Proceedings of ICES 2015 International Conference : Asian Economy at the Crossroad : China, India, and ASEAN

著者	XU Peng, ESHO Hideki
出版者	Institute of Comparative Economic Studies, Hosei University
journal or publication title	比較経済研究所ワーキングペーパー
volume	196
page range	1-327
year	2015-12-11
URL	http://hdl.handle.net/10114/12118

Proceedings of ICES 2015 International Conference

Asian Economy at the Crossroad: China, India, and ASEAN

Edited by Peng Xu and Hideki Esho

Proceedings of ICES 2015 International Conference

Asian Economy at the Crossroad: China, India, and ASEAN

Edited by Peng Xu and Hideki Esho

2015 Published by

4342 Aihara, Machida-shi, Tokyo, Japan

ICES 2015 International Conference

Institute of Comparative Economic Studies, Hosei University

Asian Economy at the Crossroad: China, India, and ASEAN

It is very clear today that rising Chinese economy as well as ASEAN and Indian economies can change not only the system of the world economy but also the world economic history. Japan has very long and intimate historical relations with China, India and ASEAN as the most important neighbors. So it is quite natural for us to make a comparison of China, Japan, India and ASEAN. It is very much delightful to get Chinese, Indian, Vietnam and Japanese together and to discuss frankly the future of Asian economy.

Supported by Grant-in-Aid for Scientific Research and Hosei University fund for Research Institute, ICES (Institute of Comparative Economic Studies) has held several international workshops and conferences since 2008. The 2015 ICES International Conference takes place from November 14th to November 15th 2015 at Hosei University, Tokyo, Japan.

Venue:

Boisonnade Tower Fl. 19, Meeting Room D, Boissonade Tower, Ichigaya Campus, Hosei University, 2-17-1 Fujimi, Chiyoda-ku, Tokyo, 102-8160 JAPAN

Language: English

Coordinators:

Hideki ESHO (Professor, Faculty of Economics, Hosei University)

Peng XU (Professor and Director of ICES, Hosei University)

Contact:

(Mr.) Naoki Sekiguchi (ICES, Hosei University)

TEL：042-783-2330 ; Email：ices@adm.hosei.ac.jp

Program

14th November, 2015

Opening Address 10:00-10:05

Peng XU, Hosei University, Japan

Session 1 10:05-12:35

“Political Relation, Bilateral Trade and Economic Power: Evidence from East Asia”
Hongzhong LIU, Liaoning University, China

“China's Competitiveness in Promoting Free Trade”
Akiko TAMURA and Peng XU, Hosei University, Japan

Lunch 12:35 – 13:35

Session 2 13:35-16:05

“The Quality of Distance: Quality sorting, Alchian-Allen Effect, and Geography”
Kazutaka TAKECHI, Hosei University, Japan

“Japanese and Chinese Models of Industrial Organization: Fighting for Supremacy in the Vietnamese Motorcycle Industry”
Mai FUJITA, IDE-JETRO, Japan

Coffee Break 16:05-16:30

Session 3 16:30-17:45

“Vietnam's Trade Integration with ASEAN+3: Trade Flow Indicators Approach”
Nguyen Anh THU, VNU University of Economics and Business, Vietnam

Reception 18:30-21:00

Hotel Metropolitan Edmont Tokyo

15th November, 2015

Session 4 10:00-12:30

“Development of the ICT industry of India and Its Activities in ASEAN”
K. J. JOSEPH, Centre for Development Studies, India

"Business Environment for ‘Make in India’ by Japanese Firms"
Takahiro SATO, Kobe University, Japan

Lunch 12:30 – 13:30

Session 5 13:30-16:00

"Identifying Competition Neutrality of SOEs in China”
Mariko WATANABE, Gakushuin University, Japan

"Industrial Location and Agglomeration Economies for Enhancing Innovation"
Akio KONDO, Hosei University, Japan

Invited Discussants
Prof. Etsuro ISHIGAMI (Fukuoka University)
Prof. Tomoo MARUKAWA (University of Tokyo)
Prof. Atsushi KATO (Aoyama Gakuin University)

Coffee Break 16:00-16:20

Wrap-up 16:20-16:30

Hideki ESHO, Hosei University, Japan

Political Relations, Economic Power, and Trade Flows: Evidence from East Asia

Hongzhong Liu, Gongyan Yang①

Abstract

There are conflicting views on the impact of political conflict on economic relations from the literature of international political economics. We use quarterly data to investigate the effects of political relation on export flows between China and certain countries in East Asia from 1980 to 2013 while controlling the role of the economic power of China. The results suggest that the political relations between China and East Asia countries impact their trade volume significantly which supports the traditional view of "trade following flag". We also find that China’s economic power decreases the impact of political relations on the bilateral trades. However, the interaction among political relations, trade flows, and China economic power varies for the periods before and after the 2008 financial crisis.

Key words: Political Relation; Trade Flow; Economic Power; Fixed Effects

① Hongzhong Liu, Dean, Professor of School of International Studies, Liaoning University, China; Address: No. 58, Daoyi South Street, Shenbei New District，Shenyang，China，110136; Mobile: (+86)130-7921-6833; Email: hongzhongliu@126.com; Gongyan Yang, Lecturer of International Studies, Liaoning University, China; Mobile: (+86)150-4007-7379; Email: ygy85@163.com.

1. Introduction

Early in 1940s, Hirschman (1945) found that bilateral trade flows of Nazi German, before World War Ⅱ were directed by its political purpose from rich countries to its weak neighbors, such as Bulgaria and Romania[①]. The paper indicated that political factors strongly influenced the bilateral trade volume of Nazi Germany. Galtung (1971) contributes the Center-Periphery Theory by indicating that trade volume between center and periphery countries is usually determined by the political relationship of dominating and dominated counties. Gilpin (2006) claims that political ambition and the competition of each country set the framework in which market and economic force work. Starting from the 1990s, an increasing amount of literature began to investigate the relationship between politics and trade by examining the conclusions of previous research from different perspectives. The literature can be divided into three groups.

The first group is from the perspective of the special political relationship of colonies and suzerains and their heavy bilateral trade volumes. The perspective is introduced by Yeats (1990). The paper analyzes the impact of politics on traded goods price by taking 20 former French colonies and by analyzing the commodity import of each country from France between 1962 and 1987. The result suggests that the former colonial countries pay a higher price (about 20-30%) higher than non-colonial trading partners do. The conclusions also hold true for the former colonial countries of UK, Portugal and Belgium. Some studies deal with the political effect from the perspective of trade volume. Mitchener and Weidenmier (2008) find the trade volume among colonial countries in a same imperial system is twice amount of the trade volume of the countries not in the imperial system because of a lower trade cost within the system. From the perspective of time dimension, Head, Mayer and Ries (2010) study the impact of independence of colonial countries from their suzerains on the trade volume. The results show the impact of independence of colonial countries is not significant in a short term. However, in the following three decades, the trade volume among the colonies and the suzerains declined by 60%. All the studies above suggest that political factors influence international trade. However, numerical effect of political factors has not been measured accurately in the existing literature.

[①] Germany is a large country, which play a dominant role in the trade with small countries. The asymmetry in the economic status makes its geopolitical dominance position. On the contrary, the political power of Germany does not have big impact on trade with Europe and the United States and other rich countries.

Secondly, many studies focus on the impact of military conflict on economic and trade behaviors for a long historical period. The results are mixed. There are some studies showing that military conflict impacts trade volume reversely (Omar etc, 2004; Oneal etc, 2003). There are some researches questioning this conclusion by arguing that expectation is not taken into account. Morrow (1999) claims that counties should foresee wars that might happen in the future so that they would adjust trade partner and trade flow gradually in advance when facing the risk of a potential war. As a consequence, the impact of war on trade could be very little. Even though Li and Sacko (2002) point out that an unexpected conflict may have a negative effect on trade. Oneal(2003) argues more factors should be considered in the study of impact of war on trade, such as characteristics of wars, because wars differ in scale and duration in the history. The study shows that the impact of the war on trade is severe when the war is caused by trade conflict, which is not agreed by Barbieri and Levy (1999) and Mansfield and Pevehouse (2000). They argue that wars do not affect trade in general. Only for a short period, does war occasionally reduce trade volume between the two sides at war. In the long run after war, the bilateral trade would resume. Moreover, trade volume would even exceed the past.

With historical data from the 18th century to the middle of the 20th century, Rahman (2007) examines the role of the naval supremacy in international trade. This research concludes that naval warfare reduces trade volume between the maritime powers and non-allied countries, however, increases trade volume among allies. Anderton and Carter (2010) and Glick and Taylor (2010) estimate the trade cost caused by wars in long history from 1870 to 1990. They find that wars significantly reduce bilateral trade volumes and the influence could last for many years. The conclusion is contradicted with Barbieri and Levy（1999）. They find that the wars reversely impact trade not only for the involved countries, but also for the neutral countries. As stated above, the related studies never agree with each other. Also, the military conflict can be only seen as an extreme political event. Even in peacetime, status for political relationship among countries varies. To our knowledge, there is no research so far using comprehensive measurement to analyze the impact of political relations on international economics and trade relations.

There is another group of studies concerning the impacts of political relations deterioration on economic and trade relations. Many studies show that the deterioration of the political relations brings adverse effect on economic and trade exchanges. Pollins (1989) finds that countries are more willing to establish closer trade relation with political allies. In the meantime, Morrow, Gowa and Mansfield (2004) point out that a country tends to trade with its allies or countries that have the same allies. “Trade follows flag” is supported by the studies. Reuveny and Kang (1998) further supplement it with an idea that the impact of political confrontation is asymmetric in tradable goods. Strategic commodities suffer more from political confrontation than general products. By contrast, Omar, Pollins and Reuveny (2004) show there is no significant correlation between them. Focusing on this argument, scholars have made more extensive empirical test by taking a specific country as the object of study (United States, Japan and China).

Gupta and Yu (2009) show that political factor is significant enough to explain the U.S. foreign trade. The deterioration of bilateral political relations leads to a significant decline in the trade volume between the United States and its trade partners. The study takes the Iraq War as an instrumental variable to have further tests. However, this result is contradicted by Davis and Meunier (2001). They extend Gupta and Yu (2009). They use the trade data of the United States and Japan from 1990 to 2004 and find that political relations deterioration does not damage bilateral trade relations. For the robustness checks, they further test the impact of 2002 Iraq war which caused the U.S. and France political deadlock on the trade between the U.S. and France, and the impact of Ryutaro Hashimoto’s visit in 1996 which caused the tension of Sino-Japan political relations on the trade between China and Japan. The results show the results are robust. However, the above results seem not to agree with the popular phrase of “Hot Economics, Cold Politics” in the field of political and economic field, which is due to the different time spans and different choices of variables of political relations. Further studies begin to search for evidence from the micro field. Govella and Newland (2011) and Hamao and Wang (2014) test the phrase of “Hot Economics and Cold Politics” between China and Japan from micro perspective. They claim that the impacts of the politics on different types of enterprises vary. Fuchs and Klann (2013) examine the economic consequence of the sensitive political event, Dalai Lama's visit. They find that the occurrence of Dalai Lama's visit significantly reduces exports from the visited country to

China. The impact is more significant from 2002 to 2008. Davis, Fuchs and Johnson（2014）further point out that compared to private enterprises, the imports by state-owned enterprises are more sensitive to the change of political relations.

Chinese scholars had more extensive discussions on economic and political interaction on China and Japan. Before the 2008 financial crisis, people all agree on describing China Japan relation as “Hot Economics and Cold Politics”. Liu (2006) discusses the root of “cold politics and hot economy” between China and Japan from three perspectives: the impact of the changes on international environment and Japan’s policy on China, Japanese political right deviation development and the balance of power changes, and misleading of wrong strategic thought and misjudgment of national interests. Zhu (2006) analyzes this problem from the perspective of Japan's domestic political requirement. Feng (2006) points out that the situation is experiencing new change. The long-term “cold politics” changes the “hot economy” into “cool economy”. The Sino-Japanese relation has been at a crossroad. This assertion is subsequently confirmed. The “collision” event in 2010 and the malicious “buy island” event in 2012 make the Sino-Japanese relation fall off a cliff. Xu and Chen (2014) empirically test the impact of political tension between China and Japan from 2002 to 2012 on their bilateral trade. The result shows that the impact of the Sino-Japanese political tension experienced three stages during the ten years, i.e., weak, no influence and significant influence that changes “cold politics and hot economy” to “cold politics and cold economy”. In addition, they further quantify the gains and losses from the Sino-Japanese conflict for both China and Japan. It is estimated that the loss of export from China to Japan in 2012 is about 31.5 billion. Japan's loss is about 20 percentage higher than China. Jiang (2014) claims that since the normalization of diplomatic relation, the Sino-Japanese relation has been devided into four stages, “hot politics and cold economy”, “hot politics and hot economy”, “cold politics and hot economy”, and “cold politics and cold economy”. The research analyzes the origin and background of the tendency of vicious circle in East Asian cooperation and Sino-Japanese relation interaction and puts forward the direction of China's effort.

To sum up, the existing literature analyzes the impact of politics on bilateral trade from three perspectives: colony and suzerain, war and negative political event. There is no consensus so far.

Some potential problems exist.

First, in most studies, the political relation between two countries is measured by colony, war and political conflict, all of which are categorical either 1 or 0. The event study method adopted by most studies is limited because only extreme manifestation of deterioration of the political relations is considered. For most of time is peacetime throughout the history, the impact of the continuous change of bilateral political relations on economic and trade relations is still unambiguous. Especially in the era of global economic integration, the conflict between countries is often in the form of “fighting without breaking”. Among the major powers, a direct military conflict is almost hard to find. Gradual change of bilateral political relations becomes common. So the impact of gradual change of political relations on international trade is a gap between the academic works and the real world. In addition, the change of political relations includes two cases, deterioration and improvement. They are not simple inverse process of each other. When a war or negative political event is included as explanatory variable, it only reveals the economic consequence resulted from the deterioration of political relations. The effect of the improvement of political relations between two countries on trade is neglected in literature.

Second, based on the linear relationship of political and economic variables, the conclusion of “cold politics and hot economy” or “cold politics and cold economy” does not consider the external environment and constraints, especially the asymmetric dependence due to the shift in country’s economic powers in the era of globalization. Therefore, this may cover up special features during the era of power transition (Huang, 2012) and may make it difficult to dig into the logic behind the story. Findlay and O’Rourke (2007) claim that state power and influence constantly shape the structure and form of international trade. In the era of globalization, the trend of economic and political interaction and integration is increasingly apparent, and economic power increasingly becomes a basic source of state power and an important part of comprehensive national strength (Ma and Feng, 2014). But state power (especially economic power) has not been considered in most previous studies. Most literature focuses on hegemonic countries (especially the United States) or colony suzerain. The rising emerging countries gain less attention. As for the hegemony country, its economic power keeps relatively stable in the short term compared to its trade partners. However, with the rise of the emerging economies, we are experiencing the transfer of world economic gravity and economic power. With the continual economic growth in emerging powers and the continual changes in economic powers of countries, will the results on the impact of the bilateral political relations on international trade be different from what is already known? The existing literature cannot give an answer.

Third, after the global financial crisis, there are more studies on China. Fuchs and Klann (2013) use time series approach to discuss the economic consequences of the political deadlock between China and Japan. But more research needs to be done on examining the general rules of economic and political interaction between them using panel data approach. East Asia has become the most dynamic economic region in the world. The economic integration based on market force continues to expand, and the trade exchange between China and the other East Asian countries is increasingly close. At the same time, the territorial dispute among countries and the debate around the historical issues bring the risk of tense political situation and conflict. Politics and economy are closely and intricately intertwined. With the rise of China and the transformation of international power structure, what will happen to the relationship between politics and economy among China and other East Asian countries? This question has not received much attention from both theoretical and empirical worlds yet.

2 Model specification and data

With what have been found by the previous studies, this paper empirically analyzes the impact of intra-East Asia political relations on the trade between China and East Asian countries. Instead of using categorical variables to denote events of political relations, we use a new numerical measurement for the political relations. We take China as our stand to look for a general rule of East Asian political relations and trade flows. We incorporate China's emergence and economic power transference which are often neglected by existing literature into our model to examine the effect of China's rising power on the results. We divide the sample by dimensions of country and time to do the robustness check.

2.1 Measuring model building

Since long term period is required by political relations to influence trade among countries, our sample period covers 33 years from 1980 to 2013 in our empirical analysis. Quarterly data is used which gives higher frequency than annual data. Our sample includes five East Asian countries.[①] Following Anderson (1979) and Davis, Fuchs and Johson(2014), the basic empirical model is specified as follows:

$$Economic\ Flows_{i,t} = \beta_0 + \beta_1 Political\ Relations_{i,t-1} + \beta_2 X_{i,t} + \gamma_i + \varepsilon_{i,t} \qquad (1)$$

i stands for trade partner country of China, and t denotes time. The panel regression includes five countries for 33 quarters which generates a total of 165 observations in our sample set. The dependent variable *Economic Flows*$_{i,t}$ is measured by total trade volume between country i and China during time t. The core explanatory variable *Political Relations*$_{i,t-1}$ represents the political relations between country i and China during lag time period $t-1$. To avoid the endogeneity problem, all explained variables lag one phase. To be consistent with the related literature, $X_{i,t}$ includes several control variables, such as country i's GDP per capita, inflation, exchange rate and country risk. These factors significantly affect bilateral trade volume. γ_i stands for unobservable element relevant to country i. $\varepsilon_{i,t}$ is the random perturbed variable.

