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How Chinese Home Appliance Firms Coped with Default Risk of Trade Credit?

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December, 2011

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Keywords: trade credit; distribution channel strategy; contract; convergence of mechanisms
JEL classification: L14, L68, L81, D22, G32, O16, O17

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Competition of the Mechanisms: How Chinese Home Appliance Firms Coped with Default Risk of Trade Credit? *

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Abstract

During the transition period from a planned economy to a market economy in 1990s of China, there was a considerable accrual of deferred payment, and default due to inferior enforcement institutions. This is a very common phenomenon in the transition economies at that time. The Chinese government attempted in vain to deal with this problem by legislation of related institutions and administrative control. Interviews with home electronics appliance firms revealed that firms were able to cope with this problem by adjusting their sales mechanisms (found four types), and the benefit of institutions was limited. A theoretical analysis here found that spot and integration are inferior to the two contract mechanisms in terms of cost and price: a contract with a rebate on volume and prepayment against an exclusive agent can realize the lowest cost and price, and maximize social welfare. Hence, through Bertrand price competition, any of two contract mechanisms is selected to dominate the supply behavior. The empirical part showed that mechanisms converged into a mechanism with a rebate on volume an against exclusive agent, and a firm who initiated this mechanism gained the largest share in the market. Estimation of a (semi) structural supply function that utilizes demand estimates showed that the price level with the dominant mechanisms is the lowest. The competition is the driving force of the convergence of mechanisms and improvement risk management capacity.

Keywords trade credit risk; distribution channel strategy; contract; convergence of mechanisms
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1 Introduction

1.1 Literature on enforcement and inter-firm transaction

The payment method for sold goods is critical in economic transactions. However, this payment practice became increasingly chaotic in the transition economies from planned to market economies in the 1990s. This led academics to focus on how the payment mechanism, or how economic transaction is governed. Empirical investigations preceded to theoretical works: McMillan and Woodruff (1999) discussed how transactions by the then-rapidly increasing private enterprises in Vietnam were supervised. Johnson, McMillan and Woodruff (2002) investigated how the courts in transitional economies function in terms of the supervision of commercial transactions and enforcement. Fafchamps (1996:1997) documented the case of Africa and found that ethnicity affects the performance of a contract, or, more specifically, the performance of payment. Inspired by these empirical works, theoretical studies followed. Dixit (2003a; 2003b; 2009), for example, demonstrated the possibility that economic transactions may expand if enforcement of contracts is guaranteed by a third party or institution.

Contract theory claims that a contract may become incomplete when (1) the contract cannot provide for every eventuality; (2) the content of the contract cannot be verified, and it cannot be enforced by a third party; or (3) no party of the contract has sufficient rationality to create an "optimal contract" (the bounded rationality problem), and (4) adverse selection and moral hazard are caused by asymmetric information. Theoretical literature,particularly, incomplete contract literature, added to the claim that if the contract is incomplete, good arrangement of ownership or other institutions is necessary to obtain efficiency of the economic transaction. Many application of the incomplete contract approach assumes that efficiency of economic transaction heavily depends on the quality of the institution that facilitates the contract enforcement[1]. Some empirical studies support the notion that an economy with good-quality systems experiences more rapid growth (Demigruge-Kunt and Maksimovic, 2001). Hence, most empirical studies focused on the quality of institutions such as ownership or organization of firms, or the role of the court.

[1]Application of the incomplete contract idea was rapidly expanded. Helpman (2006) conducted an excellent survey on the application of the incomplete contract approach to trade, foreign direct investment and organization of firms

They investigated the impact of the institution, not the design of the contract.

Against this hypothesis of institution-dependent quality of transaction, counter-arguments were presented. Allen, Qian and Qian (2005) assert that the experience of China which accomplished high economic growth in spite of its poor-quality systems is the best counter-evidence to simple institution-dependence hypothesis. Some theoretical papers also presented propositions to challenges the hypothesis. Maskin and Tirole (1999) and Maskin (2002) claimed that the contract does not become incomplete if a proper mechanism is designed even in the case where a contract is incomplete because of an unforeseen contingency not contained in the contract in the situation described in 1) above. They maintain that it is naive to argue that "if the institution or the contract that supports economic transaction is incomplete, inefficiency occurs immediately and then the ownership and other institution that affect the renegotiation will become completely determinant". Empirical works to examine the argument are somewhat limited. With respect to the situation in China, Allen, Qian and Qian (2005) only examined the relationship between the indicators of the quality of the institution and macroeconomic indicators, and empirical findings or analysis on the types of measures or mechanisms that actually worked have not been presented. This paper attempts to fill this gap.

1.2 Perspective of this paper

From the 1990s to the 2000s, institutions that affect Chinese firms' behavior have changed drastically. Those firms which had been only been required to produce goods as planned were suddenly exposed to an environment in which they had to set price, sell goods and receive payment by themselves in order to obtain profit. Under such drastic change of environment, most firms faced the problem that payment for the goods they sold was not made[2]. In order to understand what actually happened in such a chaotic situation, I conducted an interview survey among businessmen in the home electronics appliances industry in China from the early 2000s (Watanabe(forthcoming)). The survey revealed that many manufacturers individually devised measures to avoid default of deferred payment, and that the mechanisms were amazingly diversified. Improvement of institutions such as

[2]Default or delay of payment will affect cash demand and financing behavior of a firm. Payment performance is affected by not only the contract or institution, but also by how products of the firms are preferred. In this sense, the total strategy of a firm may determine payment probability.

the judicial system is undeniably important, but according to my interviewees, institutional reform was neither crucial nor sufficient. They were able to manage their risk of default of deferred payment by adjusting their own strategy.

This paper aims to evaluate which mechanisms was superior among those that I encountered in the field research. Here, a superior mechanism is defined as the one that generates larger profit for the firm and at the same time induces greater consumers' welfare, that is, a mechanism contributing to social welfare. Through this procedure, not only the superiority or inferiority of each strategy but also the relationship between each strategy and the institutional system are examined.

2 Findings from field work: How did firms cope with trade credit default?

2.1 "Triangular debt": Chaos of deferred payment in the transition period

In the late 1980's, the payment chain stagnated and deferred payment raged out of control among the upper to lower value chains: once payment between any node of a chain from a supplier, assembler, wholesaler and retailer to consumer was deferred, payment to all the members in this chain became unintentionally deferred for two to three years. This phenomenon was called the "triangular debt problem" in Chinese. In 1989, the then-vice prime minister Zhu Rongji took nationwide action to inject cash into the upper members of the transaction chain. However, the policy did not improved the chaotic situation for a long time. Thus, how did firms and businessmen who faced with chaotic deferred payment respond? The perception of interviewees from my field work can be summarized as follows: (1) stagnated deferred payment became more serious in the middle and late of 1990s, after the 1989 policy of Vice-Prime Minister Zhu. This is because (2) the institutions to support market transaction were poorly developed, (3) the firms took time to adjust to market transaction, but (3) the firms could not help but utilize the deferred payment, because there was a critical shortage of cash due to drastic expansion of the demand for money. It was'nt until the end of the 1990s or early 2000s that most of managers of accounting and financial sections of Chinese companies were able to control the risk of default of deferred payment, particularly against strategic default by customers.

