separate impacts. Interestingly, we find that the network connections of the two leaders are individually (Table 6) and jointly (Tables 3 - 6) contributing factors to the likelihood of trade. Furthermore, neither one of the two career network variables appear to stand out in terms of the direction or magnitude of influence.

Finally, turning to the role of market forces, GDP per unit urban area of exporters and importers do not seem to affect the probability of land quota trade once exporter and importer fixed effects are included, the same conclusion applies with population

size of exporters and importers. We interpret these results as reflective of the salience of the leader network adjusted transaction costs, as well as the exporter and importer fixed effects in determining the pattern of trade in land conversion quota, relative to any additional year-on-year changes in GDP per unit land endowment, or the year-on-year changes in population within our 5-year study period.

Leader Networks and the Intensive Margin of Trade

Throughout, transaction cost is taken to impact the fixed contract costs of trade, and as such it is expected to have no impact on trade at the intensive margin. Consistent with this focus, in our main specifications, we only take into account the extensive margins of trade. We also verify our findings at the intensive margin of trade as well as a check on the assumption that network connections impact the fixed cost of contracting between local government. In a placebo test, we perform intensive margin regressions (the log number of traded hectares of land quotas, and the log value of trade between jurisdictions conditional on trade) using the same list of explanatory variables as in our extensive margin regressions. The results are displayed in Table 7. As shown, in all specifications with and without controlling for importer and exporter fixed effects, the coefficients on career and all networks are insignificant. This is consistent with our interpretation of network effects as making a difference along the extensive margin by mitigating against the fixed cost of transaction.

We have also shown that education and birthplace networks are not correlated with trading status. As such, we do not conclude that these networks ties facilitate trade by changing the transaction cost of contracting. Along the intensive margin as

well, almost all birthplace and education network effects are insignificant. The only exception is that the coefficients on education network are significant with importer and exporter fixed effects. This may be due to informational advantages about the quality of the land trade shared by county leaders with education ties to the buyer and/or seller location, for example. Since education networks do not appear to have impacted the likelihood of trade at all in our trade likelihood estimations, we conclude that these effects, while present, are likely mild compared to the role of career networks and not large enough to impact the participation decision of potential traders.

As a robustness check, Table A2 presents the analysis of intensive margin of trade using a hurdle model. The underlying assumption of the hurdle model is that the decision to engage in trade and the subsequent trade volume (in terms of trade revenue and trade area) are determined by different factors in two separate parts of the model. In the first part, the decision to trade (i.e., trade status) between the two counties is assumed to be determined by potential trade costs, which are measured using the size of the official's network (specifically, the number of officials with overlapping careers). Additionally, the magnitude of potential gains from trade are considered, measured by the sum of secondary and tertiary GDP minus primary GDP per unit of urban area, as well as the ratio of primary GDP to total GDP. In the second part, conditional on the two counties engaging in trade, the trade revenue and traded area are assumed to be correlated with topographical attributes of the counties. Furthermore, similar explanatory variables employed in the extensive margin analysis

are also taken into account.

Table A2 Panel A shows that trade status (i.e., whether to trade) is significantly positively associated with the number of officials with overlapping careers, which is consistent with our findings in the extensive margin analysis. For the second part, Panel B reveals that the coefficients on all networks, birthplace networks, career networks as well as education networks are insignificant, consistent with the results obtained in the Table 7, where the intensive margin of trade is also found to be insensitive to changes in network connections.

6 Conclusion

Do leader networks facilitate efficient intergovernmental contracts? From the Zhejiang experiment in land conversion quota trading, we draw several key lessons. First, we find that institutional knowledge and asset specificity are indeed important considerations in the intergovernmental transactions we consider in this paper. Second, as a potential means to mitigate against transaction costs, we find that the prior career experience of a leader in a different locality is of paramount importance in determining trade outcomes, consistent with the transaction cost view that network connections confer informational advantages.