As stated above, political relation has a significant impact on trade between countries. However, the shift in economic power also influences trade simultaneously. The two forces interact with each other to affect trade volume between countries. Therefore, we expand the basic model by including explanatory variable China's economic power (*Economic Power*$_{i,t-1}$) to examine direct impact of the increase of China's economic power on bilateral trade. Besides direct effect, there is also potential indirect effect. With the rising economic power, it plays a role of hedging against risk and further changes the sensitivity of trade flows to political relations. Same change in the

[①] Availability of data is always a concern for empirical studies. Five countries, i.e., Japan, Korea, Indonesia, India, and Vietnam, are chosen in the database "Great Power Relationship". The above countries are the most influential countries in the region.

level of political relations (deterioration) may result in a change of trade volume (decrease). The enhancement of interdependence of two countries is a hedge against negative impact on trade. Finally, a cross term of China's economic power and political relations (*Political* $Relations_{i,t-1} \times Economic\ Power_{i,t-1}$) is included into the basic model. This empirical structure listed below can be used to accurately examine the change of correlation coefficient of political relations and economic and trade flows when economic power changes.

$$\begin{aligned} Economic\ Flows_{i,t} = \beta_0 + \beta_1 Political\ Relations_{i,t-1} + \beta_2 Economic\ Power_{i,t-1} \\ + \beta_3 Political\ Relations_{i,t-1} \times Economic\ Power_{i,t-1} \\ + \beta_4 X_{i,t} + \gamma_i + \varepsilon_{i,t} \end{aligned} \quad (2)$$

2.2 Data and variable specification

The explained variable *Economic Flows* is measured by the log transformation of the trade volume between China and country *i* in dollar terms. The quarterly trade volume data is obtained by summing the monthly value up from CEIC database. All data is based on China's statistical caliber, which is China's import from partners and export to partners. For the core explained variable *Political Relations*, this paper uses the data of political relations between China and other countries from *Great Power Relationship Database* generated by Tsinghua University, which provides quantitative index for the measurements of China's bilateral relation with multiple countries since 1950 with a scale of -9 to 9. The higher the index is, the better the political relations between two countries are. This continuous numerical index helps to avoid discrepancy between event value and actual relationship[①] which distinguishes the current paper from previous studies in this issue.

There is no clear definition of *Economic Power* so far. Morgenthau(2006) suggests that the constitute state power includes geographic factor, natural resources, industrial capacity, war

[①] According to the instructions of Great Power Relationship Database, the basic thought is that the bilateral relationship is constituted by many events. These events form a "event flow" with time going by. The measurement of bilateral relationship needs to consider two dimensions, event accumulation and event flow, that is, to accumulate event influence is the starting point of our measurement. The measurement of influence change with time going by is the process. The status quo of bilateral relationship is the end. About the detailed introduction of the database, see http://www.tsinghua.edu.cn/publish/iis/7522/index.html.

preparedness, population, national character, national morale, diplomatic skills, political strategy etc.[①] Among all these factors, the factors associated to a country's economy such as industrial capacity constitute the basis of the country's economic power. Therefore, economic power can be interpreted as a country's ability to influence other countries by using its economic power during political and economic exchanges. It exists because of the asymmetric interdependence among countries. Whalley (2009）states that economic power is closely related to relative scale. It endows the country with the ability to influence other countries based on domestic market, to persuade or force other countries to act according to its will. Keohane（2001）claims that keeping a specific country from entering into its own country and allowing other countries to enter are powerful and historically important economic power weapons (Mckeown, 1983). In contrast, making the other side compromise or obey and opening your own huge domestic market may be an effective way to exert influence. The larger the domestic market is, the stronger a countries' potential economic power is. According the studies cited above, we draw a conclusion that economic power mainly stems from a country's total economic amount and market scale. Based on this, indicator China's $Economic\ Power_{i,t-1}$ is measured by the proportion of China's GNP to the global GNP which is measured by PPP in this paper. The GNP data is obtained from WEO database provided by IMF.

For both the relationship between political relations and bilateral trade volume and the relationship between China's economic power and bilateral trade volume, we can first make a descriptive analysis. As is shown in figure 1 we can find that in general both political relations and China's economic power are positively correlated with bilateral trade meaning trade volume rises with the improvement of the political relations between China and other East Asian countries. However, the correlations vary in different time periods specially for China and Japan. In order to obtain more reliable results, next we apply our empirical model illustrated in section 2.1 to test the relations between the variables.

[①] For explicit discussion, please refer to Morgenthau(2006), *Politics Among Nations: the Struggle for Power and Peace*, Peking University Press; the first edition(Nov. 1), pp151-203.

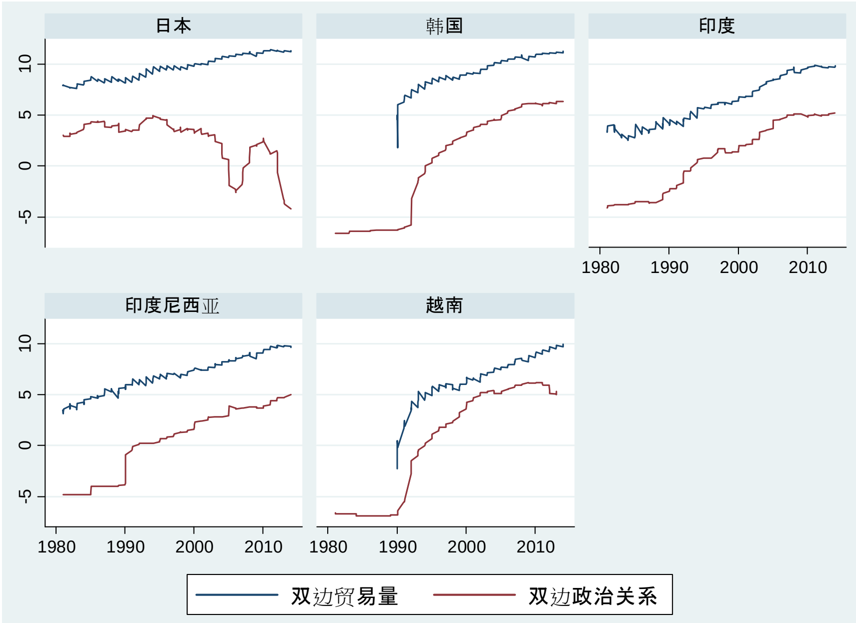


Figure 1 Trade volume and bilateral political relations between China and East Asian countries

Data source: *Great Power Relationship Database* from Tsinghua University and CEIC database

Besides the core explanatory variable, this paper brings in the following controlled variables in the empirical model: the first is log transformation of real GDP per capita with 2005 as the base year, which is used to measure the impact of difference between partner country's economic developing level and wealth level on bilateral trade, and has been used by many studies in long-term empirical test. The second is *Inflation* measured by CPI, which is to control impact of partner country's domestic macroeconomic fluctuation on bilateral trade. The third is real *Exchange Rate* measured by logarithm value of dollar against domestic currency, which is to reflect import and export change driven by the exchange rate factor. All the data above is collected from the WDI database of the World Bank.

Besides the above economic indicators, partner country's *Country Risk* often has a significant impact on trade volume, such as government's administrative ability, public security environment, intensification of social contradiction, potential internal conflict etc. These factors are essential for multinational enterprises to achieve success businesses. They also affect domestic import and export volume. Therefore, *Country Risk* variable is included into the empirical model as a control variable. According to the definition of globally-renowned International Country Risk

Guide(ICRG), country risk mainly includes 12 aspects such as government stability, social economic environment, internal conflict, corruption, law and order, ethnic conflict, democratic accountability etc. The country risk index is calculated by adding the value of each factor above together with a sale of 0 to 100. The higher the value is, the less the country risk is. The data is from ICRG database. The descriptive statistics are shown in Table 1.

Table 1 Descriptive statistical variables

Variables	Observed value	Average value	Standard deviation	Minimum value	Maximum value
Economic Flows	602	7.717	2.387	-2.282	11.417
Political Relations	660	0.895	4.162	-6.900	15.700
Economic Power	675	7.524	4.084	2.369	16.324
GDP	644	26.620	1.650	22.563	29.415
Country Risk	596	65.396	13.231	34.75	92.750
Inflation	640	14.948	53.161	-2.164	411.040
Exchange Rate	660	6.183	2.445	-0.548	9.948

The econometric model includes many political and economic variables. Since many of them correlate with each other which causes multi-collinearity problem. To avoid this problem, we test calculate correlation coefficient matrix of the explanatory variables, which is shown in table 2. As is shown, the correlation coefficients between variables are fewer than the publicly recognized standard 0.8 which is often used to judge high correlation between variables. The correlation coefficient between exchange rate and income per capita is the highest. But it is only -0.61. Therefore, we can decide that there is no necessary relation between them. And we can draw a conclusion that there is no serious multi-collinearity in our model.

Table 2 Variables correlation coefficient matrix

	Political Relations	*Economic Power*	*GDP*	*Country Risk*	*Inflation*	*Exchange Rate*
Political Relations	1					
Economic Power	0.5956	1				

GDP	0.2988	0.292	1			
Country Risk	0.4406	0.1581	0.5905	1		
Inflation	-0.2765	-0.1527	-0.5873	-0.4876	1	
Exchange Rate	0.2075	0.1911	-0.6199	-0.1282	0.3661	1

3 Results

In this section, we first run the panel regression to obtain results about the relationship between bilateral political relations and trade flows, and the role of China economic power. Secondly, Countries were grouped according to their political relations with China in order to examine some new features between political relations, trade flows and the national economic power. Finally, we further investigated the impact of historical periods on the results.

3.1 Main results

At first, pooled OLS regression was conducted for the preliminary results. Then, we control for country fixed-effects in the regression to address the endogeneity problem that arises when both political relations and economic flows are driven by unobservable time-invariant country-specific factors. Also the time fixed-effect factor was also considered. All the coefficients of the variable in table have been normalized for comparison. As shown in Table 3, in the most of regression, R-squared are greater than 0.9 which means that the model fits the data well. The Hausman test results suggest that the fixed effects improve the model.

As shown in Columns 1 of Table 3, without control variables, the coefficient β_1 on the $Political\ Relations$ is positive and statistically significant from zero indicating that trade flows respond significantly to a shift in political relations .The bilateral trade flows between the China and other East Asia countries would decline if political relations between the China and other East Asia countries deteriorate. Trade follows the flag.

From the regression results that Chinese economic power is introduced, we can see that the expanding economic scale of China has generated obvious impact on its bilateral trades. The coefficient of Chinese economic power β_2 in column 2-3 suggest Chinese economic power has a statistically significant impact on trade flow. The rising of China leads to the flourish of international trade in East Asia. For the regressions with the control variables, the significance of β_1 and β_2 maintains a high degree of stability (Columns 4-6). Columns 6 includes time fixed effects and country fixed effects. It shows that the $Political\ Relations$ enters significantly at the 1% level in regressions, and the coefficient is 0.176. As for the $Economic\ Power$, it enters significantly in the regression at the 1% level, and the coefficient is 0.482. The signs for other control variables in the estimation are consistent with common intuition. The results suggest per capita GDP has a large and statistically significant impact on bilateral trade. Inflation has a large and significant impact on macroeconomic volatility and reduces the trade flow. The effects of exchange rates and Country risk on bilateral trade are not statistically significant as shown in Columns 6.

Over the past three decades, the world has been witnessing the rise of China. Now China has its influence in many parts of the world such as global supply, trade, and finance. At the same time, to the best of our knowledge, most literature neglected the shifting of economic powers which is happening tremendously in the world or East Asia. This current paper aims to fill this gap in the literature. We now turn to the interaction between political relations and economic power ($Political\ Relations \times Economic\ Power$) to examine whether the relationship between political relations and bilateral trade has been changed. Columns 7-9 in Table 3 show that the interaction terms enter negatively and significantly at the 1% level in the model. The marginal impact of political relations on bilateral trade can be obtained by Taking derivative of Economic Flows with respect to political relations in equation 2 as shown in equation 3.

$$\frac{\partial Economic\ Flows_{i,t}}{\partial Political\ Relations_{i,t-1}} = \beta_1 + \beta_3 Economic\ Power_{i,t-1} \tag{3}$$

$$\frac{\partial Economic\ Flows_{i,t}}{\partial Political\ Relations_{i,t-1}} = 0.322\text{-}0.179 Economic\ Power_{i,t-1} \tag{4}$$

Table 3. Political relations, economic power and bilateral trade

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Political Relations	0.268*** (0.013)	0.425*** (0.32)	0.268*** (0.013)	0.098*** (0.014)	0.189*** (0.024)	0.176*** (0.019)	0.178*** (0.030)	0.445*** (0.046)	0.322*** (0.044)
Economic Power		0. 461*** (0.024)	0.509*** (0.029)	0.330*** (0.007)	0.417*** (0.017)	0.482*** (0.039)	0.370*** (0.010)	0.486*** (0.019)	0.480*** (0.037)
GDP				0.720*** (0.032)	0.408*** (0.123)	0.416*** (0.126)	0.706*** (0.031)	0.559*** (0.121)	0.528*** (0.144)
Country Risk				0.164*** (0.149)	0.120*** (0.168)	0.032 (0.243)	0.149*** (0.159)	0.055*** (0.161)	0.001 (0.288)
Inflation				-0.050** (0.005)	-0.044** (0.004)	-0.057*** (0.005)	-0.052** (0.005)	-0.023 (0.004)	-0.043** (0.004)
Exchange Rate				0.371*** (0.02)	0.161* (0.088)	0.048 (0.081)	0.366*** (0.019)	-0.098 (0.106)	-0.052 (0.093)
Political Relations $\times$ *Economic Power*							-0.104*** (0.003)	-0.308*** (0.004)	-0.179*** (0.004)
Country Fixed – effects	Yes		Yes		Yes	Yes		Yes	Yes
Year Fixed – effects	Yes		Yes			Yes			Yes
Hausman test	0.000		0.000		0.000	0.000		0.000	0.000
No. of observations	589	589	589	551	551	551	551	551	551
Adj. R – squared	0.96	0.629	0.953	0.94	0.948	0.956	0.941	0.954	0.958

Notes: Standard errors in parentheses,* Significant at 10 percent, ** significant at 5 percent; *** significant at 1 percent.

The results suggest that trade flows respond significantly to a shift in political relations between China and other East Asia countries. However, the effect of political relations on the bilateral trade is determined by the economic power of China. Therefore, with the background of China's rise, the marginal impact of political relations on bilateral trade is decreasing.

3.2 Grouping Analysis

This section aims at looking for differences of the role of China economic power in the different group of countries, which could suggest important policy implications. We separate our analysis for the "good" relation countries and the "bad" relation countries with China. If the value of the bilateral political relation is bigger than zero, it is defined as good relation. Otherwise, it is defined as bad relation. The estimation results are shown in Table 4.

For the Group B where good relations countries is in line with the primary conclusion. We see that political tension between China and trade partner produce negative and significant effects on bilateral trade volume. But China economic power is positive and significant at the 1% level in all equations. And the interaction enters positively and significantly at the 1% level in regressions. As for the bad relations countries which group A stands for, the political tension also produces negative and significant effects on bilateral trade. However, the effect of economic power on trade flow is not statically significant any more.

Table 4. Political relations, economic power and bilateral trade in different group

	(1)	(2)	(3)	(4)	(5)	(6)
	Group A（Bad Relations）			Group B（Good Relations）		
Political Relations	0.480^{***} (0.1548)	0.269^{*} (0.1635)	0.199^{**} (0.1379)	0.355^{***} (0.0308)	0.143^{***} (0.0412)	0.346^{***} (0.0382)
Economic Power	-0.039 (0.1050)	0.032 (0.0965)	-0.028 (0.1088)	0.847^{***} (0.0117)	0.520^{***} (0.0191)	0.686^{***} (0.016)
$Political\ Relations \times Economic\ Power$	-0.232^{**} (0.0181)	-0.117 (0.0187)	-0.113 (0.0202)	-0.296^{***} (0.0028)	-0.094 (0.0042)	-0.367^{***} (0.0037)
GDP		1.006^{***} (0.1414)	1.524^{***} (0.5472)		0.857^{***} (0.0251)	0.639^{***} (0.0726)
Country Risk		0.015 (0.1622)	0.089^{*} (0.4539)		0.233^{***} (0.1571)	0.034^{*} (0.1728)
Inflation		-0.04 (0.0085)	-0.013 (0.0083)		0.02 (0.0031)	0.052^{***} (0.0023)
Exchange Rate		0.618^{***} (0.0442)	0.817^{***} (0.3482)		0.385^{***} (0.0155)	-0.157^{*} (0.067)
$Country\ Fixed-effects$	Yes		Yes	Yes		Yes
Hausman test	0.09		0.003	0.06		0.000
No. of observations	146	123	123	443	428	428
$Adj.\ R-squared$	0.935	0.946	0.653	0.951	0.929	0.938

Notes: Standard errors in parentheses,* Significant at 10 percent, ** significant at 5 percent; *** significant at 1 percent.