2.2 Relation between legal institutions and payment default in China

Legal institutions to mitigate strategic default were introduced but their capacity was extremely limited: commercial bill law and contract law were legislated, code of civil procedure was revised in 1996, and the commercial bill became available in China in 1996. A commercial bill guarantees repayment of a deferred payment, or trade credit received by the borrower. The bill is accepted based on confidence toward the issuer-firm. If the issuer-firm fails to make payment, it is supposed to exit from its transaction network. For example in Japan, if the issuer fails in its on-time repayment twice in six months, all member banks of the bill exchange are informed of the default, and they immediately stop settlement via checking account and loan to the issuer, who goes to bankrupt. However, China's commercial bill was restricted to different sources of confidence: not of issuer-firms, but of banks that guarantee the bill. As a result, the volume of bill issued is also extremely limited compared to the expanding size of economic activity in China[3]. This institutional situation implies that trade credit supported by the commercial bill system was an instruments of limited use for the most of firms. Institutions still remain insufficiently supportive for payment default risk in China.

2.3 Perception and behavior of firms

Therefore, how are firms perceived and how do they behave under such circumstances? One interviewee provided evidence that he was able to control strategic default of deferred payment until 2004. How could be manage this risk of strategic default, even though institutional support was extremely limited? Most interviewees provided similar evidence that (1) most firms had experienced default of deferred payment. (2) This incident sparked the start of reconstruction of distribution channels to cope with the default risk. Several interviewees evaluated that the formulation of good strategy was more effective than the legal institutions mentioned above to deal with default risk of deferred payment. What was interesting is that (3) most of the home appliance manufacturers interviewed formed an

[3]A bank guaranteed commercial bill has been the main mode in China since 1985. In November 2006, pure commercial bill was introduced for the first time, but its size is still limited compared to a bank guaranteed commercial bill: the pure commercial bill issued 2.02 and 2.216 billion sheets, 457.8 and 593.533 billion RMB in 2006 and 2010, whereas the bank guaranteed commercial bill issued 56.813 and 91.453 billion sheets, $5,050.246$ and $10,251.890$ billion RMB at the end of 2006 and 2010 respectively. The issuance is strictly controlled.

independent mechanism, and then the risk became manageable. One interviewee provided the following evidence;

> Default of deferred payment was serious in 1996 when we started business, but it was under control by 1999. This is not a problem of "institution" but a problem of "management". The most important is whether you effectively rate the creditworthiness of a customer to whom make trade credit; "are they credible," "whether market risk is controllable?" Since I joining this company in 1996, I myself have never experienced the default because I undertook painstaking risk management even though our department had been seriously damaged by deferred payment.

Adoption of a firm's strategy against default risk, such as reconstruction of the sales mechanism and retail strategies, made the default risk of deferred payment manageable. The launch of new institutional support such as a bank guaranteed commercial bill occurred until around the early 2000s.

3 The Four Mechanisms

So, what did they do? My field work identified four sales-management mechanisms: (1)spot transaction with wholesalers, (2)internalization of wholesaling function, and two types of contract; (3) a rebate in proportion to the retail price with major chain stores, (4) a rebate on volume with prepayment to an exclusive wholesaler agent.

3.1 Basic setting

In order to compare the characteristics of the four mechanisms, we set up the following generic model: We consider a transaction between manufacturer M and merchant (he can be a retailer or wholesaler) S in the environment where merchant M can strategically commit a default deferred payment. At time 0, M produces a goods X that incurs cost c, sells amount d at price p toward S. At time 1, merchant S sells product X of amount d at price v to a consumer, then S can commit default though he is expected to make the remaining payment. Merchant S is faced with a normal demand d, which will decrease when price v increases. For this demand d, merchant S and manufacturer M have expectation $E(d) = \theta$ - $v = dk$, where d is a realized sale, and k $(0 \leq k \leq 1)$ is an error between the

expected and realized volume, and θ is the consumer's highest valuation of this product X. We again assume that both wholesaler S and manufacturer M engage in Bertrand pricing competition.

3.2 How strategic default takes place?

When strategic default by a buyer is feasible, expected profit for M and S is as follows: For wholesaler S, both payment and default are options. If he makes payment, he may reduce profit at this stage, but gain the opportunity to continue repeated transaction with M. Let subjective discount rate of S to be $\delta(0 \leq \delta \leq 1)$ and the assumed transaction will repeat endlessly, his expected profit is,

$$\frac{(v-p)dk}{(1-\delta)} = \frac{(v-p)(\theta-v)}{(1-\delta)}.$$

If he chooses to default α of the entire, and is refused from continuing, his expected profit becomes,

$$(v-\alpha p)dk = (v-\alpha p)(\theta-v)$$

If he defaults on the remaining payment, his profit increases by the amount he default. Here, if S can choose α so as to keep $\delta = \frac{(1-\alpha)p}{v-\alpha p}$, payment and default become indifferent to him. Hence, we assume here that wholesaler S will commit default probabilistically. Wholesaler S will default on the remaining α portion of payment with probability t, and will repay full payment with probability $1-t$. Here we call $T \equiv t\alpha + (1-t)$ as payment probability of the buyer or recollection probability of the seller. This uncertainty of payment is exactly the agency cost when principal-manufacturer M relies on agent-wholesaler S's marketing function. In order to see the impact of this agency cost clearly, we assume that the consumer and the retailer will not commit default, and further assume that wholesaler S knows that manufacturer M assume the above expectation. This basic setting is common to all four strategies except the condition of payment specified by each mechanism.

3.3 Selection of mechanisms and competition

In this section, we first consider the type of outcome that appeared if merchant-manufacturer pair engaged in a Bertrand price competition on product retail price v within the same mechanism respectively. By doing this, we can figure out the level of total marginal cost

of each mechanism, because Bertrand pricing competition with the same marginal cost leads market price to a level equal to marginal cost. Threfore, we will consider what will happen if all the four mechanisms compete each other in a Bertrand way. The four mechanisms below are not operating independently in a market, but competing with each other. Here, we first assume that an individual firm chooses a different strategy because their object of optimization is different from others due to reasons unknown to the researcher. Because of this, we could observed heterogenous four mechanisms above appeared in home electronics appliance markets of China in the 2000s, in spite of the fact that some of the four mechanisms is absolutely superior to others as we will see later. Second assumption is that each manufacturer-merchant pairs learn whether or not their mechanism is efficient via competition in the market, then imitates the more efficient mechanism.