Naturally, the career history of local leaders in China is subject to the rules of the civil service system. The main contribution of this study is the finding that these rules have impacts that extend well beyond typical career advancement concerns of civil servants. Indeed, we show that leaders' experience and network linkages are key determinants of the transaction costs incurred in interjurisdictional contracts. The

potential gains to local jurisdictions as leaders incur smaller transaction costs in interjurisdictional contracts stand as a balance to a longstanding view, that frequent job rotation discourages leaders from making long run efficiency improving decisions.

Many future research questions remain. For example, there is as yet no study on the quality aspect of land consolidation efforts in China, and likewise, there is no study to date on the agricultural productivity impact of China's land administration reforms. What roles do leader characteristics play? Furthermore, there are many policy programs in China that transcend county-level and/or provincial-level boundaries, such as infrastructure projects and cross-border environmental programs. What roles do leader networks play in these interactions?

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Table 1: Summary of Statistics
(Year: 1999-2003; Total number of jurisdictions: 96)

Variables	Obs	Mean	Std Dev.	Min	Max
Trade activity dummy	45,570	0.008	0.087	0	1
Career networks (dummy)	45,560	0.036	0.187	0	1
Birthplace networks (dummy)	45,560	0.023	0.151	0	1
Education networks (dummy)	43,880	0.079	0.269	0	1
Either of the three networks (dummy)	45,560	0.122	0.327	0	1
Adjacency (dummy)	45,570	0.052	0.221	0	1
Belonging to the same prefecture (dummy)	45,570	0.094	0.291	0	1
GDP per urban area (100 million yuan/sq. km)	40,440	0.11	0.136	0.002	0.957
Population (in million)	40,915	0.088	0.162	0.009	1.728
Network with local officials for exporter	45,570	0.348	0.476	0	1
Network with local officials for importer	45,570	0.348	0.476	0	1

Table 2: Variables by Trade Status

Variables	Importer	Exporter	Two-way Trader	Non-trader
Total Number	52	55	24	13
GDP Per Urban Area (100 million yuan/sq. km)	0.14	0.09	0.13	0.16
Network Links All	12.74	12.77	14.66	7.58
Network Links Career	4.06	3.55	4.53	2.42
Network Links Birthplace	2.69	2.28	3.05	1.55
Network Links Education	7.57	8.34	9.18	4.52

Notes: 1. This table summarizes the total number of counties by trade status, as well as the average GDP per urban area, the average number of links per year for each type of connections by trade status; 2. A county that ever imported is defined an importer in this table, a county that ever exported is defined an exporter. Two-way traders are thus counted twice, once as importer and once as exporter. Non-trader denotes counties that never traded. The total number of counties can be retrieved by summing the number of importers, the number of exporters, the number of non-traders, minus the number of two-way traders.

Table 3: Factors Affecting Land Conversion Quota Trade Between Jurisdiction Pairs

VARIABLES	(1) OLS (All)	(2) OLS (Traders Only)	(3) Logit (Traders Only)
Connected (three types), t-1	0.008***	0.053***	0.021*
	-0.002	-0.016	-0.012
Adjacent or not	0.001	0.035	-0.02
	-0.006	-0.04	-0.019
Belonging to the same prefecture city	0.024***	0.301***	0.296***
	-0.005	-0.034	-0.026
Prior trade dummy	0.206***	0.311***	0.077***
	-0.026	-0.042	-0.015
Network with local officials for exporter, t-1	0.001	-0.021	-0.012
	-0.002	-0.02	-0.017
Network with local officials for importer, t-1	0	-0.029	-0.031
	-0.002	-0.041	-0.03
Ln(population) of exporter, t-1	-0.089	-0.021	-0.46
	-0.055	-3.052	-4.673
Ln(population) of importer, t-1	0.002	-0.712	-1.171
	-0.115	-1.198	-1.049
Ln(GDP per urban area) of exporter, t-1	0.069*	-0.419	-0.411
	-0.042	-0.67	-0.729
Ln(GDP per urban area) of importer, t-1	-0.1	0.13	0.359
	-0.066	-0.542	-0.431
Observations	25,240	3,053	3,053
R-squared	0.118	0.286	/
Log likelihood	22854	-9.897	-547.6
Wald chi-square	/	/	634.3
Year FE	Yes	Yes	Yes
Importer FE	Yes	Yes	Yes
Exporter FE	Yes	Yes	Yes

Notes: 1. The average marginal effects are provided for Logit model (Column 3); 2. Covariates, t-1 are used; 3. Standard errors are clustered at importer-exporter level; 4. Year fixed effects, importer and exporter fixed effects are included in all the columns; 5. *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$.