3.3 Extension analysis in different period

For the period from 1980 to 2013 when the data set covers，the world economy has been changing a lot. One of the biggest changes is the status of East Asia in the world economy. East Asian economies have embarked on various initiatives for economic integration and cooperation in the areas of trade and investment. In the early stage of the time period, only the developed countries, such as Japan, played important roles. In the early 1990s, Japan's real estate and stock market bubble burst and the economy went into a tailspin. Since then, Japan had suffered the so called "Japan's Lost Decade". After the Global financial crisis of 2008, China has been the leading source of economic growth in the region.

We further split our dataset into three periods: 1981Q1–1997Q1, 1997Q2–2008Q2 and 2008Q3-2013Q4. There are two arguments that motivate the two cutting off points 1997Q1and 2008Q2. Firstly, the 1997 Asian financial crisis and the 2008 Global financial crisis helped to integrate production networks and supply chains in Asia. The second argument is the increasing influence of China which improves China's trade status.

As shown in Columns 1-4 of Table 5, during the periods of 1981Q1–1997Q1 and 1997Q2–2008Q2, we see that political tension between China and trade partner produce negative and significant effect on bilateral trade at the 1% level. The expanding economic scale of China has generated an obvious impact on bilateral trade. With the rising of China, the marginal impact of political relations on bilateral trade is decreasing. The impact is different for the both periods. In the second period, the trade promotion effect from the economic power growth is larger (coefficient changed from 0.23 to 0. 468). And the coefficient of interaction is changed from -0.563 to -0.396, indicating the negative impact of political power in defusing on bilateral trade declines.

From 2008 to 2013, the global economy and East Asia are in a slow recovery phase. Columns 5-6 suggest in this sub-period that the estimated effect of political relation on the trade is not statistically significant any more. This result is in line with the fact that with East Asia and the global economy getting out of crisis, the two factors may still be back to the negative correlation. We suspect that this could be a short-term phenomenon.

Table 5. Political relations, economic power and bilateral trade in different periods

	(1)	(2)	(3)	(4)	(5)	(6)
	1981Q1-1997Q1		1997Q2-2008Q2		2008Q3-2013Q4	
Political Relations	0.500*** (0.0717)	0.625*** (0.0792)	0.091 (0.1085)	0.423*** (0.0649)	0.128 (0.2028)	0.125 (0.1002)
Economic Power	0.179*** (0.0499)	0.230*** (0.1137)	0.200*** (0.0381)	0.468*** (0.0378)	0.464*** (0.0581)	0.113** (0.0504)
Political Relations × *Economic Power*	-0.403*** (0.017)	-0.563*** (0.0188)	-0.026 (0.0103)	-0.396*** (0.0066)	0.117 (0.0131)	-0.244 (0.0059)
GDP	0.894*** (0.0479)	0.990*** (0.0598)	1.054*** (0.0339)	0.638*** (0.1359)	0.839*** (0.0737)	2.326*** (0.3219)
Country Risk	0.034 (0.2367)	-0.044 (0.3077)	0.257*** (0.1855)	-0.024 (0.2763)	0.696*** (0.2683)	-0.208 (0.9113)
Inflation	-0.160*** (0.0048)	-0.148*** (0.0052)	0.026 (0.0024)	0.051*** (0.0016)	0.041 (0.0103)	0.011 (0.0056)
Exchange Rate	0.530*** (0.0274)	0.578*** (0.0292)	0.488*** (0.0189)	-0.085 (0.1926)	0.291*** (0.0239)	0.161 (0.2417)
Country Fixed – effects		Yes		Yes		Yes
Hausman test		0.000		0.000		0.000
No. of observations	231	231	220	220	100	100
Adj. R – squared	0.931	0.941	0.943	0.973	0.917	0.99

Notes: Standard errors in parentheses,* Significant at 10 percent, ** significant at 5 percent; *** significant at 1 percent.

4 Conclusions

This paper analyzes the relationship between the political, trade contacts and economic power by taking China as the center country using the quarterly data of five countries in East Asia between 1980 and 2013. The following conclusions have been made. In general, there is a significant positive correlation of the political tension and trade contacts between China and East Asia countries. Specifically, the political tension significantly reduces bilateral trade volume between the countries that is consistent with the view of "Trade Follows Flag". Being different from previous studies, this research considers the background of the rise of China and ongoing economic power shifts in East Asia. The results show that the correlation between them is not constant. China's economic power plays a crucial role. The continuous increase of China's economic power has brought an obvious pulling effect for bilateral trade. More importantly, the sensitivity of bilateral trade volume drops with political conflict. The rise of China integrates the East Asia economy and strengthens the dependence of East Asia economy.

The sample grouping analysis indicates that the trade pulling effect from the rise of China differs in different sample groups. Only for the countries with good relations with China, an increase of China's economic power brings a positive impact on trade. The strengthening of China's economic power serves a trade stabilizer when political deadlock appear only for these countries. Thus, the positive effect of Chinese economy growth on East Asia is limited by the political tensions caused by the historical problems. Finally, we find that political relations, bilateral trade and economic power also present different relations for different periods. Before the 2008 global financial crisis, the trade promotion effect of China's economic power is growing. However, the effect of hedging political risk and smoothing bilateral trade is declining. In the recovery phase from the crisis, the influence of political relations for trade in East Asia is not statistically significant any more.

Recently, political tensions in East Asia are growing. The doubt about a peaceful rise of China and the strategy of the U.S. for returning to Asia-Pacific makes the region become the center of power games in the world. The gap between the demand of economic integration driven by market forces and the political division among countries is wider and wider. The results of this study indicate that effectively improving in the political relations between countries will release the spillover effect of China's economic growth and benefit the whole East Asia.

References

(1) Anderton, Charles and John Carter(2001), The Impact of War on Trade: An Interrupted Time-Series Study. *Journal of Peace Study*, Vol.38, No.4, pp.445-457.

(2) Barbieri, Katherine and Jack S. Levy(1999), Sleeping with the Enemy: The Impact of War on Trade，Journal of Peace Research，（36）: 463-479.

(3) Brian, Pollins (1989), Does Trade Still Follow the Flag? *American Political Science Review*, Vol.83, No. 2, pp.465-480.

(4) Davis, Christina L. and Sophie Meunier(2011), Business as usual? Economic Responses to Political Tensions, *American Journal of Political Science*, Vol.55, No.3, pp.628-646.

(5) Davis, Christina, Andreas Fuchs and Kristina Johnson(2014), State Control and the Effects of Foreign Relations on Bilateral Trade. University of Heidelberg Discussion Paper Series No.576.

(6) Feng, Zhaokui(2006), Rethinking the relations of Cold politics and hot economy between China and Japan, *Japanese Studies*, No.2, pp1-9.

(7) Findlay, Ronald and Kevin H. O'Rourke(2007), *Power and Plenty: Trade, War and the World Economy in the Second Millennium*, Princeton: Princeton University Press.

(8) Fuchs, Andreas and Nils-Hendrik Klann(2013), Paying a visit: The Dalai Lama Effect on International Trade. *Journal of International Economics*, Vol.91, No.1, pp.164-177.

(9) Galtung, Johan(1971), A Structural Theory of Imperialism, *Journal of Peace Study*, Vol.8, No.2, pp.81-117.

(10) Glick, R. and A. Taylor(2010), *Collateral damage: Trade Disruption and The Economic Impact of War*. MIT Press, Vol. 92, No.1, pp.102-127.

(11) Govella, K. and S. Newland(2011), Hot Economics, Cold Politics? Re-examining Economic Linkage and Political Tensions in Sino-Japanese Relations, University of California Working Paper.

(12) Gupta, N. and X. Yu(2009), Does money follow the flag? Indiana University, Kelley School of Business Working Paper.

(13) Head, Keith, Thierry Mayer and John Ries(2010), The Erosion of Colonial Trade Linkages after Andependence, *Journal of International Economics*, Vol.81, No.1, pp.1-14.

(14) Hirschman, Albert O.(1945), *National Power and the Structure of Foreign Trade*. Berkeley: University of California Press.

(15) Huang, Qixuan(2012), Big countries' economic growth pattern of and its international political consequences, *World Economics and Politics*, No.9, pp107-130.

(16) Gilpin, Robert (2006), *Global Political Economy: Understanding The International Economic Order* (Chinese version), Shanghai People's Publishing House, p17.

(17) Jiang, Ruiping(2014), East Asian cooperation and interactive relations between China and Japan: problems and countermeasures. *Foreign Affairs Review*. No.5, pp1-18.

(18) Joanne, Gowa and Edward Mansfield(2004), Alliances, Imperfect Markets, and Major-Power Trade. *International Organization*, Vol.58, No.3, pp.775-805.

(19) Keohane, Robert (2001), *After Hegemony: Cooperation and Discord in the World Political Economy*, Shanghai People's Publishing House, p38.

(20) Li, Quan and David Sacko(2002), The (Ir)Relevance of Militarized Interstate Disputes for International Trade, *International Studies Quarterly*, Vol.46, No.1, pp.11-43.

(21) Liu, Jiangyong(2006), Reason and the way out for the relations of Cold politics and hot

economy between China and Japan, *Contemporary International Relations*, No.4, pp28-30.

(22) Ma, Yahua, Feng Chunping(2014), East Asian Power Distribution from Space Perspective-a Comparative Static Analysis Based on Gravity Model, *World Economics and Politics*, Volume 11, pp121-134.

(23) Mansfield, Edward D. and J. C. Pevehouse(2000), Trade Blocs, Trade Flows, and International Conflict. *International Organization*, Vol.54, No.4, pp.775-808.

(24) Mitchenr, Kris J. and M. Weidenmier(2008), Trade and Empire, NBER Working Paper No.230.

(25) Morgenthau, Hans J．(2006), *Politics Among Nations: the Struggle for Power and Peace*, Peking University Press; the first edition(Nov. 1), pp151-203

(26) Morrow, James D. (1999), How Could Trade Affect Conflict? *Journal of Peace Study*, Vol.36, No.4, pp.481-89.

(27) Omar, Keshk, Brian Pollins and Rafael Reuveny(2004), Trade Still Follows the Flag: The Primacy of Politics in a Simultaneous Model of Interdependence and Armed Conflict. *Journal of Politics*, Vol.66, No.4, pp.1155-1179.

(28) Oneal, John R., Bruce Russett and Michael Berbaum(2003), Causes of Peace: Democracy, Interdependence, and International Organizations, 1885–1992. *International Studies Quarterly*, Vol.47, No.3, pp.371-94.

(29) Rahman, Ahmed S. (2007), Fighting the Forces of Gravity: Seapower and Maritime Trade between the 18th and 20th Centuries. United States Naval Academy Working Paper, 2007.

(30) Rafael,Reuveny and Heejoon Kang(1998), Bilateral Trade and Political Conflict/Cooperation: Do Goods Matter? *Journal of Peace Study*, Vol.35,No.5, pp.581-602.

(31) Xu, Qiyuan and Chen Sichong(2014), Impact of relation tensions between China and Japan on the bilateral economic and trade. *Journal of International Political Science*, No.1, pp1-23.

(32) Yeats, Alexander J., Do African Countries Pay More for Imports? Yes. *World Bank Economic Review*, 1990，Vol.4, No.1, pp.1-20.

(33) Zhu, Feng(2006), Why is Japan so hard to China? *Contemporary International Relations*, No.4, pp34-36.

China’s International Competitiveness in Promoting Free Trade

Akiko Tamura and Peng Xu*

November 2015

Abstract

China has drastically increased its international trade flows in the last decade and now it is a major trade partner for OECD countries as well as ASEN and South Asian countries. The phenomenal export performance of China raises worldwide issues – ‘How competitive is China?’ and ‘Why is China so competitive?’ In this paper, we analyze China’s absolute advantage, its comparative advantage, and its geographical barriers, using a bilateral international trade matrix in manufactures for China and major Asian and OECD countries in 2003-2008. We estimate the Ricardian theory based on the gravity model modified from Eaton and Kortum [2002]. Our finding suggests that China was the most competitive among our sample countries in 2007 and 2008. In addition, China improved its state of technology rapidly after 2003 and the rank was number three following Japan in 2007 and 2008. The analysis of the source of the competitiveness implies that lower wages and higher R&D expenditures are significant. China’s R&D expenditure was comparable with OECD countries but was much higher than emerging countries, whereas China’s wage rate was comparable with emerging countries but was much lower than OECD countries. In addition, the openness to foreign capital and the excellent transportation links may contribute to the unexplained China’s competitiveness.

Keywords: Bilateral trade, gravity model, China’s competitiveness, foreign direct investment, wages, technology

JEL Classification: F11, F13, O24, O33

* Akiko Tamura, Faculty of Economics, Department of International Economics, Hosei University, e-mail: atamura@hosei.ac.jp. Peng Xu, Director and Professor, ICES, Hosei University, e-mail: pxu@hosei.ac.jp. This work is supported by the Grant-in-Aid in Scientific Research of Japan’s Society for the Promotion of Science.

1. Introduction

In the past three decades, China has drastically increased its international trade flows, to the extent that it is now it is one of the major trade partners for OECD countries. In Asia, the most important manufacturing center in the world, in 2006, China–Japan trade volume exceeded US–Japan trade volume and China became the largest trade partner for Japan. The phenomenal export performance of China raises worldwide issues – 'How competitive is China?', 'Why is China so competitive?' and 'Is China's competitiveness sustainable?' Chinese manufacturing industries have been playing a key role in the economic growth of China. China provides a new model for developing countries. Furthermore, in recent economic development literature, the comparative economic analysis between China and India has become a hot topic.

How competitive is China? The answer depends on the cost of producing a unit of a manufacturing good in China as well as the cost of delivering a unit of the good from China in comparison with its trade partners. Wages represent a key cost in manufacturing industries. Regardless of rapid economic growth in the past three decades, Chinese wages are still extremely low in comparison with OECD countries, as well as in comparison with most East Asian countries (Adams, Ganges and Shachmurove [2006]). The low wages may reflect the access to technology of China, because countries are working with different technologies. Meanwhile, the openness of China's economy to foreign direct investment has dramatically improved the efficiency of China's manufacturing technology. China has been the dominant destination for foreign direct investment in East Asia. Foreign direct investment often combines cheap labor costs and foreign technologies and makes a key contribution to China's competitiveness. In sum, foreign direct investment is an important factor, not only for capital flows, but also for flows of technology and management skills (Adams *et al.* [2006]). Moreover, foreign invested firms play a great role in interindustry spillovers to China's manufacturing sector (Wei and Liu [2006]). So far, the openness to foreign direct investment has made a crucial difference in the economic growth between China and India in the past decade.

Quite a few previous papers have discussed a variety of measures and linked them with China's competitiveness. Most of them have documented China's export performance, attributing it to foreign direct investment and low wages. In this paper, we explore China's absolute advantage, its comparative advantage, and its geographical barriers, using a bilateral international trade matrix (N × N data) for China and major Asian and OECD countries in 2003-2008. Here, comparative advantage and competitiveness are interchangeable terms. We estimate the Ricardian model developed in Eaton and Kortum [2002]. The model captures the competing forces of comparative advantage that promote trade, and both artificial and natural geographic barriers that inhibit trade. The model has simple expressions relating bilateral trade volumes to technologies and geographical barriers. Based on Eaton and Kortum [2002], we estimate the parameters needed to examine the absolute advantage and the comparative advantage of China and its trade partners.

Our parameter estimates allow us to explore a number of issues. First, we provide an answer to the question 'How competitive is China?' Also, we explain 'Why China is competitive?' in comparison with India, the second most populous country in the world. Finally, we analyze the consequences of a wage rise in China, which may be caused by appreciation of the RMB. The rest of the paper proceeds as follows. Section 2 describes our empirical model and the dataset. Section 3 explore the issues listed above, using the parameter estimates. Section 4 concludes.