3.4 Mechanism 1: Spot transaction with wholesaler

The first type of sales management mechanism is a spot transaction with wholesalers. This is a prototype of the transaction between a manufacturer and merchant of the transition era. Spot transaction proceeds as follows: At time 0, manufacturer M produces goods X, and sells amount d at price p to wholesaler S. Here, wholesaler M defers payment pd. At time 1, wholesaler S sells goods X of amount d at price v to consumers via retailer, who is assumed to simply just transfer goods from the wholesaler to the consumer, and then he is expected to make payment pd but can default on it because there is no mechanism to force him to pay.

Here, expected profit of wholesaler S becomes,

$$\begin{aligned} \Pi_S &= (1-t)(v-p)(\theta-v) + t(v-\alpha p)(\theta-v) \\ &= (v-pT)(\theta-v) \end{aligned} \tag{1}$$

where $T \equiv t\alpha + (1-t)$ is the expected probability of being repaid for manufacturer M. The expected profit of manufacturer M is,

$$\begin{aligned} \Pi_M &= (1-t)(p-c)(\theta-v) + t(\alpha p - c)(\theta-v)) \\ &= (pT-c)(\theta-v). \end{aligned} \tag{2}$$

Prices v and p were set via Bertrant pricing competition. If wholesalers let several

manufactures compete with each other,

$$\begin{aligned} v &= pT \\ p &= \frac{c}{T}. \end{aligned}$$

At equilibrium, sales amount d and profits of M and S are as follows,

Table 1: Spot transaction with wholesaler

v	p	d	Π_M	Π_S
c	$\frac{c}{T}$	$\frac{\theta-c}{k}$	$\frac{c(1-\frac{1}{T})(\theta-c)}{k} < 0$	0

Source: Author.

Here we can see that the profit of manufacturer M is negative (because $c < \frac{c}{T}$ as T<1) if it is faced with competition among brand, and M's profit is an increasing function of probability to be repaid T and deferred payment ratio α. If manufacturer M tries to negotiate with to wholesaler S to make repayment with 100% probability in exchange for any incentives, the manufacturer cannot afford to give this incentives, because he himself is already in deficit. This implies manufacturers must exit from this market only if they cannot change their transaction mechanism.

3.5 Mechanism 2: Integration of wholesaling function

The second type of sales mechanisms attempted by Chinese home appliance firms was the integration of wholesale function with manufacturers. This is attempted by TCL, one of the largest color TV manufacturers. TCL, who experienced serious default of deferred payment by wholesales in the 1990s, integrated the wholesale function at the provincial level into their company. They set up a marketing company in each province that is in charge of the distribution of goods and collection of payment, whereas price and quantity was uniformly set by their national headquarter. Compared to a wholesaler, a retailer is more cash rich because consumers usually buy products with cash. Direct transaction with a retailer is expected to reduce the default risk of deferred payment. Integration of the wholesale function

produced about changes on several levels: first, the agency problem of strategic default by wholesalers disappeared. At the same time, they had to incur fixed cost F, for example, hiring several people to operate provincial marketing companies, building warehouses and other fixed costs. Here, we assume that the retailer will buy products with cash, so no deferred payment happens. They are only faced with the risk that the consumer will not buy. This probability is $1-k$. Here, the problem of manufacturer M is,

$$\begin{aligned} Max_v\ \Pi_S + \Pi_M &= (v-c)dk - F \\ &= (v-c)(\theta - v) - F. \end{aligned}$$

Though integration mitigate the default of deferred payment, if brand competition is keen, the price is lowered to equal the marginal cost, and cannot afford fixed cost. This mechanism is not viable for the long term. If manufacturer has some bargaining power to raise prices, there is a possibility that this mechanism will continue.

Table 2: Integration of wholesale function

v	d	$\Pi_M + \Pi_S$
$c + \frac{F}{d}$	$\theta - c - \frac{F}{d}$	0

Source: Author.

3.6 Mechanism 3: A rebate contract on retail price

In China, one type of distributor called "Chain Store" became dominant in the home appliance industry's distribution in the early 2000s. A "Chain Store" is usually a large retailer that has large numbers of store outlets in a relatively large geographical area, and at the same time has a function as wholesaler. A chain store offers spot transaction, which was already discussed in section 3.1, but also offers a contract to pay a rebate on retail prices to manufacturers. The retailer requires manufacturers to make a fixed payment D at the

beginning of the transaction as prepayment, then profit is shared based on turnover. Profit of retailers consists of two parts: the first item is dvm where d is the amount sold, v is the retail price, m is the margin to retailers, and prepayment D. Here, the retailer, who has strong bargaining power, will solve following problem:

$$\begin{aligned} \text{Max}_{D,m,v} &= Tdvm + D \\ \text{subject to} : \Pi_M &= dv - Tdvm - D - dc \geq 0 : \text{Participation constraint of M} \\ dk &= \theta - v : \text{Demand curve} \\ D &\leq W : \text{Cash constraint of M} \end{aligned}$$

where, T is the recollection ratio of manufacturer M, W is cash constraint of retailer.

Table 3: A rebate on retail price to chain store

v	p	d	m	Π_M	Π_S
$\frac{\theta}{2}$	$c + \frac{2W}{\theta}$	$\frac{\theta}{2}$	$\frac{1}{T}(1\text{-}\frac{2c}{\theta}\text{-}\frac{4W}{\theta^2})$	$\frac{\theta}{2}(\frac{\theta}{2} - c)$	0

Source: Author.

At equilibrium of this mechanism, a retailer sets the price just by evaluating the demand nature regardless of cost and procurement price level, and monopolizes the entire profit from this transaction. At the same time, the retail price is high and the sales amount becomes small. There is no explicit mechanism to prevent strategic default by the buyer, but because strategic default is irrelevant to the profit of retailer M, retailer has no incentive to default.