Table 4: Robustness Checks using Career, Birthplace and Education Networks

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
	All			Traders		
	Career	Birth	Education	Career	Birth	Education
Connected (Career), t-1	0.038***			0.210***		
	-0.009			-0.048		
Connected (Birthplace), t-1		0.011			0.105*	
		-0.008			-0.054	
Connected (Education), t-1			0.001			0.015
			-0.003			-0.017
Adjacent or not	-0.001	0.002	0.002	0.014	0.041	0.045
	-0.006	-0.006	-0.006	-0.04	-0.039	-0.04
Belonging to the same	0.015***	0.025***	0.027***	0.234***	0.304***	0.327***
prefecture city	-0.005	-0.005	-0.005	-0.038	-0.036	-0.036
Prior trade dummy	0.203***	0.206***	0.205***	0.299***	0.312***	0.308***
	-0.026	-0.026	-0.027	-0.042	-0.042	-0.042
Network with local officials	0.001	0.001	0.001	-0.025	-0.019	-0.019
for exporter, t-1	-0.002	-0.002	-0.002	-0.020	-0.019	-0.020
Network with local officials	0.000	0.001	0.000	-0.028	-0.030	-0.028
for importer, t-1	-0.002	-0.002	-0.002	-0.040	-0.041	-0.041
Ln(GDP per urban area)	0.082*	0.081*	0.085*	-0.298	-0.228	-0.233
of exporter, t-1	-0.042	-0.042	-0.044	-0.675	-0.663	-0.692
Ln(GDP per urban area)	-0.085	-0.088	-0.110*	0.292	0.267	0.185
of importer, t-1	-0.066	-0.066	-0.066	-0.542	-0.534	-0.550
Ln(population) of exporter, t-1	-0.102*	-0.100*	-0.105*	0.304	0.258	0.287
	-0.055	-0.055	-0.056	-3.075	-3.062	-3.081
Ln(population) of importer, t-1	-0.013	-0.009	0.005	-1.065	-0.840	-0.758
	-0.115	-0.115	-0.118	-1.195	-1.190	-1.210
Observations	25,240	25,240	24,310	3,053	3,053	2,952
R-squared	0.121	0.118	0.118	0.295	0.286	0.282
Log likelihood	22892	22852	21739	10.26	-9.958	-43.09
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Importer FE	Yes	Yes	Yes	Yes	Yes	Yes
Exporter FE	Yes	Yes	Yes	Yes	Yes	Yes

Notes: 1. The coefficients are provided for the results of ordinary least squares; 2. Covariates in year t-1 are used; 3. Standard errors are clustered at importer-exporter level; 4. Year fixed effects,

importer and exporter fixed effects are included in all the columns; 5. *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$.

Table 5: Robustness Checks With Leader-Specific Attributes (with FEs)