2. The Model and the Data Set

2.1 The Ricardian Theory-based Gravity Model

Our empirical model is the Ricardian theory-based gravity model, which is modified from Eaton and Kortum [2002].[1] With constant returns to scale, the cost of production in country i in good j is $c_i/z_i(j)$, where c_i consists of the cost of labor and of intermediate inputs, and $z_i(j)$ is the realization of technology in good j. Technology has a Fréchet distribution, $F_i(z) = \Pr[Z_i \le z] = \exp(-T_i z^{-\theta})$, with two parameters. The first parameter is $T_i > 0$, where higher T_i means a higher average realization for country i, so T_i reflects country i's absolute advantage. The second parameter is $\theta > 1$, where larger θ implies lower technology differences across countries. Taking geographic barriers, d_{ni}, into account, the cost of exporting good j produced in country i to country n is the price of good j from country i under perfect competition:

$$p_{ni}(j) = \left(\frac{c_i}{z_i(j)}\right) d_{ni}$$

We assume that geographic barriers consist of both natural and artificial barriers, the distance, $dist_{ni}$, sharing border, b_{ni}, and belonging to FTA, fta_{ni}. Countries buy the good j from the cheapest source, so the distribution of prices is $G_{ni}(p) = \Pr[P_{ni} \le p] = 1 - F_i(z) = 1 - F_i(c_i d_{ni}/p)$. Therefore, trade shares are expressed as the probability that country i provides a good at the lowest price in country n:

$$\frac{X_{ni}}{X_n} = \int_0^{\infty} \prod_{s \neq i} [1 - G_{ns}(p)] dG_{ni}(p) = \frac{T_i (c_i d_{ni})^{-\theta}}{\sum_{i=1}^{N} T_i (c_i d_{ni})^{-\theta}}$$

where X_{ni} is the amount of the manufacturing imports from i to n; and X_n is country n's total spending. We assume that production in country i combines labor and intermediate inputs, with labor share β, wage w_i, and overall price index as index of intermediate goods price, $c_i = w_i^{\beta} p_i^{1-\beta}$. We can express trade shares as functions of wages, w_i, geographic barriers, d_{ni},

[1] To describe our model as simply as possible, we introduce only the essence of the complete model by Eaton and Kortum [2002].

and technology parameters, T_i. Normalizing by the importer n's home sales, X_{nn}, gives:

$$\frac{X_{ni}/X_n}{X_{nn}/X_n} = \frac{X_{ni}}{X_{nn}} = \frac{T_i}{T_n}\left(\frac{w_i}{w_n}\right)^{-\theta\beta}\left(\frac{p_i}{p_n}\right)^{-\theta(1-\beta)} d_{ni}^{-\theta}$$

Applying an equation of X_{ni}/X_n to home sales, X_{ii}/X_i, X_{nn}/X_n, we obtain:

$$\frac{p_i}{p_n} = \frac{w_i}{w_n}\left(\frac{T_i}{T_n}\cdot\frac{X_i/X_{ii}}{X_n/X_{nn}}\right)^{-1/\theta\beta}$$

Plugging this relative price of intermediates into previous equation and taking logarithms, we obtain the empirical equation, i.e.:

$$(1) \qquad \ln\frac{X'_{ni}}{X'_{nn}} = S_i - S_n - \theta\ln dist_{ni} - \theta b - \theta fta_{ni} + \delta 1_{ni} + \delta 2_{ni},$$

where $\ln X'_{ni} = \ln X_{ni} - \frac{1-\beta}{\beta}\ln\left(\frac{X_i}{X_{ii}}\right)$. Source countries' competitiveness is defined as $S_i = \frac{1}{\beta}\ln T_i - \theta\ln w_i$; and the geographic barrier is defined as $\ln d_{ni} = \ln dist_{ni} - b_{ni} - fta_{ni}$.

In the same way as Eaton and Kortum[2002], we assume that the error term δ_{ni} consist of two components: $\delta_{ni}=\delta 1_{ni} + \delta 2_{ni}$. The country-pair specific component $\delta 2_{ni}$ affects two-way trade, so that $\delta 2_{ni}=\delta 2_{in}$, while $\delta 1_{ni}$ affects one-way trade. Thus, when $\delta 1_{ni}$ has variance σ_1^2 and $\delta 2_{ni}$ has variance σ_2^2, the variance-covariance matrix of δ has diagonal elements $\sigma_1^2 + \sigma_2^2$ and nonzero off –diagonal elements σ_2^2. We estimate the equation (1) by generalized least squares.

X_{ni} is manufacturing imports from i to n and X_{ii} is gross manufacturing production less manufacturing exports. X_n is country n's total spending, which comprises home purchases plus imports from everywhere else. β is a constant labor share, setting $\beta = 0.21$. S_i is the coefficient on source country dummies; $dist_{ni}$ is the distance between country n and i; b_{ni} is the dummy variable of the effect on n and i on sharing a border; fta_{ni} is the dummy variable of the effect of n and i both belonging to FTA; and δ is the error. Then we estimate the source of competitiveness, S_i:

$$(2) \qquad S_i = \alpha_0 + \alpha_R \ln R_i - \alpha_H \left(\frac{1}{H_i}\right) - \theta \ln w_i + \tau_i$$

We use our estimates of S_i from equation (1), and R_i is country i's R&D expenditure, H_i is the human capital, and τ is the error.

2.2 Sample Countries and Data

We estimate China's competitiveness in comparison with OECD countries, East Asian countries, and South Asian countries including India. Thus, 18 our sample countries are: China; the main OECD countries, namely, Australia, Canada, France, Germany, Italy, UK, US, and Japan; South Korea; ASEAN4, namely, Indonesia, Malaysia, the Philippines and Thailand; and the South Asian countries, India, Sri Lanka, and Pakistan[2]. The sample period is from 2003 to 2008. We perform year-to-year regression[3]. The number of observations in equation (1) is N*(N-1).

Our dependent variable in equation (1) is a transformation of bilateral manufacturing trades, from country i to country n. We use SITC bilateral trade data from the United Nations (UN) Comtrade. X_{ni} is bilateral manufacturing trade from country i to country n; we aggregate SITC 5+6+7+8-68(NON-FERROUS METALS). X_n (X_i) is importer's (exporter's) total

2 Singapore is excluded because Xnn (Xii)<0 in each year.
3 We also perform 2003-2008 average regression, as well as panel regression. In average regression, the number of observation is N*(N-1), and the number of observation is N*(N-1)*T in panel regression.

spending; we add importer's (exporter's) manufacturing production and importer's (exporter's) imports from the world. Manufacturing production data is gross output in US$ from UNIDO INDSTAT4, 2013. X_{nn} (X_{ii}) is importer's (exporter's) home sales; we subtract importer's (exporter's) manufacturing export from importer's (exporter's) manufacturing production. β is a constant labor share, setting β = 0.21.[4]

The first explanatory variables in equation (1), distance between country's capital, is from World Atlas by Microsoft. FTA[5] includes the European Union (EU), North American Free Trade Agreement (NAFTA), ASEAN Free Trade Area, and South Asian Preferential Trading Arrangement (SAPTA) in all sample periods. In addition, China-ASEAN FTA started from 2003.

Explanatory variables in equation (2) are as follows: R&D expenditure (US$) is from World Development Indicators (WDI) Online by the World Bank, and the wage in manufacturing sector is from UNIDO INDSTAT4, 2013 (Wages and salaries / Employees). We also use per capita GDP (PPP, international $) from WDI Online as an indicator of wage rate. Year of schooling is Educational Attainment for Total Population Aged 15 of the Barro-Lee data from the Barro-Lee websites. Table 1 presents descriptive statistics of the explanatory variables in equation (2). The number of observations in equation (2) is N*T in our pooled regression.

3. Estimating the Competitiveness and its Source

We estimate equation (1) by performing year-to-year regression. As shown in the Appendix, distance substantially inhibits trade and FTA enhances international trade, while borders do not have a significant positive effect but have a negative effect in some periods. Table 2 indicates the ranking of competitiveness; which is referred to as comparative advantage,

[4] Setting β = 0.21 is the same assumption as Eaton and Kortum[2002].
[5] From the list on the WTO (World Trade Organization) homepage.

from the estimates of S_i. The estimates of S_i show that China was the third most competitive country from 2003 to 2005, following the United States. In 2006, China's competitiveness ranked second. Japan was the most competitive country from 2003 to 2006. From 2007, China became the most competitive country in terms of comparative advantage of manufacturing industries and stayed ahead. Two years later, China became the second largest economy.

In 1990, Japan was the most competitive country (Eaton and Kortum [2002]) and it stayed ahead until 2006. The United States was next to Japan after the competitive losses in the 1980s. South Korea and Germany were most competitive countries following the United States since 2006. India, the second most populous developing country, was less competitive than China but it was more competitive than France and UK after 2006. Philippines, Sri Lanka and Pakistan were the least competitive countries[6].

A country's competitiveness increases with higher R&D expenditures, higher level of human capital, and cheaper labor costs. Obviously, low wages in China contributed to its international competitiveness. In 2003, China's wage rate was below those in India, Indonesia and the Philippines. Later, China's wage rate has been rapidly increasing, such that in 2008 India and Indonesia had a lower wage rate than China, as Table 3 indicates. However, the 2008 labor cost in the Philippines was more expensive than that in China. On the other hand, China was less innovative than OECD countries except Italy but China put much more money into R&D than emerging countries. Japan was the most innovative country from 2003 to 2008. South Korea ranked as the second innovative country. India was the most innovative among emerging countries until 2007 but it lost to Malaysia in 2008.

Now we estimate equation (2) using robust OLS, using estimated competitiveness, $\hat{S}_i$, from equation (1). Table 4 shows the estimation results. Panel A indicates that equation (2a)

[6] The data for the Philippines, Sri-Lanka, Thailand and Pakistan is only available inconsecutively.

yearly wage has a significantly negative impact on $\hat{S}_i$. Yearly wage data is not available for some country*year. When we use per capita GDP as a proxy for wage rate, the result of equation (2b) remains unchanged, as shown in Panel B of Table 4. Per capita GDP is available for all country*years. However, including 1/Hi does not yield a significant coefficient on human capital. We drop 1/Hi from equation (2a) and equation (2b).

Does a rapid wage rise weaken China's competitiveness? Is China's competitiveness sustainable? To answer the above questions, we estimate 2008 China's competitiveness presuming a doubled 2008 China's wage rate. Even if the 2008 wage rate in China had doubled, it would have remained more competitive than the second most competitive country, Japan. Indeed, from 2003 to 2008, the wage rate in China increased by 164.5% in comparison with a 63.2% growth in India, and in comparison with a 17.5% growth in Japan. At the same time, the RMB appreciated by 20 percent against US dollar. Nonetheless, China sustained its competiveness and finally became the most competitive country in 2007.

The wage rate in China is still much cheaper than wage rates in OECD countries. Adams et al. [2006] pointed out that in coastal areas – such as Shanghai, Jiansu and Guandong provinces – wages (in $US) are much higher than the national average. Recently, cities with huge labor pools in China's interior use tax breaks and cheap land to attract foreign investors. Excellent transport links of highway, railway and airline ensure a reliable supply of inputs. Many foreign and domestic manufacturers have shifted from Shanghai to Henan and Sichuan provinces. They have been building facilities in the poorest regions, where wages are lower and the workforce more stable. It would be hard to recreate what China has done–not only cheap labor costs but also excellent transport links. Therefore, even a rapid wage rise would only hurt China's manufacturing competitiveness slightly.

A country's wage may increase with level of technology. If the wage rise were attributable to technology improvement, it would not hurt China’s competitiveness so much. Now, we calculate the state of technology parameter, $T_i = \left(e^{\hat{S}_i} w_i^{\theta}\right)^{\beta}$, which is also referred to as the absolute advantage of country i, using data on wage and the estimates of the parameter on wage, θ. Table 5a reports the rankings of state of technology, using equation (2b). China’s rank in 2003 is number 7, which was inferior to the United States, Japan, Germany, South Korea, France and Italy. However, China rapidly improved its state of technology over the sample period. In 2004, 2006, China’s state of technology ranked ahead of France and Italy. Then China ranked third in 2005, 2007 and 2008. Over the sample period, the United States ranked first in terms of technology capacity and second ranked Japan. Meanwhile, India was not good as China but it ranked as the top among emerging countries. The Philippines, Pakistan and Sri Lanka ranked as the lowest regarding to the state of technology. Table 5b reports the state of technology calculated using equation (2b).

In viewing China’s competitiveness, it is important to understand that technology is mobile. Unlike financial investment, foreign direct investment comprises not only capital flows but also inflows of technology and management skills. China has been absorbing foreign investment as well as foreign technology, because of its ‘open door’ policy. The sharp increase of registered capital of foreign invested enterprises suggests that foreign firms seek entry to China with the intention of eventually penetrating China’s local markets for sales in the future. However, they begin by setting up subsidiaries or joint ventures in China to produce products for export to their home country, using the cheap Chinese labor force (Adams *et al.* [2006]). Direct foreign invested firms play a great role in expansion of exports. Foreign invested firms’ share in exports has been more than 40 percent since the late 1990s. Meanwhile, foreign invested firms import about 20 percent of total imports in China.

Indirectly, spillovers from foreign invested firms to China’s manufacturing sector strengthen China's competitiveness in the locally owned sector. The openness to foreign direct investment implies that China is a recipient of foreign technology. Wei and Liu [2006] assessed productivity spillovers from R&D, exports, and the very presence of foreign direct investment in China's manufacturing sector, based on a panel of indigenous and foreign-invested firms for 1998–2001. There are positive interindustry productivity spillovers from R&D and exports, and positive intra- and interindustry productivity spillovers from foreign presence to indigenous Chinese firms within regions. Furthermore, OECD-invested firms seem to play a much greater role in interindustry spillovers than overseas Chinese firms from Hong Kong, Macao, and Taiwan do within their respective regions. As suggested above, foreign direct investment has been a major factor in improving China's technology. It is remarkable that the effect of foreign direct investment on technology improvement is so much more pronounced, compared with India.

Based on the above estimation results of equation (2), we predict the competitiveness of each country in 2008. Table 6 reports these rankings of predicted competitiveness, as well as the estimated competitiveness of equation (1). The predicted competitiveness for China is largely underestimated. What is responsible for this unexplained competitiveness of China?' We conjecture that this might be attributable to foreign direct investment and excellent infrastructures in China. The openness to foreign direct investment implies openness to foreign technology. From this viewpoint, China may provide a new economic growth model for developing countries.

4. Conclusion

In this paper, we explore China's absolute advantage, its comparative advantage, and its geographical barriers, using bilateral international trade matrix (N × N-1 data) for China and major Asian and OECD countries in 2003–2008. Our findings suggest that China was the most competitive country in 2007-2008. China's low wage rate contributed to its competitiveness. Recently, China's wages have been increasing with its technology improvement. However, a wage rise would not substantially change China's comparative advantage. In addition, excellent infrastructures ensure manufacturers to move factories to China's interior, where wages are lower and the workforce more stable. Rapid expansion in R&D is another important factor that contributes to technology improvement in China. Also, in relation to China's competitiveness, it is important to understand that technology is as mobile as capital flows. Foreign direct investment includes not only capital flows but also inflows of technology and management skills. Direct foreign invested firms play a great role in expansion of export. Indirectly, spillovers from foreign invested firms to China's manufacturing sector strengthen China's competitiveness in the locally owned sector. The openness to foreign direct investment implies openness to foreign technology. It is very clear today that rising Chinese economy has important implications for emerging countries. It would be crucial to recreate what China has done—excellent transport links, an open system to foreign capital and foreign technology and innovation, in addition to cheap labor costs.

References:

Adams, F. Gerard, Byron Ganges and Yochanan Shachmurove [2006], "Why is China so Competitive? Measuring and Explaining China's Competitiveness", *World Economy,* 29.

Eaton, Jonathan and Samuel Kortum [2002], "Technology, Geography, and Trade", *Econometrica,* 70, 1741–1779.

Eaton, Jonathan and Akiko Tamura [1994], "Bilateralism and Regionalism in Japanese and U.S. Trade and Direct Foreign Investment Patterns", *Journal of the Japanese and International*

Economies, 8, 478-510.

Tamura, Akiko and Peng Xu [2006], “Trade and Investment between China and the World” (in Japanese), *Chinese Research Monthly*, Institute of Chinese Affairs, 60(7), 15-28.

Wei, Y. and X. Liu, [2006], “Productivity Spillovers from R&D, Exports and FDI in China’s Manufacturing Sector”, *Journal of International Business Studies,* 37, 544–557.