3.7 Mechanism 4: A rebate contract on volume with down payment to exclusive agent wholesaler

The last mechanism is a packaged-contract that consists of a rebate on volume and prepayment with exclusive to agent wholesaler. This mechanism was first introduced by GREE, one of the largest air-conditioner manufacturers in China, in the late 1990s after which other brand-manufacturers have followed suit and started to imitate since the middle of the 2000s. A contract mechanism between a manufacturer and wholesaler offers detailed

conditions: (1) manufacturers exclusively transact with selected agent-wholesalers and offer a mechanism. (2) The mechanism (d, Z, m) offered consists of down-payment Z, rebate according to volume d, and margin m given to wholesalers. (3) Manufacturer M requests down-payment Z in exchange for higher margin md with larger sales amount d. With regard to margin m, in order to raise recollection of deferred payment of wholesaler S, M provides the following incentives: if S accomplishes a higher recollection rate of payment than the reference level, give higher margin m_1; if the realized recollection rate is lower than the reference level, give lower margin m_0. Here, we assume that m_1 is the maximum of profit in hand of M, while $m_0 = 0$ for simplicity. Wholesaler S will decide the amount of transaction d taking into consideration of his own cash constraint and demand nature. The probability of being purchased by a consumer is assumed to be k. Here, wholesaler S gives trade credit to manufacturer M by $md^2 = md * d$. This is a very important feature of this mechanism. Because of this provision, this mechanism succeeds in mitigating the default risk of deferred payment by transforming wholesaler S from a receiver of trade credit to supplier. Here, wholesaler S will solves the following problems,

$$\begin{aligned} \text{Max}_{dk,Z}\ \Pi_S &= kd(v-p) \\ \text{subject to} & \\ p &= Z - md : \text{Rebate function} \\ Z &\geq A : \text{Cash constraint of S} \\ \Pi_M &= dk(p-c) \geq 0 : \text{Participation constraint of M} \\ dk &= \theta - v : \text{Demand curve} \\ m &= (m_0, m_1) = (0, m_{max}) : \text{margin} \end{aligned} \tag{3}$$

(4)

The equilibrium of this problem is solved as follows: At time 0, manufacturer M offers a mechanism with deposit Z and margin menu $m = (m_0, m_1)$. Wholesaler S will choose purchase amount dk so as to maximize his profit under the relevant constraints. At time 1, wholesaler S undertakes good management so as to be charged a better margin m_1 by manufacturer M, and will be able to obtain a higher recollection rate than the reference level with probability $s(0 \geq s \geq 1)$. Solving this problem backwardly, we obtain the following

outcome. Wholesaler S will set purchase amount $dk^* = \frac{\theta - Z}{2(1-m/k)}$, which maximizes Π_S. Expected margin level $m_e = sm_1 + (1-s)m_0 = sm_{max} + (1-s)0 = sm_{max}$. From the participation constraint of M, $m \geq (Z-c)/d$ holds, $m_{max} = (Z-c)/d$. Inserting this m into the dk^* function, we can derive $d^* = \frac{\theta + Z - 2c}{2k}$ and $m_1^* = \frac{2k(Z-c)}{\theta + Z - 2c}$. The level of down-payment Z is set by manufacturer M in real practice. Profit of $M = \frac{\theta - Z - 2c}{2k}(Z-c)(1-s)$ is an increasing function of Z (if $\frac{3c-\theta}{2} \geq Z$). Hence, M requires S to pay Z at maximum ($Z = Z_{max} = A$). At equilibrium, manufacturer M sets wholesale prices p at the lowest level regardless of the degree of competition intensity. In this mechanism, M allows S to commit to a larger transaction by relinquishing all rent from this transaction to S. For M, with the larger cash in hand of S, M can enjoy lower retail price v and larger sales d.

Table 4: Rebate on volume with exclusive agent

v	p	d	m	Π_M	Π_S
$\frac{\theta - A + 2c}{2}$	c	$\frac{\theta + A - 2c}{2k}$	$\frac{2k(A-c)}{\theta + A - 2c}$	0	$\frac{\theta + A - 2c}{2k}\frac{\theta - A - 2c}{2}$

Source: Author.

3.8 Outcome of competition among four strategies

The four mechanisms mentioned previously are not operating independently in a market, but competing with each other. Here, we consider the type of outcome that appears after the competition among the four mechanisms. First, we consider that an individual firm chooses a different strategy because their object of optimization differs from one firm to another due to reasons unknown to the researcher. As a result, in spite of the fact that some of the mechanisms is absolutely superior to others, we observed that the four heterogenous mechanisms above appeared in the home electronics appliance markets of China in the 2000s. Here, we also show that a contract designed against default risk of deferred payment is the most efficient in terms of social welfare maximization.

In order to perform this analysis, we consider here that the retail price level as the "total marginal cost" of each mechanisms that involves all variable costs including incentives to

Table 5: Competing mechanisms

	$v = TMC$	d	Π_M
Mechanism 1: Spot	c	$\frac{\theta-c}{2k}$	$(c-\frac{c}{T})\frac{\theta-c}{2k} < 0$
Mechanism 2: Integration	$c+\frac{F}{d}$	$\theta-c-\frac{F}{d}$	0
Mechanism 3: Rebate on retail price	$\frac{\theta}{2}$	$\frac{\theta}{2}$	0
Mechanism 4: Rebate on volume with down-payment	$\frac{\theta-A+2c}{2}$	$\frac{\theta+A-2c}{2k}$	0

Source: Author.
Note: TMC = total marginal cost.

retailers or wholesalers, that manufacturers should incur, where cost c in our generic model represents only pure production variable cost. Then, we consider what will happen if the four mechanisms with different marginal cost engaged in Bertrand price competition with each other. If cash in hand of wholesaler S is sufficiently large ($A \geq 2c$), and the total marginal cost of "Rebate on volume with down-payment" is the lowest, "Rebate on retail price" follows. Total marginal cost of"Spot" and "Integration" is always higher than the two mechanisms above as long as production marginal cost c is positive.

Next, let us consider the pricing strategies of a user of the "Rebate on retail price" mechanism. His total marginal cost is the second lowest among the four mechanisms. This firm can set a price that is lower than $\frac{\theta+c}{2}$, the total cost of "Spot" and "Integration", so as to force the latter two types to exit from the market. But it cannot set a price lower than its own total cost $\frac{\theta}{2}$. Hence, the best response price level for the "Rebate on retail price" mechanism is $\frac{\theta}{2}$. Here, "Spot" and "Integration" mechanisms were driven out of the market. A firm that uses the the "Rebate on volume with down-payment" mechanism, and whose total marginal cost is the lowest among the four mechanisms will also set the same level of price as the user of the "Rebate on retail price" mechanism taker. This is because of the following logic: if it sets its price at $\frac{\theta-A+2c}{2}$, its own total marginal cost level, it can monopolize market demand, but its profit is zero. If it sets its price at a level slightly

lower than the total marginal cost of his competitor, for example, the user of "Rebate on retail price," $\frac{\theta}{2} - \epsilon$, it can monopolize demand and gain non-zero positive profit. The forth mechanism's profit is maximized if it sets price $\frac{\theta}{2} - \epsilon$ and minimizes ϵ to the minimal limit. Here, the market equilibrium appears as follows: price in a market is $v_c = \frac{\theta}{2}$, and two mechanisms "Rebate on retail price" and "Rebate on volume with down-payment" can survive in this market, but their profit levels are different: "Rebate on retail price" must operate with zero profit, whereas "Retail on volume with down-payment" can gain rent of $\frac{A-2c}{2}$ per unit.