VARIABLES	(1) OLS (All Career)	(2) OLS (Traders Career)	(3) Logit (Traders Career)
	Panel A: Age Effect		
Connected (Career), t-1	0.047***	0.251***	1.161**
	-0.011	-0.062	-0.504
Exporter Average Age	0.003	0.053	0.475
	-0.006	-0.032	-0.530
Exporter Average Age Squared	0.000	-0.001*	-0.006
	0.000	0.000	-0.008
Observations	19,948	2,513	2,343
Log likelihood	17587	9.741	-444
Wald chi-square	/	/	551.3
Connected (Career), t-1	0.014**	0.127**	0.952
	-0.006	-0.056	-0.635
Importer Average Age	0.002	0.080	1.030
	-0.001	-0.074	-1.084
Importer Average Age Squared	0.000	-0.001	-0.012
	0.000	-0.001	-0.013
Observations	19,950	2,004	1,559
Log likelihood	20594	-1.762	-349
Wald chi-square	/	/	433.54
	Panel B: Political Cycle Effect		
Connected (Career), t-1	0.044***	0.236***	0.857
	-0.013	-0.072	-0.525
Exporter Cycle	-0.001	-0.028	-0.545
	-0.002	-0.022	-0.356
Exporter Cycle Squared	0.000	0.006	0.134
	-0.001	-0.007	-0.099
Observations	14,809	1,958	1,784
Log likelihood	12293	-43.09	-358.4
Wald chi-square	/	/	478.47
Connected (Career) in year t-1	0.015**	0.112**	0.224
	-0.007	-0.057	-0.676
Importer Cycle	-0.005**	-0.036	-0.301
	-0.002	-0.023	-0.373
Importer Cycle Squared	0.001**	0.004	0.014
	0	-0.007	-0.116
Observations	14,810	1,535	1,192
Log likelihood	14477	-62.01	-292

Wald chi-square	/	/	316.03

Notes: 1. The average marginal effects are provided for Logit model (Column 3); 2. Covariates in year t-1 are used; 3. Standard errors are clustered at importer-exporter level; 4. Year fixed effects, importer and exporter fixed effects are included in all the columns; 5. *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$.

Table 6: Robustness Checks Unbundling Party Secretary and County Governor Effects

VARIABLES	(1) OLS (All Career)	(2) OLS (Traders Career)	(3) Logit (Traders Career)
Panel A: county head			
Connected (county head), t-1	0.038***	0.231***	0.068***
	-0.011	-0.061	-0.024
Observations	25,244	3,053	3,053
R-squared	0.12	0.293	/
Log likelihood	22885	6.43	-544.1
Wald chi-square	/	/	650.5
Panel B: party secretary			
Connected (party secretary), t-1	0.025***	0.200***	0.045**
	-0.009	-0.058	-0.02
Observations	25,244	3,053	3,053
R-squared	0.119	0.291	/
Log likelihood	22870	1.858	-546.3
Wald chi-square	/	/	613.7
Year FE	Yes	Yes	Yes
Importer FE	Yes	Yes	Yes
Exporter FE	Yes	Yes	Yes

Notes: 1. The average marginal effects are provided for Logit model (Column 3); 2. Covariates in year t-1 are used; 3. Standard errors are clustered at importer-exporter level; 4. Year fixed effects, importer and exporter fixed effects are included in all the columns; 5. *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$.

Table 7: Network Effects on the Intensive Margin of Trade

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Panel A: Log Trade Revenue				Panel A: Log Trade Revenue			
	All	Career	Birthplace	Education	All	Career	Birthplace	Education
Connected, t-1	-0.069	0.14	-0.064	0.451**	0.056	0.122	0.028	0.14
	-0.251	-0.351	-0.332	-0.218	-0.165	-0.233	-0.22	-0.176
Observations	277	277	277	273	277	277	277	273
R-squared	0.611	0.611	0.61	0.618	0.195	0.196	0.195	0.198
Log likelihood	-220.6	-220.5	-220.7	-212.9	-321.2	-321	-321.2	-314
	Panel B: Log Traded Area				Panel B: Log Traded Area			
	All	Career	Birthplace	Education	All	Career	Birthplace	Education
Connected, t-1	-0.052	0.141	-0.014	0.402*	0.037	0.084	-0.014	0.11
	-0.238	-0.325	-0.311	-0.21	-0.157	-0.216	-0.212	-0.16
Observations	277	277	277	273	277	277	277	273
R-squared	0.577	0.578	0.577	0.582	0.14	0.141	0.14	0.152
Log likelihood	-203.2	-203	-203.3	-196.3	-301.4	-301.3	-301.5	-292.9
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Importer FE	Yes	Yes	Yes	Yes				
Exporter FE	Yes	Yes	Yes	Yes				

Notes: 1. The coefficients are provided for the results of ordinary least squares; 2. Covariates in year t-1 are used; 3. Standard errors are clustered at importer-exporter level; 4. Year fixed effects, importer and exporter fixed effects are included in all the columns; 5. *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$.