Table 1 Descriptive Statistics

year		mean	sd	min	p25	p50	p75	max	N
2003	R&D	1.593751	0.976258	0.06544	0.70779	1.77731	2.48577	3.14388	14
	Percapita GDP	20197.9	13148.87	1840.66	3204.21	27242.8	29793.2	39682.5	14
	Schooling	9.618429	2.243783	5.39	8.056	10.3	11.256	12.772	14
	Wage (US dollar)	18517.4	15031.18	1456.639	2061.886	21734.89	31279.81	40220.44	12
2004	R&D	1.720252	0.918794	0.06544	1.09127	1.85791	2.50339	3.1332	13
	Percapita GDP	22637.11	13204.07	2010.01	11369.1	28089.6	31329	41928.9	13
	Schooling	9.872769	2.279768	5.51	9.076	10.864	11.332	12.816	13
	Wage (US dollar)	24145.75	17114.61	1372.674	3823.768	29481.28	38104.69	44885.27	12
2005	R&D	1.647255	1.012848	0.06544	0.77914	1.87027	2.5058	3.3087	14
	Percapita GDP	22280.67	14354.55	2233.86	4114.57	28866.2	32525.6	44313.6	14
	Schooling	9.876429	2.239638	5.63	8.18	10.61	11.46	12.86	14
	Wage (US dollar)	23564.96	18060.74	1416.978	2826.086	29103.47	38843.25	45560.25	13
2006	R&D	1.453126	1.093659	0.06544	0.55536	1.3883	2.1891	3.4091	17
	Percapita GDP	20260.35	15562.78	2314.32	3897.5	24246.5	33503.3	46443.8	17
	Schooling	9.542	2.425362	4.948	7.334	10.232	11.412	12.924	17
	Wage (US dollar)	20480.51	19321.93	1165.825	2254.172	16757.54	40639.3	47717.19	16
2007	R&D	1.734009	1.07538	0.06544	0.75751	1.866785	2.53169	3.46142	14
	Percapita GDP	24931.43	15553.43	2757.57	5543.02	32523	36213.8	48070.4	14
	Schooling	10.23057	2.15032	5.874	9.342	10.882	11.696	12.988	14
	Wage (US dollar)	26741.9	20706.17	1529.11	2898.712	31725.5	45308.13	52596.23	13
2008	R&D	1.674247	1.15429	0.06544	0.75751	1.77949	2.68945	3.46706	15
	Percapita GDP	24107.31	16177.01	2882.12	4533.59	33372.1	37119.2	48407.1	15
	Schooling	10.19813	2.12192	5.996	8.33	10.456	11.814	13.052	15
	Wage (US dollar)	24789.65	21809.66	1374.386	3852.94	28488.33	46245.09	56740.48	13
Total	R&D	1.630234	1.020272	0.06544	0.74385	1.77017	2.5058	3.46706	87
	Percapita GDP	22345.5	14460.07	1840.66	4234.28	28089.6	33396.6	48407.1	87
	Schooling	9.881471	2.200498	4.948	8.18	10.344	11.48	13.052	87
	Wage (US dollar)	22986.08	18487.96	1165.825	2351.994	28280.96	40220.44	56740.48	79

Table 2 Competitiveness Ranking: $\exp(S_i)$ $(\exp(S_{US})=1)$

2003			2004			2005	
Japan	1.173		Japan	1.293		Japan	1.064
USA	1.000		USA	1.000		USA	1.000
China	0.397		China	0.925		China	0.832
Germany	0.217		Germany	0.280		Korea Rep. of	0.236
Korea Rep. of	0.187		Korea Rep. of	0.232		Germany	0.209
France	0.121		Italy	0.155		Italy	0.117
Italy	0.112		France	0.107		France	0.096
India	0.065		India	0.106		India	0.078
United Kingdom	0.054		United Kingdom	0.072		United Kingdom	0.049
Indonesia	0.047		Indonesia	0.048		Indonesia	0.037
Australia	0.024		Australia	0.029		Australia	0.022
Malaysia	0.013		Canada	0.019		Canada	0.014
Canada	0.013		Malaysia	0.012		Malaysia	0.010
Philippines	0.000		Pakistan			Philippines	0.001
	2006		2007			2008	
Japan	1.284		China	2.103		China	1.959
China	1.130		Japan	1.246		Japan	1.135
USA	1.000		USA	1.000		USA	1.000
Korea Rep. of	0.432		Korea Rep. of	0.335		Korea Rep. of	0.308
Germany	0.177		Germany	0.296		Germany	0.295
India	0.121		Italy	0.206		Italy	0.174
Italy	0.117		India	0.160		India	0.144
France	0.105		France	0.101		France	0.087
Indonesia	0.053		United Kingdom	0.068		United Kingdom	0.067
United Kingdom	0.050		Indonesia	0.063		Malaysia	0.040
Thailand	0.026		Australia	0.028		Indonesia	0.027
Australia	0.023		Malaysia	0.018		Australia	0.024
Canada	0.015		Canada	0.017		Canada	0.019
Malaysia	0.012		Sri Lanka	0.002		Philippines	0.003
Pakistan	0.005					Sri Lanka	0.001
Sri Lanka	0.002						
Philippines	0.001						

Table 3 R&D, education and wages

2003			
Country	R&D	Year of Schooling	Wage (US dollar)
Australia	1.80395	11.256	
Canada	2.03524	11.598	30824
China	1.13356	7.146	1456.64
France	2.17703	9.972	31735.6
Germany	2.53963	11.014	40220.4
India	0.70779	5.39	1542.01
Indonesia	0.06544	5.906	1651.78
Italy	1.10064	9.002	24543.3
Japan	3.14388	11.156	27987.4
Korea Rep. of	2.48577	11.3	18926.5
Malaysia	0.62622	9.462	5701.56
Pakistan	0.32833	4.506	
Philippines	0.12994	8.056	2471.99
Sri Lanka	0.16301	10.282	
Thailand	0.26192	6.478	
United Kingdom	1.75067	10.628	35147.6
USA	2.61275	12.772	
2004			
Australia	1.85791	11.318	
Canada	2.06669	11.814	35358
China	1.22989	7.218	1679.97
France	2.15591	10.046	35459.2
Germany	2.50339	11.332	44885.3
India	0.74385	5.51	1628.55
Indonesia	0.06544	6.158	1372.67
Italy	1.09127	9.076	28281
Japan	3.1332	11.228	30681.6
Korea Rep. of	2.68298	11.38	21274.3
Malaysia	0.5999	9.586	5967.56
Pakistan	0.32833	4.718	
Philippines	0.120685	8.118	
Sri Lanka	0.1821	10.296	
Thailand	0.25535	6.754	
United Kingdom	1.68751	10.864	40750.2
USA	2.54533	12.816	42410.7
2005			
Australia	2.0235	11.38	
Canada	2.03975	12.03	38843.3
China	1.32476	7.29	1915.35
France	2.10865	10.12	37303.7
Germany	2.5058	11.65	45560.3
India	0.77914	5.63	1794.47
Indonesia	0.06544	6.41	1416.98
Italy	1.08598	9.15	29103.5
Japan	3.3087	11.3	30486.4
Korea Rep. of	2.79176	11.46	25109
Malaysia	0.60548	9.71	6021.23
Pakistan	0.43689	4.93	
Philippines	0.11143	8.18	2826.09
Sri Lanka	0.17815	10.31	
Thailand	0.23498	7.03	
United Kingdom	1.71704	11.1	41929.1
USA	2.59414	12.86	44035.2

2006			
Country	R&D	Year of Schooling	Wage (US dollar)
Australia	2.1891	11.412	
Canada	2.00489	12.088	42421.3
China	1.3883	7.334	2275.64
France	2.10801	10.232	38857.3
Germany	2.54026	11.794	47717.2
India	0.76703	5.752	1875.76
Indonesia	0.06544	6.65	1707.17
Italy	1.12732	9.246	30614
Japan	3.4091	11.36	29425.5
Korea Rep. of	3.00918	11.578	27907.5
Malaysia	0.61106	9.856	5607.56
Pakistan	0.55536	4.948	2334.82
Philippines	0.11053	8.23	3244.11
Sri Lanka	0.1742	10.26	1165.83
Thailand	0.24919	7.222	2232.7
United Kingdom	1.74046	11.328	44703.2
USA	2.65371	12.924	45598.7
2007			
Australia	2.2978	11.444	
Canada	1.9634	12.146	45308.1
China	1.39582	7.378	2898.71
France	2.08306	10.344	43629.1
Germany	2.53169	11.938	52596.2
India	0.75751	5.874	2351.99
Indonesia	0.06544	6.89	1666.56
Italy	1.17304	9.342	34599.9
Japan	3.46142	11.42	29217
Korea Rep. of	3.21035	11.696	31725.5
Malaysia	0.699765	10.002	6277.19
Pakistan	0.67383	4.966	
Philippines	0.10963	8.28	
Sri Lanka	0.14432	10.21	1529.11
Thailand	0.21378	7.414	
United Kingdom	1.77017	11.556	50162.4
USA	2.72234	12.988	45682.9
2008			
Australia	2.40649	11.476	
Canada	1.91784	12.204	46245.1
China	1.46986	7.422	3852.94
France	2.12427	10.456	51189.1
Germany	2.68945	12.082	56740.5
India	0.75751	5.996	2516.8
Indonesia	0.06544	7.13	1919.73
Italy	1.20577	9.438	38411
Japan	3.46706	11.48	32904.8
Korea Rep. of	3.3609	11.814	28488.3
Malaysia	0.78847	10.148	6889.37
Pakistan	0.56932	4.984	
Philippines	0.10963	8.33	4230.37
Sri Lanka	0.11444	10.16	1374.39
Thailand	0.23217	7.606	
United Kingdom	1.77949	11.784	
USA	2.85709	13.052	47502.9

Table 4 Regressions of competitiveness on R&D and wage

Panel A equation (2a)		
	Coefficient	s.e.
R&D	1.595	0.224
ln(wage)	−0.545	0.193
_cons	2.648	1.814
R-squared	0.484	
Number of obs	79	
Panel B equation (2b)		
R&D	1.477	0.271
ln(per capita GDP)	−0.627	0.221
_cons	3.416	2.099
R-squared	0.423	
Number of obs	87	

Table 5a The ranking of state of technology based on equation (2a)

2003			2004			2005	
Japan	3.336054		Japan	3.440491		USA	3.397538
Germany	2.439625		USA	3.382962		Japan	3.300408
Korea Rep. of	2.170287		Germany	2.605932		Germany	2.454909
France	2.101217		Korea Rep. of	2.301186		Korea Rep. of	2.353008
Italy	2.006227		China	2.300622		China	2.283616
China	1.894943		Italy	2.183987		Italy	2.066174
United Kingdom	1.794162		France	2.071507		France	2.038152
Canada	1.307031		United Kingdom	1.937752		United Kingdom	1.796686
India	1.306321		India	1.454251		India	1.380019
Indonesia	1.230164		Canada	1.438465		Canada	1.375674
Malaysia	1.086543		Indonesia	1.209892		Indonesia	1.14952
Philippines	0.423508		Malaysia	1.063907		Malaysia	1.036947
						Philippines	0.571476
2006			2007			2008	
Japan	3.41943		USA	3.411844		USA	3.427124
USA	3.411124		Japan	3.395064		Japan	3.375045
Korea Rep. of	2.703238		China	2.909355		China	2.96136
China	2.483861		Germany	2.685674		Germany	2.707186
Germany	2.382636		Korea Rep. of	2.600675		Korea Rep. of	2.524925
France	2.085726		Italy	2.370887		Italy	2.315679
Italy	2.078699		France	2.099097		France	2.071382
United Kingdom	1.811752		United Kingdom	1.96312		India	1.631132
India	1.518554		India	1.654734		Canada	1.480428
Canada	1.399967		Canada	1.455236		Malaysia	1.40065
Indonesia	1.265008		Indonesia	1.30635		Indonesia	1.115835
Thailand	1.118681		Malaysia	1.172234		Philippines	0.768578
Malaysia	1.065221		Sri Lanka	0.60805		Sri Lanka	0.496689
Pakistan	0.810531						
Sri Lanka	0.634819						
Philippines	0.585945						

Table 5b The ranking of state of technology based on equation (2b)

2003			2004			2005	
USA	4.03608		Japan	4.094284		USA	4.095214
Japan	3.985231		USA	4.065473		Japan	3.948731
Germany	2.801527		Germany	2.972934		China	2.880424
Korea Rep. of	2.597536		China	2.894646		Germany	2.813324
France	2.465647		Korea Rep. of	2.742478		Korea Rep. of	2.770577
Italy	2.425332		Italy	2.600838		Italy	2.461207
China	2.386262		France	2.41029		France	2.37253
United Kingdom	2.108703		United Kingdom	2.257814		United Kingdom	2.097531
Australia	1.776885		Australia	1.854509		Australia	1.758853
Canada	1.567093		Canada	1.708687		Canada	1.630843
India	1.519215		India	1.700331		India	1.618088
Indonesia	1.496276		Indonesia	1.515397		Indonesia	1.448354
Malaysia	1.369724		Malaysia	1.347249		Malaysia	1.32302
Philippines	0.489972					Philippines	0.662532
2006			2007			2008	
Japan	4.130814		USA	5.252594		USA	4.143172
USA	4.120629		Japan	5.201141		Japan	4.055169
Korea Rep. of	3.170619		China	4.40366		China	3.636792
China	3.130789		Germany	3.883771		Germany	3.096703
Germany	2.742695		Korea Rep. of	3.79993		Korea Rep. of	2.992106
Italy	2.48496		Italy	3.539882		Italy	2.731181
France	2.435789		France	3.066055		France	2.370292
United Kingdom	2.117215		United Kingdom	2.863363		United Kingdom	2.266527
India	1.796121		Australia	2.374728		India	1.902757
Australia	1.78899		India	2.30395		Australia	1.826221
Canada	1.654055		Canada	2.165885		Malaysia	1.802813
Indonesia	1.574623		Indonesia	1.973245		Canada	1.744771
Thailand	1.495852		Malaysia	1.870716		Indonesia	1.395416
Malaysia	1.382187		Sri Lanka	0.950016		Philippines	0.871284
Pakistan	0.92648					Sri Lanka	0.659105
Sri Lanka	0.84148						
Philippines	0.674293						

Table 6 Estimated competiveness (si), predicted competitiveness based on equation (2a) (sihat) and the difference in 2008

	si	sihat	difference
Canada	−3.982	−2.165	−1.818
China	0.673	−1.235	1.908
France	−2.438	−2.057	−0.382
Germany	−1.220	−1.737	0.517
India	−1.935	−2.061	0.125
Indonesia	−3.596	−5.819	2.223
Italy	−1.751	−2.804	1.053
Japan	0.127	−1.035	1.162
Korea Rep. of	−1.176	−1.006	−0.170
Malaysia	−3.209	−2.545	−0.664
Philippines	−5.801	−5.426	−0.375
Sri Lanka	−7.268	−4.745	−2.523
USA	0.000	−1.543	1.543

Appendix I: Equation (1) Panel FGLS Estimation Results

	Panel FGLS		Panel FGLS		Panel FGLS		Panel FGLS		Panel FGLS		Panel FGLS	
	1999-2010		2003-2010		1999-2001		2002-2005		2006-2007		2007-2010	
	est.	s.e.	est.	s.e.	est.	s.e.	est.	s.e.	est.	s.e.	est.	s.e.
Source Country												
Exporter : Si												
Australia	-3.748	0.105	-3.673	0.121	(omitted)		-3.618	0.142	-3.738	0.156	-3.619	0.223
Canada	-4.271	0.101	-4.157	0.121	-4.515	0.185	-4.314	0.142	-4.171	0.156	-4.133	0.223
China	0.052	0.110	0.203	0.123	(omitted)		-0.528	0.162	0.186	0.159	0.827	0.226
France	-2.346	0.102	-2.330	0.123	-2.559	0.189	-2.172	0.143	-2.295	0.158	-2.522	0.233
Germany	-1.526	0.103	-1.425	0.124	-1.972	0.192	-1.451	0.145	-1.528	0.159	-1.329	0.234
India	-2.380	0.103	-2.185	0.124	-2.878	0.194	-2.524	0.146	-2.177	0.160	-1.929	0.234
Indonesia	-3.198	0.101	-3.107	0.122	-3.762	0.186	-2.995	0.142	-3.027	0.157	-3.398	0.232
Italy	-2.053	0.102	-1.938	0.123	-2.484	0.190	-2.045	0.144	-1.988	0.158	-1.840	0.233
Japan	0.108	0.103	0.132	0.123	0.011	0.191	0.196	0.146	0.192	0.160	0.035	0.225
Korea Rp	-1.439	0.107	-1.279	0.131	-1.877	0.193	-1.552	0.147	-1.111	0.162	-1.248	0.273
Malaysia	-4.455	0.102	-4.166	0.122	-5.393	0.194	-4.542	0.142	-4.357	0.157	-3.500	0.225
Pakistan	-5.397	0.231	-5.297	0.234	(omitted)		(omitted)		-5.260	0.216	(omitted)	
Philippines	-7.158	0.126	-6.936	0.147	-8.220	0.232	-8.296	0.205	-6.896	0.172	-5.815	0.270
Sri Lanka	-6.886	0.138	-6.811	0.143	(omitted)		(omitted)		-6.270	0.179	-7.319	0.226
Thailand	-3.731	0.150	-3.715	0.234	-4.782	0.229	-3.137	0.195	-3.682	0.215	(omitted)	
UK	-2.837	0.103	-2.842	0.124	-2.885	0.192	-2.764	0.145	-2.912	0.159	-2.843	0.234
Deatination Country												
Importer : Sn												
Australia	0.730	0.105	0.663	0.121	(omitted)		0.720	0.142	0.677	0.156	0.655	0.223
Canada	2.029	0.101	1.980	0.121	2.043	0.186	2.066	0.142	2.006	0.156	1.999	0.223
China	-1.408	0.110	-1.532	0.123	(omitted)		-0.830	0.162	-1.450	0.159	-2.256	0.226
France	0.235	0.102	0.382	0.123	0.129	0.189	-0.189	0.143	0.356	0.158	0.948	0.233
Germany	0.461	0.103	0.559	0.124	0.297	0.192	0.198	0.145	0.697	0.159	0.695	0.234
India	-1.132	0.103	-1.092	0.124	-1.293	0.194	-1.196	0.146	-1.120	0.160	-0.830	0.234
Indonesia	0.317	0.101	0.185	0.122	1.057	0.186	0.038	0.142	0.126	0.157	0.459	0.232
Italy	-0.524	0.102	-0.546	0.123	-0.414	0.190	-0.679	0.144	-0.475	0.158	-0.493	0.233
Japan	-1.564	0.103	-1.565	0.123	-1.551	0.191	-1.577	0.146	-1.495	0.160	-1.687	0.225
Korea Rp	-0.348	0.107	-0.398	0.131	-0.141	0.193	-0.297	0.147	-0.526	0.163	-0.007	0.274
Malaysia	3.005	0.102	2.672	0.122	4.194	0.193	3.143	0.142	2.945	0.157	1.685	0.225
Pakistan	0.775	0.231	0.746	0.234	(omitted)		(omitted)		0.731	0.216	(omitted)	
Philippines	5.204	0.126	4.901	0.147	6.367	0.226	6.835	0.205	4.887	0.171	2.877	0.270
Sri Lanka	1.547	0.138	1.569	0.143	(omitted)		(omitted)		0.675	0.179	2.539	0.226
Thailand	1.769	0.150	2.038	0.234	2.878	0.229	0.760	0.195	2.019	0.215	(omitted)	
UK	1.539	0.103	1.607	0.124	1.296	0.193	1.418	0.145	1.730	0.159	1.635	0.234
Distance(ln(distni))	-0.391	0.045	-0.349	0.050	-0.510	0.104	-0.426	0.072	-0.342	0.065	-0.282	0.074
Shaired border(bni)	0.093	0.086	0.162	0.097	-0.319	0.206	-0.003	0.130	0.151	0.125	0.229	0.152
FTA(ehni)	0.679	0.085	0.718	0.090	0.735	0.243	0.717	0.149	0.739	0.113	0.883	0.126
Const	0.550	0.442	0.106	0.499	1.842	1.004	0.896	0.700	0.035	0.646	-0.587	0.762
Number of obs.	1875		1346		373		494		636		372	
Wald chi2	18252.49		13808.42		5621.75		8111.02		8694.14		6887.57	