If cash held by wholesaler S who is using the "Retail on volume with down-payment" is not sufficient enough and $A \leq 2c$ holds, the market equilibrium price remains unchanged, $v_c = \frac{\theta}{2}$, though both mechanisms earn zero profit. If firms who use "Rebate on retail price" relinquish their mechanism and succeed in transferring to "Rebate on volume with down-payment," when the mechanism in a market converges into the latter, the market equilibrium function also changed into $v_c = \frac{\theta - A + 2c}{2}$. If cash of wholesaler S in this mechanism is sufficient enough, market equilibrium price is lowered to be $v_c = c$, where retail price is the lowest and sales unit is the largest, which produces the largest consumer welfare. This implies that social optimum can be realized by the "Rebate on volume with down-payment" mechanism. This mechanism can realize the same situation as the perfect market condition are supposed to do according to the textbooks of microeconomics.

Market equilibrium analysis above can be summarized as follows: among the four mechanisms which were observed in the field work, total marginal cost of "Spot" and "Integration" are absolutely higher than the two contract mechanisms "Rebate on retail price" and "Rebate on volume with down-payment" in the presence of risk of strategic default of deferred payment; hence, the former two mechanisms are supposed to be driven out of the market. Market equilibrium price depends on the sign of $A - 2c$: if $A - 2c$ is negative, market price is set equal to total marginal cost of $v_c = \frac{\theta}{2}$, if $A - 2c$ is positive, market price is set as $v_c = \frac{\theta - A + 2c}{2}$. In the former case, equilibrium price and volumes is inferior to the perfect market condition. But for the latter case, equilibrium price and volume are equivalent to perfect competitive market situation, which is most efficient because it can maximize the sum of consumer welfare and a firm's profit if A is sufficiently high, say, $A \geq \theta$ holds.

Proposition : Under an environment where strategic default is feasible, "Spot" and "Integration " mechanisms are inferior to the "Rebate on retail pricing" or "Rebate on volume with down-payment" mechanisms in terms of social welfare maximization. "Rebate on volume with down-payment" is socially optimal because it can lower the retail price as low as $v_c = c$ if $A \geq \theta$ holds. "Rebate on retail pricing " is second to "Rebate on volume with down-payment" because it cannot lower the retail price below $\frac{\theta}{2}$.

4 Empirical Studies

4.1 Empirical Strategy

Empirical studies are presented here to investigate whether the proposition holds with actual data. In order to accomplish this target, I will implement the following strategy: First, I will show convergence of mechanism appears in the market. Above proposition claims a "superior order" among the four mechanisms. However, as an individual firms have their own management target due to reasons unknown to the researcher, thus they employ heterogenous mechanisms. Here, it is reasonable to hypothesize that the mechanism employed by each firm will be converged to the most efficient mechanisms following informational diffusion. Hence, the first empirical target is to show the type of mechanism that was used by each brand firm from the fieldwork and published data. Next, in order to test this hypothesis, I will first infer substitution patterns among brands from market outcome data, such as price, market share and other market outcome data. Then, I will test whether pricing strategies are functions of types of mechanisms regarding sales and distribution. By conducting this structural approach, we can separate the impact of demand side and supply side on pricing, and evaluate correctly the impact of strategy at supply side. [4]

4.2 Convergence to a mechanism

First, I showed the development of sales mechanisms that are actually used by home electronics appliance firms of China in the 2000s. This information was collected by my inter-

[4]Rigorously speaking, direct empirical testing on the pricing functions induced above is ideal. However, there is no detailed data on wholesalers/retailers' cash position, or other information of the transaction. Hence, we adopt a strategy to evaluate whether the revealed market outcome fits with the theoretical prediction of the analysis above.

views and press releases or other literatures. Hence, heterogenous mechanisms coexit, and at the same time, convergence of the mechanisms takes place. Table 6 is a summary of the development of sales mechanisms of air conditioner and color TV manufacturers' in China from 2000 to 2007, the coverage period of market data. The sales mechanism prototype was the spot transaction in the 1990s, but as already seen, firms attempted several mechanisms: integration of wholesale function, transaction with monopolistic chain stores, and establishing contract mechanisms with exclusive agents. In the early 2000s, chain stores became a dominant sales channel for most home electronics appliances brands, and a joint possession of the distribution channel were also attempted very recently.

Table 6: Convergence of the Mechanisms

	2000	2001	2002	2003	2004	2005	2006	2007	2007 market share (Rank)
Air-conditioner									
Gree	EA	EA	EA	EA	EA	EA	EA	EA	17.2 (1)
Midea	CS	CS	CS	CS	CS	CS	EA	EA	16.1 (2)
Haier	CS	CS	CS	CS	CS	CS	EA/CS	EA/CS	14.2 (3)
Panasonic	CS	CS	CS	CS	CS	CS	CS	CS	6.5 (4)
Aux	-	-	-	-	-	-	-	-	5.9 (5)
Hisense	CS	CS	CS	CS	CS	CS	EA/CS	EA/CS	4.64 (6)
Chigo	-	-	-	-	-	-	EA/CS	EA/CS	4.3(7)
Kelon	CS	CS	CS	CS	CS	CS	EA/CS	EA/CS	3.7 (8)
Chunlan	-	-	-	-	-	-	-	-	2.9 (9)
Samsung	-	-	-	-	-	-	-	-	1.8 (10)
Changhong	CS	CS	CS	CS	CS	CS	CS	CS/IN	1.34 (11)
TCL	IN	IN	IN	IN	CS	CS	CS/EA	CS/JC	0.47 (-)
Daikin	EA	EA	EA	EA	EA	EA	EA	EA	0.79 (-)
Color-TV									
Konka	CS	CS	CS	CS	CS	CS	CS	CS	13.8 (1)
Changhong	CS	CS	CS	CS	CS	CS	CS	CS/IN	12.7 (2)
Skyworth	CS	CS	CS	CS	CS	CS	CS	CS	11.9(3)
Hisense	CS	CS	CS	CS	CS	CS	EA/CS	EA/CS	10.4 (4)
TCL	IN	IN	IN	IN	CS	CS	CS/EA	CS/JC	8.83 (5)
Haier	CS	CS	CS	CS	CS	CS	EA/CS	EA/CS	4.6 (6)
Samsung	CS	CS	CS	CS	CS	CS	CS	CS	4.55 (7)
Sony	CS	CS	CS	CS	CS	CS	CS	CS	1.2 (-)
Panasonic	CS	CS	CS	CS	CS	CS	CS	CS	0.13 (-)

Data Source: GfK Research China.