[1] There are many specific examples of intergovernmental contracting (O'Brien and Li 1999). A short list includes contracts to improve environmental governance (Eaton and Kotska 2012), negotiate water governance under the threat of regular seasonal floods (Tilt 2015), and coordinate the enforcement and monitoring of transborder crime (Lo 2009).

[2] For example, previous studies have investigated 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).

[3] See, for example, Coria and Sterner (2010) for the case of tradeable emissions permits in Chile.

[4] See Section 2 for an in depth discussion.

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

[6] Details are available in the Provisional Regulations on State Civil Servants (*Guojia gongwuyuan zhidu zanxing tiaoli*). The content of the regulation can be accessed at http://cpc.people.com.cn/GB/64162/71380/71387/71591/4855083.html, accessed December 15, 2015.

[7] The 1993 reform also introduced a competitive recruitment system that spells out education qualification requirements and a nationwide civil service exam. For example, the civil service exam in 2008 attracted 775,000 applicants for 13,500 places.

[8] The origin of civil service job rotation dates back to a central government policy directive since 1962 which required that all local government leaders at county level or above be rotated at regular intervals (Huang 2002).

[9] Zhang et al. (2014) lays out the various stages of a typical land consolidation project in Zhejiang as consisting of six stages, running from the merging of scattered and irregularly shaped plots, stripping top soil, leveling and shaping plots, replenishing top soil, constructing roads and other irrigation facilities to re-determining ownership in the end.

[10] 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).

[11] In fact, a 1998 Zhejiang province notice flexibly interprets Article 18, stipulating that 72% of the total areas of added effective cultivation could be used as rewarded quota for approved infrastructure, core village, small town and industrial district (Zhang et al. 2014).

[12] The policy of fully decentralized trading was terminated starting 2004. We thus restrict ourselves to investigating the time period between 1999 to 2003.

[13] The land conversion quota trade began in 1999, with only 11 trading activities during that year. The number of trades increased significantly to 83 in 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.

[14] A buyer prefers location s to n if and only if $W_{bs}^b + \epsilon_{bs} \geq W_{bn}^b + \epsilon_{bn}$. The likelihood that location s is preferred to all $n \neq s$ is $\prod_{n \neq s} exp(-exp(-(W_{bs}^b - W_{bn}^b + \epsilon_{bs})))$. It follows that ρ_{bs}^b is the expectation of $\prod_{n \neq s} exp(-exp(-(W_{bs}^b - W_{bn}^b + \epsilon_{bs})))$ over $\epsilon_{bn} \in [-\infty, \infty]$, or

$$\int_{-\infty}^{\infty} \prod_{n \neq s} exp(-exp(-(W_{bs}^b - W_{bn}^b + \epsilon_{bs}))) \, exp(-\epsilon_{bs}) \, exp(-exp(-\epsilon_{bs})) \, d\epsilon_{bs}.$$

This yields equation (2), upon incorporating $exp\left(-exp\left(-\left(W_{bs}^b - W_{bn}^b + \epsilon_{bs}\right)\right)\right) = exp(-exp(-\epsilon_{bs}))$ and $W_{bn}^b = \beta_{bn}^b (W_{bn} - T_{bn})$.

[15] Yet another possibility that also works through β_{bs}^b involves budget constraints. A highly developed jurisdiction may simply have more tax revenue on hand to pay for the cost to facilitate land quota transfer.

[16] *Qu xian* was revoked and upgraded to *Qujiang* district in 2001, and therefore, was not included in our sample.

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

[18] Seto and Kaufmann (2003) also suggest clearly that foreign direct investment, as well as the relative productivity of agricultural and industrial land are important determinants of the rate of agricultural land conversion in the Pearl River Delta.

[19] We are grateful to an anonymous referee for encouraging us to pursue this possible linkage.