Appendix II: Equation (1) Year to Year Estimation Results

	FGLS		FGLS		FGLS		FGLS		FGLS		FGLS	
	2003		2004		2005		2006		2007		2008	
	est.	s.e.	est.	s.e.	est.	s.e.	est.	s.e.	est.	s.e.	est.	s.e.
Source Country												
Exporter: Si												
Australia	−3.727	0.201	−3.555	0.185	−3.830	0.195	−3.780	0.232	−3.573	0.238	−3.735	0.242
Canada	−4.355	0.171	−3.973	0.164	−4.237	0.175	−4.202	0.200	−4.053	0.238	−3.982	0.215
China	−0.924	0.197	−0.078	0.175	−0.184	0.190	0.122	0.190	0.743	0.193	0.673	0.203
France	−2.110	0.158	−2.238	0.145	−2.343	0.168	−2.255	0.183	−2.288	0.194	−2.438	0.177
Germany	−1.528	0.156	−1.274	0.142	−1.566	0.151	−1.733	0.179	−1.216	0.208	−1.220	0.187
India	−2.726	0.182	−2.245	0.169	−2.547	0.188	−2.116	0.216	−1.830	0.230	−1.935	0.215
Indonesia	−3.049	0.150	−3.028	0.154	−3.289	0.154	−2.934	0.186	−2.768	0.215	−3.596	0.195
Italy	−2.190	0.171	−1.863	0.139	−2.143	0.169	−2.142	0.179	−1.582	0.180	−1.751	0.178
Japan	0.160	0.191	0.257	0.189	0.062	0.185	0.250	0.211	0.220	0.221	0.127	0.200
Korea Rp	−1.674	0.447	−1.459	0.455	−1.443	0.454	−0.840	0.408	−1.094	0.476	−1.176	0.448
Malaysia	−4.315	0.174	−4.440	0.177	−4.568	0.178	−4.401	0.179	−4.006	0.212	−3.209	0.193
Pakistan	(omitted)		(omitted)		(omitted)		−5.225	0.267	(omitted)		(omitted)	
Philippines	−8.347	0.250	(omitted)		−6.993	0.234	−6.949	0.265	(omitted)		−5.801	0.253
Sri Lanka	(omitted)		(omitted)		(omitted)		−6.010	0.323	−6.363	0.366	−7.268	0.339
Thailand	(omitted)		(omitted)		(omitted)		−3.666	0.192	(omitted)		(omitted)	
UK	−2.918	0.168	−2.632	0.152	−3.007	0.164	−3.002	0.172	−2.683	0.190	−2.697	0.176
Deatination Country												
Importer: Sn												
Australia	0.705	0.248	0.646	0.248	0.796	0.267	0.577	0.253	0.646	0.276	0.851	0.275
Canada	1.980	0.305	1.857	0.330	2.076	0.325	1.856	0.296	2.094	0.338	2.066	0.315
China	−0.601	0.286	−1.122	0.276	−1.079	0.288	−1.500	0.315	−1.894	0.344	−2.036	0.342
France	−0.429	0.259	0.097	0.260	0.168	0.269	0.280	0.260	0.703	0.281	0.926	0.270
Germany	0.223	0.272	0.179	0.267	0.550	0.268	0.871	0.278	0.648	0.301	0.585	0.289
India	−1.181	0.257	−1.267	0.251	−1.061	0.267	−1.241	0.285	−1.099	0.276	−0.694	0.275
Indonesia	−0.190	0.314	0.209	0.314	0.612	0.304	−0.203	0.314	−0.044	0.342	0.845	0.307
Italy	−0.740	0.324	−0.740	0.316	−0.642	0.325	−0.359	0.304	−0.415	0.337	−0.620	0.329
Japan	−1.577	0.278	−1.596	0.275	−1.446	0.288	−1.586	0.291	−1.504	0.294	−1.672	0.288
Korea Rp	−0.251	0.240	−0.331	0.239	−0.431	0.251	−0.754	0.258	−0.401	0.285	0.079	0.276
Malaysia	2.795	0.310	3.122	0.298	3.287	0.298	2.882	0.300	2.587	0.323	1.330	0.306
Pakistan	(omitted)		(omitted)		(omitted)		0.657	0.270	(omitted)		(omitted)	
Philippines	6.820	0.311	(omitted)		5.079	0.318	4.672	0.284	(omitted)		2.877	0.317
Sri Lanka	(omitted)		(omitted)		(omitted)		0.136	0.372	1.332	0.404	2.742	0.384
Thailand	(omitted)		(omitted)		(omitted)		1.926	0.271	(omitted)		(omitted)	
UK	1.491	0.287	1.287	0.298	1.570	0.289	1.862	0.297	1.751	0.338	1.562	0.320
Distance(ln(distni))	−0.453	0.129	−0.361	0.131	−0.520	0.115	−0.310	0.101	−0.203	0.133	−0.190	0.118
Shaired border(bni)	−0.043	0.230	0.018	0.211	−0.078	0.221	0.150	0.191	0.396	0.238	0.236	0.215
FTA(ehni)	0.642	0.287	0.800	0.287	0.492	0.241	0.842	0.187	0.821	0.223	1.090	0.216
Const	1.254	1.196	0.234	1.208	1.756	1.098	−0.182	0.971	−1.436	1.263	−1.501	1.104
Number of obs.	182		156		182		272		182		210	
LOG Likelihood	−168.76		−133.072		−166.978		−286.529		−192.096		−218.003	

The Quality of Distance:

Quality Sorting, the Alchian-Allen Effect, and Geography

Kazutaka Takechi
Faculty of Economics
Hosei University
4342 Aihara-machi, Machida-shi
Tokyo, 194-0298, Japan
Tel: +81-42-783-2566
Fax: +81-42-783-2611
Email: ktakechi@hosei.ac.jp

Current Draft: November 22, 2015

Abstract

Either quality sorting or the presence of a specific cost (the so-called Alchian-Allen effect) is considered to be the main mechanism for the positive relationship between product quality and the distance to market. However, the reduced-form regressions found in the literature generally fail to reveal which of these two mechanisms is (or even whether both are) the main driving force. In this study, we employ unique Japanese individual goods price data to identify separately the effects of quality sorting and specific costs. Our empirical analysis shows that while high-cost producers produce high-quality goods, as suggested in Baldwin and Harrigan (2011), the quality-sorting mechanism solely is not sufficiently strong to account for the purported positive link between quality and distance. Moreover, we do find that the technology parameter that relates costs to quality is overestimated in the absence of specific costs. On this basis, we confirm that the presence of specific costs is significant, which may generate the positive relationship between quality and distance. We also find that the specific-cost components in transport costs are more distance elastic than any ad valorem components, a finding qualitatively consistent with the trade cost specification in Hummels and Skiba (2004). Finally, our results are robust with respect to various measures of distance and specification.

Key Words : *Quality sorting; Transport costs; Specific costs; Geographic barriers; Producer heterogeneity*

JEL Classification Number : F11, F14, F41

We would like to thank Volodymyr Lugovskyy, Ryosuke Okamoto, and seminar participants at GRIPS and RIETI for useful discussions. The usual disclaimer applies. We gratefully acknowledge the financial support of the Ministry of Science, Technology, and Education (No. 15K03647). This study is conducted as a part of the Project Trade and Industrial Policies in a Complex World Economy undertaken at Research Institute of Economy, Trade and Industry(RIETI)

1. Introduction

Are the markets for high-quality goods more remote than for low-quality goods? The response of many studies appears to be in the affirmative (Bastos and Silva (2010), Baldwin and Harrigan (2011), Manova and Zhang (2012), Martin (2012)). However, while this positive relationship between the quality of goods and the distance to market results only from simple observation, it does lead to a more primary concern when evaluating trade models and the specification of trade costs. This is because this empirical relationship is inconsistent with the prediction of standard firm heterogeneity models in the absence of a quality dimension and the specification of iceberg-type trade costs. Therefore, we need to incorporate novel elements into our modelling, in the form of quality sorting and the presence of specific trade costs, to reconcile the available empirical and theoretical evidence.

A quality-sorting mechanism introduces quality into standard firm heterogeneity models. Because high-quality products are also highly profitable, they can overcome the significant trade costs associated with long distances to market. In contrast, in standard firm heterogeneity trade models, as distance increases, only highly productive, hence low-cost, firms can provide supply. Because low-cost producers are able to set lower prices, when measuring quality the average free on board (FOB) price, the FOB price is typically lower in distant markets, which is not what the pattern of observed data suggests. Hence, it is necessary to incorporate quality in a firm-heterogeneity model to account for the supposed positive relationship between quality and distance (Baldwin and Harrigan, 2011).

The presence of specific costs also account for the positive relationship between good quality and distance to market. The relative prices of high quality, and therefore higher-priced goods, are lower in distant markets when there are specific costs in trade. Hence, the relative demand for high-quality goods is also high in these markets. This enables firms producing high-quality goods to ship to these more distant markets, a process referred to as the Alchian–Allen effect (Hummels and Skiba, 2004). Importantly, this change in relative prices does not arise under iceberg-type trade costs.

However, because of data limitations, to our knowledge, the Alchian–Allen and quality-sorting effects have not been jointly analyzed using individual pricing data. In the literature, the FOB price (the unit value) of export goods is regressed on the distance to market. Unit value is then the measure of quality. Unfortunately, in most cases, no data on trade costs are available. Because the Alchian–Allen effects concern the specification of the trade cost function, to identify the impacts of the quality-sorting and Alchian–Allen effects, we need to link quality, trade costs, and distance separately. However, in the absence of trade cost data, we could erroneously attribute variations in quality to distance, not to trade costs. Thus, with the exception of Hummels (2001) and Hummels and Skiba (2004), such an identification remains undone because trade cost information is usually unavailable. The contribution of this study to the literature is then to analyze the quality-sorting and Alchian–Allen effects jointly and identify these effects separately.

In the recent literature, several studies incorporate specific cost components in trade costs and assess their size and impact. For instance, Irarrazabal et al. (2013) show that the size of specific costs is large and significant, while Khandelwal et al. (2013) use specific costs to model quotas, which affect firm behavior in a different way from an ad-valorem cost reduction. While our study shares a common motivation concerning the impact of specific costs, our focus is slightly different, which is the identification of the impact of distance on ad-valorem and specific costs.

In this paper, we first follow Anderson and van Wincoop's (2004) suggestion for use of the price of production (at the source or origin). The use of source and market price data enables us to measure trade costs because there is actual delivery between these areas. As examples of the use of origin information, Donaldson (2013) uses salt price data in India, Atkin and Donaldson (2014) employ price data in Ethiopia and Nigeria, for which source prices are also available, and Kano et al. (2013) use wholesale vegetable price data in Japan, including a detailed description that allows the identification of identical products in different locations. Because price differentials reflect both ad-valorem and specific costs, it remains necessary to identify these costs separately. Then by utilizing the monotonic relationship between price and quality arising from the optimal price formula, we are able to obtain information on quality and production costs from the price data. Because variable costs consist of ad-valorem trade costs multiplied by production and specific costs, derived production costs enable us to separate ad-valorem costs from specific costs.

There is also an additional identification problem in that if transport is too costly, even high-quality goods may not be supplied to distant markets. This self-selection bias is absent in most of the literature, with the exception of Kano et al. (2013, 2014), and may serve to create an under biased distance effect. To overcome this, we employ unique micro data on agricultural product (vegetable) prices in Japan. As in Kano et al. (2013, 2014), this data set contains market and origin prices, and information on the region where a product is produced. Thus, we can establish product delivery patterns and take into account selection bias arising because of delivery choices.

The analysis in this paper begins with reduced-form regressions as in the existing literature. Our origin price is approximately equivalent to a FOB price in the literature, which is used to measure product quality. Therefore, we first simply regress origin prices on distance to markets and find that our vegetable qualities are also positively associated with the distance to market. We then estimate the structural model to obtain the ad-valorem and specific cost components separately. We use the origin price and markup formula to back out the cost of production and utilize the derived production cost to identify the ad-valorem and specific costs. Our estimations show that the specific cost component is more distance elastic than the ad-valorem component, which is qualitatively consistent with the specification adopted by Hummels and Skiba (2004). The empirical analysis also shows that the technology parameter connecting production costs and quality is positive (high-cost producers produce high-quality goods). However, the magnitude of the increase in quality associated with these costs alone is not sufficient to account for the positive link between quality and distance, suggesting that the quality-sorting effect is weak. The presence of specific costs is then important for a positive relationship between quality and distance. In addition, the size of the technology parameter in the case of no specific costs is higher than when we consider specific costs. This suggests that in the absence of specific costs, the technology parameter is overestimated. Thus, our contribution is to detect not only the relationship between quality and distance, but also the technical relationship between quality and costs.

Existing studies, such as Irarrazabal et al. (2013), have also identified the significance of specific costs. The identification strategy in Irarrazabal et al. (2013) is to utilize the property that the presence of specific costs changes the demand elasticity. To identify this, Irarrazabal et al. (2013) estimate the size of the specific costs relative to the ad-valorem costs using the data variation in FOB (producer) prices and destinations (trade costs). Our study is notable in that we estimate the ad-valorem and specific components separately and then identify how these costs are sensitive to distance. Additionally, we also estimate the elasticity of substitution parameter and thus obtain the key parameters in the heterogeneous-quality model, including the dispersion of productivity, the elasticity of substitution, and the distance elasticity. As these determine the behavior of the heterogeneity model, our estimates then yield a benchmark for evaluating the implications of existing theoretical models.

Of course, our results relate in part to the characteristics of the data employed. In particular, we use price data for agricultural products. Thus, the reason for the rather weak effect of quality sorting in our analysis is that vegetable production is constrained by geographic conditions. While some farmers may produce high-quality goods using superior technology (e.g., greenhouses), farmer productivity is generally not associated with quality rather with costs. Thus, the demand side may matter more. Specific costs make the price of high-quality goods relatively low, creating relatively high demand in remote markets. Hence, the presence of specific costs in our model encourages farmers producing high-quality goods to deliver their product to distant markets.

The remainder of the paper is organized as follows. In Section 2, we discuss the reduced-form regressions representing the relationship between quality and distance. In Section 3, we set up a structural model for our estimations and conduct Monte Carlo exercises to demonstrate the bias in the standard model. Section 4 introduces our data set, and Section 5 details the specification of our model. Section 6 reports the estimation results, and Section 7 provides some robustness checks. In Section 8, we evaluate the welfare improvements associated with the reduction in trade costs using general equilibrium model simulations. The final section concludes the paper.

2. Reduced-Form Relationship

A positive relationship between FOB prices and distance has been obtained in a number of previous studies, including Bastos and Silva (2010), Baldwin and Harrigan (2011), Manova and Zhang (2012), and Martin (2012). This observation motivates the introduction of quality because it is not consistent with a standard firm heterogeneity model. In the standard heterogeneous model, high-productivity firms enter a market with high entry costs (e.g., high transport costs) and can set low prices, so there will be a negative relationship between FOB prices and distance to markets. The introduction of a quality dimension into the firm-heterogeneity model leads to the case where high-FOB-price firms produce high-quality goods, and therefore these firms sell to markets that are more distant. In this section, we conduct similar exercises using regional price data, which contain the price set in the origin market (the production site). After controlling for market-specific effects, the origin prices capture the quality of the product. Therefore, our empirical exercise is comparable to that in the literature.