Selective Sources of Information on Sales Mechanisms of each brand:

Gree Dong Minzhu (CEO of the company), *A Journey without Regret*, Zhuhai Publishing Company,2006 (In Chinese).

Haier http://homea.people.com.cn/GB/41392/6591831.html.(Accessed 15 Sept, 2011)

Hisense, Kelon http://news.chinaluxus.com/Bsn/20110608/31996.html.(Accessed 13 Sept, 2011)

Midea http://hea.yidaba.com/heahot/900478.shtml (Accessed 1 Sept, 2011)

Chigo http://news.chinaluxus.com/Bsn/20110608/31996.html (Accessed 13 Sept, 2011)

TCL http://www.globrand.com/2009/166255.shtml (Accessed 15 Sept, 2011)

Changhong http://tech.sina.com.cn/e/2007-08-30/01571707043.shtml.(Accessed 13 Sept, 2011)

Konka http://homea.people.com.cn/GB/5321772.html (Accessed 15 Sept, 2011)

Skyworth http://www.skyworth.com/cn/news-detail-1333.html (Accessed 15 Sept, 2011)

Daikin TAKAHASHI Motohito, *Sell Air-Conditioner to the Chinese* ,Soshisha Publishing Company, 2005 (In Japanese)

Panasonic, Sony Author's interview.

general Author's interview and Watanabe(forthcoming)

Note: EA: Exclusive Agent (Rebate on volume with down-payment). CS: Chain Store (Rebate on retail price and Spot). IN:Integration of wholesales function. JC:Joint channel. −: unknown

5 Pricing by the Mechanisms

The next empirical test is whether the convergence to "Rebate on volume with down-payment" mechanisms is related to pricing and the cost of a firm. If so, it implies the convergence of mechanisms were driven by the competition. To evaluate actual pricing strategies of the firms I studied, I first estimate the demand system to obtain substitutability between brands, then utilize the estimates to correctly identify the supply strategies.

5.1 Data

To estimate substitutability among brands, I utilize data on air-conditioner and color TV markets of China. Data I utilized here is audited by GfK marketing in China. CTV data contains yearly sales values and numbers of unit sold by TV types(CRT/LCD/PDP), screen size (21 inch, 22-32 inch and over 32 inch) and air-conditioner types contains sales values and numbers of unit sold by horsepower (below 1HP, 1HP to 2HP, over 2HP) for 21 cities[5] for year 200-2002, and 30 cities[6] for the year 2003 to 2007. Demographic data such as the average wage and distribution of wage at each market are obtained from public data from the China State Statistical Bureau: China City Statistical Yearbook for 2002 to 2008 for average wage and income; and China Price and Urban Household Expenditure Yearbook 2000 to 2005; and China Urban Life and Price yearbook for 2006 to 2007 for distributions of income and expenditure data.

5.2 Estimation model

Here, consumer demand is modeled using a discrete-choice formulation first. On the supply side, we model competition between several brands in different geographical markets at different timings.

5.2.1 Demand

Consumers select a brand in a given market (=city, here) to maximize their utility. I view a product as a particular brand sold at each city $m = 1, 2, ...M$.(I delete m hereafter simply

[5]Shanghai, Beijing, Nanjing, Guangzhou, Harbin, Chongqing, Xian, Chengdu, Shenyang, Tianjin, Wuhan, Hangzhou, Wuxi, Kunming, Qingdao, Changsha, Shenzhen, Nanning, Dalian, Fuzhou, Xiamen

[6]In addition to the aforementioned 21 cities, Dongguan, Hefei, Jinan, Nanchang, Ningbo, Shijiazhuang, Suzhou, Taiyuan, Zhengzhou

for the reader's convenience). The indirect utility U_{ijt} of consumer i from purchasing brand $j = 1, 2, ...J$ at time $t = 1, 2, ...T$ is,

$$u_{ijt} = -\alpha p_{jt} + \beta X_{jt} + \xi_{jt} + \epsilon_{ijt}. \tag{5}$$

p_{jt} denotes price of brand j at market m in time t. Other factors affect product choice, such as features of product x_{jt}. Following Berry (1994) or Nevo (2000), we can rewrite the utility of consumer i for brand j as follows:

$$\begin{aligned} u_{ijt} &= -\alpha_i y_i + \delta_{jt} + \mu_{ijt} + \epsilon_{ijt} \\ \text{where, } \delta_{jt} &= x_{jt}\beta - \alpha p_{jt} + \xi_{jt}, \\ \mu_{ijt} &= \beta_{ib} B_{jt} + \alpha_i p_{jt}, \end{aligned} \tag{6}$$

where the random coefficients are $\beta_{iB} = \sigma_B \nu_i$ with ν_i $N(0, 1)$; and $\alpha_i = \alpha + \sigma_I I_i$ with I_i the observed income. We can rewrite the model as,

$$u_{ijt} = \delta_{jt} + \sigma_B \nu_i B_{jt} + \sigma_I I_i p_{it} + \epsilon_{ijt}. \tag{7}$$

5.2.2 Supply

Next, suppliers are supposed to maximize their profit at time t. Suppose there are B firms, each of which produces some subset, of $\mathcal{J}_b$ the $j = 1, ..., J$. The profits of firm b are

$$\Pi_b = \Sigma_{j \in \mathcal{J}} (p_j - mc_j) M s_j(p_j) - C_f$$

where $s_j(p)$ is the share of product j , which is a function of the prices of all the products, M is the size of the market, and C_f is the fixed cost of production. Assuming the existence of a pure-strategy Bertrand-Nash equilibrium in prices, and that the prices that support it are strictly positive, the price p_j of any product j produced by firm b must satisfy the first-order condition:

$$s_j(p) + \Sigma_{j \in \mathcal{J}} (p_j - mc_j) \frac{\partial s_j(p)}{\partial p_j} = 0. \tag{8}$$

This set of J equations implies price-costs margins for each goods. The markups can be solved for explicitly by defining $S_{jk} = -\partial s_j / \partial p_k$ for $j, k = 1, ...J$ and,

$$\Omega^*_{jk} = \begin{cases} 1, & \text{if } any\ j, k \subset \mathcal{J}_f \\ 0, & \text{otherwise,} \end{cases} \tag{9}$$

and Ω is a JxJ matrix with $\Omega_{jk} = \Omega^*_{jk} * S_{jk}$. Then, first order conditions in the vector term become

$$s(\mathbf{p}) - \Omega(\mathbf{p} - \mathbf{mc}) = 0,$$

where $s(), p$ and mc are $Jx1$ vectors of market shares, prices, and marginal cost, respectively. This implies the markup equation,

$$\mathbf{p} - \mathbf{mc} = \mathbf{\Omega^{-1}} \mathbf{s}(\mathbf{p}).$$

5.2.3 Demand substitution pattern

Using estimates of the demand elasticities, we can estimate the price cost margin (PCM) without observing actual cost.

Here, we can compare the elasticities from pure logit demand estimates and random coefficient logit demand coefficients.

Own and cross price elasticity of the market share induced from choice function (8) are

$$\eta_{jkt} = \frac{\partial s_{jt} p_{kt}}{\partial p_{kt} s_{jt}} = \begin{cases} -\alpha p_{jt}(1 - s_{jt}) & \text{if j=k,} \\ \alpha p_{kt} s_{kt} & \text{otherwise.} \end{cases} \tag{10}$$

when market share is defined by logit form:

$$s_{jt} = \frac{exp(\delta_{jt} + \sigma_B \nu_i B_{jt} + \sigma_I I_i p_{it})}{1 + \Sigma_{k=1}^{J} exp(\delta_{jt} + \sigma_B \nu_i B_{jt} + \sigma_I I_i p_{it})}^{7}. \tag{11}$$

[7]Here, instead of complete structural form claimed by Berry (1995), Nevo (2000) or Rasmusen (2007), we use a reduced form that allows the linear addition of interaction terms with products characteristics and demographic data, here, the average wage of each market. This approach provides a degree of flexibility compared to simply defining market share s_{jt} as $\delta_{jt} + \epsilon_{jt}$, but it is inconsistent with the theoretical model; it violates the rule that the sum of predicted market shares of the differentiated products should not add up to more than one. See Rasmusen (2007). If you follow the complete structural approach of BLP, the price elasticities changes into the following nonlinear format. Distributions of demographics D and unobservable disturbances ν are denoted by $P^*_D(D)$ and $P^*_\nu(\nu)$. The overall market share of product j in time t is found

5.3 Estimation of demand system

We first estimate demand and then supply. In the case of logit demand, the utility u_{ijt} is given by $ln(s_{jt}) - ln(s_{0t})$. Here, we assume that the outside option is "NOT buy any brand", hence, s_{0t} is assumed to be zero. Our estimation equation is,

$$ln(s_{jt}) - ln(s_{0t}) = \delta_{jt} + \sigma_B I_i B_{jt} + \sigma_I I_i p_{it} + yeardummy + firmdummy + \xi_{jt}{}^{8}. \quad (12)$$

Following the argument of the identification of oligopoly models, I claim that the parameters of the demand system can be identified. Identification of price parameters, which is critical for our margin calculation, relies on the fact the unobserved determinants of demand are uncorrelated with input prices. To account for the potential endogeneity of prices because of the presence of the changes in unobserved attributes, and because we added interaction terms of the average wage of each market and product characteristics, we use the GMM estimator with prices of the same brand of other markets as instrument variables. This instrument strategy adheres to the so-called Hausuman-instruments approach (Hausman, 1997). The Hausman instruments approach relies on the assumption that prices in two different markets be correlated via common cost shocks and not via common demand side shocks such as nationwide demand shock. If a situation such as particular two markets' demand shrink a certain common shock occurring when shrinkage in demand tales place between two particular markets, the instruments are invalid. However, in our estimation case, this IV works effectively[9].

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by integrating the market shares selected by each consumer's equation across the individual types:

$$\eta_{jkt} = \frac{\partial s_{jt} p_{kt}}{\partial p_{kt} s_{jt}} = \begin{cases} -\frac{p_{jt}}{s_{jt}} \int \alpha p_{jt}(1 - s_{jt}) d\hat{P}^*_D(D) dP^*_\nu(\nu) & \text{if j=k,} \\ \frac{p_{kt}}{s_{jt}} \int \alpha p_{kt} s_{kt} d\hat{P}^*_D(D) dP^*_\nu(\nu) & \text{otherwise.} \end{cases}$$

when market share is defined by logit form:

$$\begin{aligned} s_{jt} &= \int_\nu \int_D s_{ijt} d\hat{P}^*_D(D) dP^*_\nu(\nu) \\ &= \int_\nu \int_D [\frac{exp(\delta_{jt} + \sigma_B \nu_i B_{jt} + \sigma_I I_i p_{it})}{1 + \Sigma_{k=1}^J exp(\delta_{jt} + \sigma_B \nu_i B_{jt} + \sigma_I I_i p_{it})}] d\hat{P}^*_D(D) dP^*_\nu(\nu). \end{aligned}$$

[8]Here, unobserbed feature ν_i is replaced with observed income I_i for simplicity of estimation.

[9]Demand estimates results in Tables 8, 7 show that the IV were confirmed as exogenous to our demand systems.

5.4 Supply function

Once demand is identified, I turn to the supply side with substitution patterns from the demand estimates. By estimating supply function, I verify whether or not and how much cost factor really matters in pricing strategy.Our estimation equation on the supply side is,

$$p_{jt} = \lambda m_{jt} + z_{jt}\theta + \xi_b + \eta. \tag{13}$$

where, m is the price-cost margin for the entire process and z is the cost factor [10]. We regarded competing sales mechanisms in our model analysis as the cost factor for each firm. If θ of any mechanism is statistically significant, the mechanism is a determinants of the market equilibrium price. If λ is statistically significant, we can regard that market is as oligopolistic [11]. Because margin m is determined by the consumer, and cost factor z is determined within each firm, it is reasonable to assume that η is not correlated to margin m and cost factor z if the time invariant factor within each firm is eliminated. Hence, we estimates the function by the fixed effect OLS estimator.

6 Estimation results

6.1 Demand estimates

Demand model estimates for the air-conditioner market and color TV markets are presented in Tables 7 and Table 8. On average, prices have a significant and negative impact on utility. Own price elasticities ranges for air conditioners range between -18.9 to -.73 and -3.66 on average. The color TV market's own price elasticities rages between -281.5 to -1.03, and -13.9 on average [12]. Regarding product characteristics, capacity size (horsepower category) is not significant for air-conditioners, but display type and screen size of TVs are significant. Interacted terms of product characteristics and wage are significant and positive for both markets. Brand effects are significant for both markets as well.

[10] This estimation model follows Vilass-Boas(2007).

[11] If λ is statistically insignificant, the market can be regarded as perfectly competitive.