We use vegetable wholesale price data for Japan. Because our data set includes detailed information about product characteristics, we can compare the prices of identical products. In Japan, vegetables trade in a wholesale market in each prefecture, so we can obtain the price in the production prefecture (the origin price) and the price in the market (the market price). We depict the key observation in the relationship between quality and the distance to market by plotting origin price and distance in Figure 1. We plot the log of distance on the horizontal axis and the log of the origin price on the vertical axis. All figures illustrate a positive relationship between distance and origin price. Thus, there is a positive relationship in our data set.

=== Figure 1 here ===

Next, we report the results of the reduced-form regressions. As in the extant literature, we regress the price at the source on the distance to the destination:

$$\ln p_{jj} = const + \ln D_{nj} + \eta_{nj}, \tag{1}$$

where p_{jj} is the price in region j, D_{nj} is the distance between origin j and the market n, and η_{nj} is the error term. Using OLS, we find that there is a positive relationship between quality and distance as reported in Table 1 and the fitted lines in the figure. Note that because this regression does not control for region-specific effects, this positive relationship may result from regional shocks. Thus, we conduct the same regressions after including origin- and market-specific effects. The estimates reflecting regional-specific effects also display a positive relationship.

=== Table 1 here ===

As discussed in the literature, several models can explain this positive link. Unfortunately, the results of the reduced-form regressions do not provide us with information about the structural parameters, such as distance elasticity. The purpose of this analysis is then to identify the important structural parameters in quality heterogeneity models.

3. Model

We adopt a standard monopolistic competition, producer heterogeneity, product quality model following Baldwin and Harrigan (2011). An additional feature is the introduction of specific costs. Assume that there are I regions and in each region there is a continuum of producers whose mass is expressed by N_j.

A Cobb–Douglas CES utility function expresses the preferences of consumers in region n:

$$U_n = (\int_{z \in J_n} (c_{nj} q_{nj})^{(\sigma-1)/\sigma} dk)^{(\sigma/(\sigma-1))\mu} Z^{1-\mu}, \tag{2}$$

where J_n is a set of products delivered to region I, and Z is the consumption of numeraire goods. With the budget constraint, $Y_n \mu = \int p_{nj}(k) c_{nj}(k)$, the demand function is:

$$c_{nj}(k) = \frac{p_{nj}^{-\sigma}}{q_{nj}^{1-\sigma}} \frac{Y_n \mu}{P_n^{1-\sigma}}, \tag{3}$$

where $P_n = (\int (p_{nj}/q_{nj})^{1-\sigma})^{1/(1-\sigma)}$. This signifies that as the quality of goods improves, consumer demand increases. Quality then acts as a demand shifter in this setting.

We assume that producers produce a differentiated product, face local demand $x_{nj}(z)$, and maximize their profits. On the cost side, producers must pay labor and transportation costs. The transportation costs consist of ad-valorem and specific costs. Thus, we express profits from market n with:

$$\pi_{nj} = p_{nj}x_{nj} - a_{nj}\tau_{nj}x_{nj} - t_{nj}x_{nj} - f_{nj}, \tag{4}$$

where τ_{nj} is the ad-valorem component, t_{nj} is the specific component in transportation costs, and a is the unit cost. Quality sorting implies that high-cost producers produce high-quality goods. We assume a monotonic relationship between quality and production costs:

$$q = f(a). \tag{5}$$

This is required for us to estimate the quality-sorting model. If the relationship between costs and quality is not monotonic—for example, a U-shaped relationship—we cannot identify the parameter that determines the quality-sorting pattern. We further assume a parametric form of $f(.)$. As in Baldwin and Harrigan (2012), we assume that producers decide their cost level, and the quality of their products is then a function of that cost level:

$$q = a^{1+\theta}. \tag{6}$$

Thus, if $\theta > -1$, then high-cost producers produce high-quality goods. If $\theta > 0$ and specific costs are zero, then high-cost producers will deliver their products to more remote markets than low-cost producers because the rate of quality improvement is greater than that of the increase in cost. This provides the mechanism for quality sorting: high-cost producers produce high-quality goods, so they are more profitable than low-quality producers and hence can reach more costly markets.

Producers facing the local demand function (2) maximize their profits by setting the optimal price in market n:

$$p_{nj} = \frac{\sigma}{\sigma - 1}(\tau_{nj}a + t_{nj}). \tag{7}$$

We assume that there are no interregional transportation costs for within-region trade:

$$p_{jj} = \frac{\sigma a}{\sigma - 1}. \tag{8}$$

Thus, by inverting the above price formula, we can express the cost level of the producer. Using this implied cost enables us to recover the quality level. In our data set, as we can observe the market price and the place of production, we can use the above relationship to identify the specific cost component separately from the ad-valorem component.[1]

[1] There is a slight difference between the FOB price and the source price. By definition, FOB price, p_{FOB}, satisfies the following equation: $p_{market} = \tau p_{FOB} + t$. Thus, $p_{FOB} = (\sigma/(\sigma-1))(a+t/\sigma\tau)$. However, because the source price is the price set for the source market without trade costs, $p_{source} = (\sigma a/(\sigma - 1))$.

With regard to trade costs, the key idea is that by using source and market prices, we can measure trade costs using price data. We normalize interregional trade costs by local trade costs incurred for local delivery; thus, all trade costs are relative to the local cost of delivery. In addition, because price is a monotonic function of production costs, we can replicate costs using price data. Furthermore, given that the price differential function depends on distance and the interaction term between distance and costs, we can also identify the interaction term using the price data.

The price differentials between markets and sources are:

$$\frac{p_{nj}}{p_{jj}} = \tau_{nj} + \frac{1}{a} t_{nj}. \tag{9}$$

Hence, in the price differential equation, while we include the ad-valorem term in the equation directly, the specific component is interacted with the cost term. This serves to identify the ad-valorem and specific terms separately.

The above price differential equation is observed only when there is actual delivery from j to n. Thus, we need to consider the producer's delivery decision. The profit function is:

$$\pi_{nj} = \frac{(\frac{\sigma}{\sigma-1})^{1-\sigma}(\tau_{nj}a + t_{nj})^{1-\sigma}}{q_{nj}^{1-\sigma}} \frac{Y\mu}{\sigma P_n^{1-\sigma}} - f. \tag{10}$$

If profit is positive, there will be delivery from source j to market n. We construct a delivery decision variable, V_{nj}:

$$V_{nj} = [\frac{(\frac{\sigma}{\sigma-1})^{1-\sigma}(\tau_{nj}a + t_{nj})^{1-\sigma}}{q_{nj}^{1-\sigma}} \frac{Y\mu}{\sigma P_n^{1-\sigma}}]/f. \tag{11}$$

If $V > 1$, then there is delivery from j to n. As Irarrazabal et al. (2013) show, because of specific costs, even the lowest-cost producer ($a \approx 0$) earns finite profits. Thus, other than the above condition, there is a further selection condition; i.e., whether producer costs are sufficiently low to obtain profits to cover fixed costs. We assume that this condition holds in order to focus on the entry condition.

To close the general equilibrium model, we can assume that each consumer supplies one unit of labor for production, a numeraire good is produced using the unit of labor, and this is freely traded across regions. This ensures that the wage rate is equal to one and trade balance is attained. However, to focus on the identification of trade costs, we simply analyze individual producer behavior. Regional fixed effects in the estimations capture the general equilibrium effects. For explicit treatment of the general equilibrium effects, we conduct Monte Carlo exercises to reveal how large trade cost reductions increase welfare.

3.1 Illustration of Bias

We conduct Monte Carlo experiments based on the model in the previous section to demonstrate that the estimates using a model without specific costs account for the bias. We create a linear economy geographically separated into 47 regions on the integer line between 1 and 47 sequentially. This linear economy implies that the distance between regions i and j, d_{ij}, is equal to $|j - i|$ with a minimum distance of 1 and a maximum distance of 46.

We assume that the shape of the demand function is common across the regions and characterized by an elasticity of substitution parameter equal to 3.75. Because we focus on estimates using a model with regional fixed effects, each region is also characterized by an aggregate price and aggregate real expenditure, both of which we set to 20.00. For simplicity, we ignore the cross-regional variations in productivity. We assume that in each region, a product is produced with a productivity level equal to 0.99 and a factor cost set to 1. Gaussian random components appear in both the fixed cost and the trade costs. In the fixed costs, the random term has a standard deviation of 0.65. Idiosyncratic random variations in trade costs are captured by the standard deviation, which is 0.25.

In our Monte Carlo experiment, we first draw 100 sets of Gaussian random variables of fixed and trade cost components, u_{ij} and v_{ij} independently from their distributions. We then calculate the price differentials and the selection equation under the hypothesized value of the distance elasticity of trade costs, being 0.3 for the ad-valorem trade cost and 0.5 for the specific trade cost. In each Monte Carlo draw of the true value of the distance elasticity, we then implement our estimations of the distance elasticity. The first is the FIML estimation without specific costs and the second is the FIML with specific costs. By construction, the FIML estimation without specific costs suffers bias caused by misspecification. Because the trade cost associated with the specific component is captured by the ad-valorem component, the distance elasticity of the ad-valorem trade costs will be over biased. Similarly, because the presence of specific costs delivers high-quality goods to distant markets, the elasticity of quality with respect to costs also captures this effect. If this quality elasticity is high, high-quality products are highly profitable, and thus shipped to distant market. With specific costs, the distance elasticity of specific costs correctly estimates this Alchian–Allen effect. However, without specific costs, the positive relationship between quality and the distance to market will be included in the quality elasticity estimates.

Figure 2 reports the nonparametrically smoothed densities of the distance and quality elasticity estimates with the Gaussian kernel. The top panel corresponds to the model with specific cost and the bottom panel to that without specific costs. The figures in the top panel show that the estimates using the true model are consistent and distributed around the underlying true value. However, the figures in the bottom panel reveal that the estimates using the model without specific costs are subject to sever over bias. As we have argued, while the true ad-valorem distance elasticity is 0.3, the median value of the estimates is 0.536. Similarly, while the true quality elasticity is -0.15, the median is 0.591. Hence, the Monte Carlo exercise confirms the necessity of incorporating a specific cost component for drawing correct inferences on the distance and quality elasticities.

=== Figure 2 here ===

4. Data

We conduct our empirical research using the product-level data. We employ a daily data set of the wholesale prices of agricultural products in Japan, known as "the Daily Wholesale Market Information of Fresh Vegetables and Fruits."[2] This daily market survey reports the wholesale prices and quantities sold of some 120 different fruits and vegetables. We use the 2007 report representing 274 market-opening days.

The main advantage of the data set is in including information about individual product characteristics and a detailed categorization, such that each vegetable is classified by brand, size, grade, and source region. For example, the cabbage category typically includes "cabbage," "red cabbage," and "spring cabbage." Our data set then reports that cabbages of size "6" and grade "syu (excellent)" produced in Aichi Prefecture traded in the Aichi and Tokyo markets on July 1, 2007. As also shown, the price of this type of cabbage is 31.5 yen per kilogram in Aichi and 36.8 yen in Tokyo. Thus, we can calculate the price differential between these two locations, which may reflect the trade costs between two prefectures.

Comparing the prices in different locations to infer trade costs is meaningful if the goods are identical as in the law of one price (LOP) literature, and in fact, the prices of these goods are comparable. As discussed, our data have a high degree of categorization, which is useful for our purpose of assessing our hypothesis. Furthermore, because our data represent information on agricultural products, goods can differ depending on the date of production. However, we do not have exact information on the production date, so we assume that these goods are different when the trading dates are different. Thus, while this represents a slight shortcoming, the information in our data set provides us with the identification of an identical product in terms of many aspects of product characteristics.

The price differential, q_{nj}, that reflects trade costs is obtained by subtracting the wholesale price in source prefecture j, p_{jj}, from that in consuming prefecture n, p_{nj}.[3] The

[2] Our data set is identical to that employed in Kano et al. (2013, 2014).

[3] All of the products are sold in markets, but not necessarily in their markets of origin. In this case, when we cannot observe both the market and source prices, we eliminate these product entries.

price in source, p_{jj}, is the price when we observe product l being delivered from the producer to the wholesale market in the source prefecture. If this product is also shipped to market n, then p_{nj} is also observed. Thus, we set $T_{nj} = 1$ for pair (n, j) if we can calculate the price differentials, q_{nj}.

With regard to the distance between regions, we define interprefectural distance as the direct distance between prefectural head offices in the prefectural capital cities. We set the internal distance to 10 km, because the minimum interprefectural distance is 10.4 km (Kyoto–Shiga), and therefore we set the internal distance shorter than the minimum interprefectural distance. In a later section, we use the Head and Mayer (2000) internal distance formula as a robustness check. Natural conditions, not only market conditions, may affect regional prices. For example, preferences and the production of vegetables may change according to the air temperature. Thus, we use daily temperature data for the market and origin to control for these daily variations. As these are exogenous variables, they will also be helpful for identification of our selection models.

=== Table 2 here ===

We focus our exercise on three vegetables; namely, cabbage, Chinese cabbage (c-cabbage, hereafter), and lettuce. As discussed in Section 2, these are the vegetables that are priced higher in the source region and shipped to more distant markets. Table 2 summarizes several descriptive statistics for these products, indicating that each product is highly categorized by product variety, size, and grade. The number of distinct product entries is quite large: 1,207 for cabbage, 1,001 for c-cabbage, and 903 for lettuce. We assume that these products differ when the trading date changes, so to a certain degree, our price differential data are the price differentials of identical products. The average prices are 77.833 yen for cabbage, 61.628 for c-cabbage, and 183.909 for lettuce. There are also market prices in the data. Because we use origin prices to measure quality, Table 1 also reports the prices at the origin. The average origin prices are 67.431, 50.671, and 168.855 for cabbage, c-cabbage, and lettuce, respectively. Thus, market prices outside the origin region are higher than in the origin region. This is primarily because it is costly to ship goods to distant markets. Because we consider the truck transportation market competitive, we do not need to consider markups in the transport sector, unlike Hummels et al (2009). Our purpose is to address how much these price differentials reflect the shipping of high-quality goods to distant markets. Estimating a trade model to identify the key parameters should provide us with an answer to this question.

To understand the behavior of product shipment, we count the number of delivery $T_{ijl} = 1$ and nondelivery $T_{ijl} = 0$ cases. We identify product delivery $T_{ijl} = 1$ if the data report that the source prefecture of product entry l sold in consuming region i is region j. If we observe no market price and only origin prices, then we set $T_{ijl} = 0$. As shown in Table 1, there are some 230,000 delivery and nondelivery cases for each vegetable. This provides the number of observations for our full information maximum likelihood (FIML) estimation. Out of the total number of delivery and nondelivery cases, the number of delivery cases is relatively small, only about 10,000 for each vegetable. Our data set thus suggests that product delivery is quite limited. It is clear that product delivery therefore is quite local and tends to concentrate in the local areas neighboring the producing prefectures. This raises some concern with sample selection. There is an additional concern about these delivery patterns. If products do not ship to markets directly, then the actual delivery distance will be much longer than that between the final market and the origin. This will cause over bias in the distance effects. However, the share of transferred vegetables is low, normally less than 7 percent according to the Ministry of Agriculture, Forestry and Fisheries. Thus, the influence of transit goods in our data is not significant.

As mentioned, we measure product quality with the local price (the price in the source region). Because local shocks affect local market prices, we need to control for such specific effects. If demand shocks occur locally, the price will be higher without any improvement of quality. We consider this by including region-specific effects in our estimations. When supply shocks take place—i.e., an increase in production costs—the price will be also higher. If the cost associated with quality improvement increases, the Baldwin and Harrigan (2011) framework that we employ will capture it. Conversely, source-region-specific effects reflect cost shocks unrelated to quality.

5. Empirical Specification

In this section, we specify the functional form of the transport cost functions and other elements for estimation. We assume that the ad-valorem and specific components are a function of distance and other factors:

$$\tau_{nj} = D_{nj}^{\gamma_1} \exp(const + \epsilon_{nj}) \tag{12}$$

$$t_{nj} = D_{nj}^{\gamma_2} \exp(const + \epsilon_{nj}). \tag{13}$$

As we specify a monotonic relationship between price and production costs, we can invert this relationship in terms of price and insert it into the trade cost function. For simplicity, we assume that the remaining elements are common to the ad-valorem and specific cost terms.

Then, the log of the price differential equation is:

$$\begin{aligned}\ln(p_{nj}/p_{jj}) &= const + \ln(D_{nj}^{\gamma_1} + \frac{1}{a} D_{nj}^{\gamma_2}) + \epsilon_{nj} \\ &= const + \ln(D_{nj}^{\gamma_1} + \frac{\sigma - 1}{p_{jj}\sigma} D_{nj}^{\gamma_2}) + \epsilon_{nj}. \end{aligned} \tag{14}$$

Thus, using the variations in a (therefore p_{jj}), we separately estimate γ_1 and γ_2.