[12] These figures are much more greater in absolute size compared to the results of aforementioned literatures; for example, cereal market (Nevo, 2000) or coffee market(Draganska, Klapper and Villas-Boas, 2010). This may reveal a difference in the nature of products: i.e., a home electronics appliance is a luxury goods, whereas cereal or coffee is a commodity. While nature of the market might be different, the previous empirical studies examined data from developed economies like German and US, but this data is from China, a developing and transitional economy.

Table 7: Demand Estimates: Air-conditioner

	Logit demand estimates	
Parameter	Estimate	Std.Err.
Product characteristics		
Price	-.00097	(.00013)***
HP 2-	.000	
HP1 to 2	.2825	(.541)
Interacted terms with demographics		
ln(wage)x price	.00009	(.00001)***
ln(wage) x HP2-	-.142	(.011)***
ln(wage) x HP1-2	-.002	(.057)***
Brand effect: Gree as reference		
Haier	.5274	(.0473)***
Hisense	-.6343	(.0568)***
Midea	.0652	(.0474)
Changhong	-1.123	(.0652)***
Daikin	-.8155	(.2547)***
Panasonic	-.7500	(.0707)***
No. of obs.	6854	
R-square	0.5856	
GMM-C statistics	-0.0199(1)	

*Note** p<0.1; ** p<0.05; *** p<0.01
Source Author's calculation.

6.1.1 Supply estimates

Supply function estimates revealed which mechanism dominates market equilibrium price and supply behavior. Because information on which firm uses which mechanism is not clear for all brands on the market data, estimation was performed for the limited data set, as presented in Table 9. The brand contained within the limited data is presented below the estimation results. The results show that mechanism 4 (Rebate on volume with down-payment to exclusive agent) is a cost factor for the air-conditioner market. This is consistent with the prediction of the theoretical model in Section 3. This result is consistent with our model analysis: In the presence of default of deferred payment, the sales mechanism that

Table 8: Demand Estimates: Color TV

	Logit demand estimates	
Parameter	Estimate	Std.Err.
Product characteristics		
Price	-.0018	(.000)**
LCD	-1.969	(.103)***
PDP	-2.200	(.122)***
Size -32	8.173	(3.521)**
Size 32 and larger	11.408	(9.269)
Interacted terms with demographics		
ln(wage) x price	.0001	(0.000)**
ln(wage) x Size -32	-.753	(3.556)**
ln(wage) x Size 32	-1.178	(1.26)
Brand effect: Changhong is reference		
TCL	-.172	(.0575)***
Haier	-.555	(.0586)***
Hisense	-.0956	(.0578)*
Konka	-.0985	(.0590)*
Skyworth	-.2625	(.0587)***
Sony	-1.441	(.0137)***
Panasonic	-.9788	(.1177)***
Samsung	-1.550	(.1892)***
No. of obs.	12664	
R-square	0.4492	
GMM-C statistics	-.1407(1)	

*Note** p<0.1; ** p<0.05; *** p<0.01.
Source Author's calculation.

specified rebate and down-payment with a limited trading partner can accomplish a more efficient and lower price than other mechanisms, and thus is the dominant market price. For the color TV market, mechanism 3 (Rebate on retail price with monopolistic chain stores) is dominant cost factor. Following theoretical analysis, these results imply that an exclusive agent's cash constraint is so low that mechanism 4 can only realize a higher cost than mechanism 3. This may be true from the observation from the fieldwork: Even within the

same firm brand, the distribution channel was constructed separately and independently by product at the early stage. The channel was nurtured according to the nature of products: air-conditioners requires after-sales service to install products in each customer's house, but as color TVs are more like a commodity, the brand and store are not required to care about the product distribution or installation.

Table 9: Supply function

Dependent: price	Air-conditioner		TV	
Parameter	Estimate	Std.Err.	Estimate	Std. Err.
Price cost margin	.295	(.184)*	.271	(1.523)
Average Cost Index	.893	(.194)***	1.000	(0.043)***
Integration (Mechanism 2)	-40.0	(257.8)	1155.9	(668.1)**
Chain Store (Mechanism 3)	-274.3	(189.6)	-179.6	(928.0)
Exclusive Agent (Mechanism 4)	-306.2	(162.3)**	-14.6	(393.7)
Year dummy	+		+	
Brand	Gree		TCL	
	Haier		Haier	
	Hisense		Hisense	
	Midea		Changhong	
	Daikin		Sony	
	Panasonic		Panasonic	
	TCL		Konka	
	Kelon		Skyworth	
	Changhong		Samsung	
No. of obs.	3471		8009	
R-square	0.1642		0.1266	

Note: * p<0.1; ** p<0.05; *** p<0.01.Average cost index is generated Nevo(2000) that average of product price within the same brand and the same city.
Source: Author's calculation.

7 Conclusion

This study was conducted to understand how Chinese firms coped with the default risk of payment with inferior enforcement institutions. Although the legal institutions have

certainly improved, but their impact is limited to coping with default risk. Most of businessmen perceived that they were able to cope with the risk by adjusting their sales mechanism. Furthermore, this induces competition of the mechanisms. Firms in the industry gradually learned type of the more efficient mechanisms and imitated, thus the mechanisms converged into one type. Competition of mechanisms improved capacity to control risk of whole industry and compensated inferior enforcement institutions.

To examine this hypothesis in economics, I built simple contract models to describe each strategy and the competition among them, then empirically examined the market outcome induced by the model. The theoretical model reveals that although a heterogenous transaction arrangement was observed during this transitional period, an absolute "superior order" exists among the mechanisms observed: Two contract mechanisms are superior to spot transaction or integration in an environment where strategic default by a buyer is feasible. The two contracts realized the lowest cost in the environment with trade credit default risk.

These theoretical predictions were supported empirically. In order to evaluate a firm's strategy or mechanism, I employed a structural industrial organization approach. This approach allows us to explicitly distinguish the differences of mechanisms and their impact on supply behavior by sorting out demand factors and supply factors.

By this approach, we saw that sales mechanism were cost factors and determinants of the supply behavior of firms were the sales mechanism. Hence, the sales mechanism that generates the lowest cost was effective competition strategy for a firm to gain more profit and more sales, and due to this nature, the sales mechanism worked as a driving force for converging into a mechanism. In reality, Gree, who invented the a contract package with rebate on volume, down-payment from exclusive wholesaler, gained the Number 1 market share in 2007 in our data, and other brands, like Haier, Hisense and others imitated and introduced the mechanism.

The theoretical and empirical study in this paper documented how competition of the mechanism against payment default risk developed in China's transition period: firms who encountered default risk of deferred payment began to attempt the sales-mechanism, and the attempted mechanisms were selected and converged into the one that generates the lowest cost via pricing competition. This story implies why institutional arrangement payment

default is an effective instruments to promoting effective competition in a market economy.

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