We estimate the parameter, θ, with the self-selection condition because $q_{nj} = a^{1+\theta} = (p_{jj}(\sigma - 1)/\sigma)^{1+\theta}$:

$$\begin{aligned}\ln V = \ln(\frac{\sigma}{\sigma - 1})^{1-\sigma} + (1-\sigma)\ln((p_{jj}(\sigma-1)/\sigma)D_{nj}^{\gamma_1} + D_{nj}^{\gamma_2}) + (1-\sigma)(const + \epsilon_{nj}) \\ + \ln(Y_n\mu) + (\sigma - 1)((1+\theta)(\ln p_{jj} + \ln(\sigma-1)/\sigma) - \ln\sigma - (1-\sigma)\ln P_n - f_j. \end{aligned} \tag{15}$$

We estimate the system of these nonlinear equations using maximum likelihood.

5.1. Distance elasticity of quality for the threshold producer

Producers choose their product quality level according to market conditions. One of the focuses here is on the relationship between the distance to market and the quality of goods. As discussed earlier, empirical studies generally show that there is a positive relationship between these two variables, such that the model provides us with the signs of the elasticity of quality with respect to the distance to markets for the threshold producer. For the purpose of discussion, let us begin by deriving the elasticity in the case of no specific costs. From the zero-profit condition, the threshold value of cost, a^*, is expressed by:

$$\frac{(\frac{\sigma}{\sigma-1})^{1-\sigma}(\tau_{nj}a^*)^{1-\sigma}}{q_{nj}^{1-\sigma}} \frac{Y\mu}{\sigma P_n^{1-\sigma}} - f = 0. \tag{16}$$

By the implicit function theorem, we obtain the elasticity of costs with respect to distance from:

$$\frac{da^* D_{nj}}{dD_{nj} a^*} = \frac{\gamma_1}{\theta}. \tag{17}$$

Thus, the elasticity of threshold quality (q^*) with respect to distance is:

$$\frac{dq^* D_{nj}}{dD_{nj} q^*} = \frac{(1+\theta)\gamma_1}{\theta}. \tag{18}$$

If trade cost is an increasing function of distance ($\gamma_1 > 0$) and the speed of quality improvement is relatively high ($\theta > 0$), then this elasticity is positive.

In the presence of a specific type cost, the zero-profit condition is:

$$\frac{(\frac{\sigma}{\sigma-1})^{1-\sigma}(\tau_{nj}a^* + t_{nj})^{1-\sigma}}{q_{nj}^{1-\sigma}}\frac{Y_n\mu}{\sigma P_n^{1-\sigma}} - f = 0. \tag{19}$$

Similarly, by the implicit function theorem, the elasticity is:

$$\frac{da^* D_{nj}}{dD_{nj}a^*} = \frac{\gamma_1 D^{\gamma_1}e^{\epsilon_1} + \gamma_2 D^{\gamma_2}e^{\epsilon_2}a^{*-1}}{\theta D^{\gamma_1}e^{\epsilon_1} + (1+\theta)D^{\gamma_2}e^{\epsilon_2}a^{*-1}}. \tag{20}$$

The sign of the above elasticity depends on not only γ_1 and θ, but also γ_2 and $1+\theta$. As long as $\gamma_2 > 0$ and $\theta > -1$, the elasticity will be positive, even if $\theta < 0$. Thus, the presence of specific costs relaxes the condition for the positive relationship between quality and distance.

6. Results: Relationship Between Quality and Distance

In this section, we report our estimation results. To compare our results with previous studies, we conduct our estimations using several different specifications: 1) structural estimation of a simple Melitz (2003) model, 2) structural estimation with a quality model (as in Baldwin and Harrigan (2011)), and 3) structural estimation of a firm-heterogeneity model with quality and specific costs. To compare the results with those in the extant literature, we begin by specifying no quality dimension and no specific costs.

Columns 1, 4, and 7 in Table 3 report the results of a model without quality dimension for cabbage, c-cabbage, and lettuce, respectively. The important parameters are the elasticity of substitution and the elasticity of transport cost with respect to distance. The substitution parameters are 4.957, 4.138, and 3.355 for cabbage, c-cabbage, and lettuce, respectively. These values are reasonable in the context of studies of individual product data. The distance elasticity parameters are, 0.227, 0.325, and 0.343 for cabbage, c-cabbage, and lettuce, respectively. These are also similar to the results in Kano et al. (2013). Thus, the distance effect is larger than those in the LOP literature, and this is because the sample selection problem there is not controlled for as here.

=== Table 3 here ===

We now introduce quality as in Baldwin and Harrigan (2011). The results are in Columns 2, 5, and 8 in Table 3. As shown, the estimates of the distance effect and the elasticity of substitution are almost identical to those without quality (0.228, 0.325, and 0.345 for cabbage, c-cabbage, and lettuce, respectively). The quality parameters turn out to be marginally negative, which suggests that high-cost producers produce high-quality goods. However, the rate of increase of quality is slower than where high-cost producers deliver their products to distant markets. While the earlier reduced-form regressions show a positive link between quality and distance, the results here imply that this is not solely the result of quality sorting. This may also be because we conduct our analysis using daily data for agricultural products over only a single year, such that it may be difficult to improve product quality during the relatively short period.

Finally, we estimate the model incorporating quality and specific costs. Columns 3, 6, and 9 report the results. The distance effects for the ad-valorem term are 0.162, 0.26, and 0.277 for cabbage, c-cabbage, and lettuce, respectively, whereas those for the specific cost term are 0.61, 0.665, and 0.792, respectively. Hummels and Skiba (2004) suggest that ad-valorem trade costs are only tariffs and that specific costs are distance-elastic trade costs. Our results are at least qualitatively consistent with their specification.

The magnitude of the estimates of the quality parameter is also larger than before, being -0.158, -0.204, and -0.193 for cabbage, c-cabbage, and lettuce, respectively. As mentioned, if $\theta > 0$, the model exhibits quality sorting. If $-1 < \theta < 0$, then high-quality goods are produced by high-cost firms, although the increase in quality is not as rapid as the increase in costs. Thus, the positive θ is needed for the quality selection without specific costs. However, as shown in Section 5.1, the positive relationship between quality and distance may arise with specific costs, even if $\theta < 0$. Hence, when we combine the results of the distance effects with the negative values of θ, we conclude that the positive relationship between quality and distance is a consequence of the presence of specific costs. The Alchian–Allen effects are the driving force here.

As we have seen, without taking specific costs into account, the technology parameter is marginally negative. However, this is because the estimation of this parameter is biased without specific costs. If θ is large, high-cost firms produce quite high-quality goods; thus, they ship their products to costly distant markets. However, the reason that high-quality goods are shipped to a distant market may be that consumers have relatively high demand for these goods in costly transport cost markets. Thus, the omitted variable (the specific cost term) will cause the technology parameter to capture this positive demand-side effect between distance and quality. Once we can control for specific costs, we can then identify the true technology parameter. In fact, high costs produce high-quality goods. However, this effect is not strong enough to account on its own for the quality-sorting mechanism in our sample.

Two important parameters other than distance elasticity are the elasticity of substitution and the correlation parameter of the error terms. The elasticity parameters have values between three and six, which is reasonable when using micro data. The absolute values of the correlation parameters are all more than 0.8, suggesting strong correlations.

Thus, sample selection may invoke a serious problem for biased estimates.

7. Quality of Distance Measure

The relationship between quality and distance may also depend on the choice of distance measure. If the quality and distance relationship is sensitive to the measure of distance, our results may not be considered robust. Thus, we specify a different measure of the distance between regions as a robustness check.

In the main analysis, our measure of distance is direct distance. This may differ from actual road distance, which may be a better proxy for transport costs. For example, Ehime Prefecture (the author's hometown) is 666.1 km from Tokyo by direct distance. However, because these prefectures are located on different islands, the actual shipping distance is much longer. In fact, the road distance between Ehime and Tokyo is 853.1 km. Thus, direct distance may cause an over bias in the distance effect. The fact that the distance effect is large may be simply because the actual distance is in fact longer, so each kilometer does not impose a significant burden for suppliers. While other transport modes are available (e.g., air), the most relevant type of transport in our analysis is truck. Thus, a navigation software website (navitime.co.jp) is used to calculate the road distance. Primarily, the distance for the route using only regular roads is calculated. However, where this is not possible, highways are included in the route. In addition, if there is no bridge between the two prefectures, the ferry distance is included.[4]

Columns 2, 5, and 8 in Table 4 report the estimation results using this alternative distance measure. For the most part, and as expected, the effect of distance here is smaller than previously found. However, these are similar to those using direct distance. Thus, the choice of direct or road distance does not represent a serious source of bias in our estimations.

=== Table 4 here ===

With regard to the distance measure, as discussed in the literature, the choice of internal distance may also be important. We now employ the Head–Mayer measure of internal distance: $D_{jj} = 0.376 \times \sqrt{area}$. Figure 3 depicts the same relationship as Figure 1, which is the correlation between the origin price and the distance to market. The results show that the parameter estimates are qualitatively similar to our simple measure of internal distance used previously, as again there is a positive relationship, as depicted by the solid line in the figure. Hence, our results are robust to the choice of internal distance measure.

=== Figure 3 here ===

[4]The data on land route distance between prefectures are available on Professor Tsukui's website (www.tiu.ac.jp/˜makiko/Japanese/DATA/distance_between_prefectures(land_route).xls).

Finally, we adopt a similar specification for the trade cost function as Hummels and Skiba (2004), in which specific costs are increasing in product value. Because transport costs can be high for high-value goods, the trade cost will be:

$$\ln q_{nj} = \tau_{nj} + t_{ij}/a = D_{nj}^{\gamma_1} + p_{jj}^{\beta} D_{nj}^{\gamma_2}/a. \tag{21}$$

If $\beta < 1$, then the specific transport cost increases as the value of the goods increases but at a slower rate. This again confirms the Alchian–Allen effect. Columns 4, 7, and 10 in Table 4 report the results of the Hummels and Skiba (2004) specification. The parameter values for the distance elasticity and the elasticity of substitution are similar to those for the earlier estimations. The Hummels–Skiba parameters, β, are 0.322 and 0.421 for cabbages and lettuces, respectively. Hence, our results are also consistent with those of the Alchian–Allen effect. For c-cabbage, the Hummels–Skiba parameter is 0.009 and is not significant; hence, our original specification may be the appropriate representation for the specific cost term.

One remark is worth mentioning. While our estimates reveal the large distance effects, these may in fact be the lower bounds of distance elasticity. This is because we exclude the price data, in which there is no information available for local delivery. Because of this, we cannot calculate the price differentials between the origin and the destination. This means that price differential data associated with long distances to market are not included in our analysis, which under biases the distance effect. Consequently, the direction of bias may not weaken our estimation results.

8. Policy Evaluation

How significant is the impact of policies reducing trade costs? To investigate the gains from a trade cost reduction quantitatively, we conduct Monte Carlo exercises using a three-region version of the model. To evaluate the welfare gains, we need to calculate the price indexes numerically. However, this involves some difficulty in the convergence of a model including 47 regions, as revealed in Section 4. Fortunately, as our focus is an illustration of the magnitude of welfare gains, not the replication of the overall Japanese regional gains, we create a single core region located in the middle and two peripheral regions.

We set up Monte Carlo exercises using the program developed by Irarrazabal et al. (2013) and available through Khandelwal's et al. (2013) website. In our model, unit distance is set to 1.5, so the closest region is 3 and the furthest region is 4.5. Because the elasticity for the ad-valorem cost is 0.16 and 0.61 for the specific cost, the specific trade cost is approximately 20 percent higher than the ad-valorem costs for the closest region and 60 percent higher for delivery from one peripheral region to the other. We conduct 150 exercises and calculate the average welfare gains by comparing the real wages across three transition scenarios: 1) the friction to no ad-valorem cost case, 2) the friction to the no-specific-cost case, and 3) the friction to zero friction case.

Table 5 details the average welfare gains as denoted by the percentage increase in each scenario. The first row reveals that the removal of ad-valorem costs increases welfare, but only slightly. In contrast, the reduction in specific costs, which includes a large proportion of trade costs, has a large impact, being 25 percent for the core region and 22 percent for the peripheral regions. Finally, the third row shows that the removal of all trade costs increases welfare by approximately 30 percent in this economy. As expected, when the impact of specific cost removal is large, the magnitude is substantial. Our Monte Carlo experiment thus suggests that specific trade costs are a more severe obstacle to trade than ad-valorem costs, as also shown in Irarrazabal et al. (2013).

=== Table 5 here ===

9. Concluding Remarks

The trade literature uses the iceberg-type trade (or transport) cost function. Under this specification, quality sorting is a mechanism thought to represent quality and the distance to markets. However, it is important to incorporate specific costs in this specification because of the presence of the Alchian–Allen effect. Our study thus attempts to identify the structural parameters of the quality heterogeneity model.

The main empirical test in the literature is the regression of FOB prices (unit values) on distance. Our study extends this analysis using a structural model to reveal whether it is the quality-sorting effect or the Alchian–Allen effect (or both) that drives the relationship between quality and distance. We also estimate the technical parameter that connects cost and quality and take into account selection bias associated with the choice of product delivery. The main findings indicate that specific costs are more distance elastic than ad-valorem costs, and that the presence of specific costs is the key element in the typical empirical observation of a positive link between quality and distance.

While our study reveals the importance of specific costs, further study is required. For example, with CES preferences, monopolistically competitive firms set constant markup prices to all the markets that they serve. However, pricing behavior may differ across markets. In addition, because firms may not pass the increase in production costs on to market prices, the estimation of the distance effect may be biased. Pricing to market behavior also depends on market competitiveness and the levels of market income (e.g., Lugovskyy and Skiba (2012)). Thus, to take into account the effect of distance fully, we need to incorporate pricing to market behavior. Further research in this area is therefore required.

References

[1] Anderson, J., van Wincoop, E., 2003 Gravity with gravitas: a solution to the border puzzle, American Economic Review 93, 170–192.

[2] Anderson, J., van Wincoop, E., 2004. Trade costs, Journal of Economic Literature 42, 691–751.

[3] Atkin, D., Donaldson, D., 2014. Who's getting globalized? The size and implications of intra-national trade costs, mimeo.

[4] Baldwin, R., Harrigan, J., 2011. Zeros, quality, and space: trade theory and trade evidence, American Economic Journal: Microeconomics, 3, 60–88.

[5] Bastos, P., Silva, J., 2010. The quality of a firm's exports: where you export to matters. Journal of International Economics 82 (2), 99–111.

[6] Donaldson, D., 2014. Railroads of the Raj: estimating the impact of transportation infrastructure, American Economic Review, forthcoming.

[7] Eaton, J., Kortum, S., 2002. Technology, geography, and trade, Econometrica, 1741–1779.

[8] Head, K., Mayer, T., 2000. Non-Europe: the magnitude and causes of market fragmentation in the EU, Weltwirtschaftliches Archiv 136, 284–314.

[9] Helpman, E., Melitz, M., Rubinstein, Y. 2008. Estimating trade flows: trading partners and trading volumes, Quarterly Journal of Economics, 441–487.

[10] Hummels, D. 2001. Toward a geography of trade costs. Working Paper, Purdue University.

[11] Hummels, D., Skiba, A., 2004. Shipping the good apples out? An empirical confirmation of the Alchian–Allen conjecture, Journal of Political Economy 112, 1384–1402.

[12] Hummels, D., Lugovskyy, V., Skiba, A., 2009. The trade reducing effects of market power in international shipping, Journal of Development Economics 89, 84–97.

[13] Irarrazabal, A., Moxnes, A., Opromolla, L.D., 2013. The tip of the iceberg: a quantitative framework for estimating trade costs, NBER Working Paper 19236.

[14] Kano, K., Kano, T., Takechi, K., 2013 Exaggerated death of distance: revisiting distance effects on regional price dispersions, Journal of International Economics 90, 403–413.

[15] Kano, K., Kano, T., Takechi, K., 2014 The price of distance: pricing to market, producer heterogeneity, and geographic barriers, mimeo.

[16] Khandelwal, A. K., P. K. Schott., Wei, S.-J. 2013. Trade liberalization and embedded institutional reform: evidence from Chinese exporters, American Economic Review, 103(6) 2169–2195.

[17] Lugovskyy, V., Skiba, A., 2012. How geography affects quality, mimeo.

[18] Manova, K., Zhang, K., 2012. Export prices across firms and destinations, Quarterly Journal of Economics 127, 379–436.

[19] Martin, J., 2012. Markups, quality, and transport costs, European Economic Review 56, 777–791.

[20] Melitz, M., 2003. The impact of trade on intra-industry reallocations and aggregate industry productivity, Econometrica 71, 1695–1725.

	Cabbage	Cabbage	C-Cabbage	C-Cabbage	Lettuce	Lettuce
Distance	0.074	0.007	0.106	0.01	0.046	0.008
	(0.002)	(0.003)	(0.03)	(0.005)	(0.003)	0.004
Num. of Obs.	15841	15841	10803	10803	11565	11565
R squared	0.065	0.494	0.105	0.504	0.019	0.364
Region-Specific Effect	No	Yes	No	Yes	No	Yes

Table 1: Reduced-Form Estimation Results

	Cabbage	C-Cabbage	Lettuce
Average market price	77.833	61.628	183.909
Average local price	67.431	50.671	168.855
Product entry			
No. of varieties	3	4	7
No. of size categories	63	50	71
No. of grade categories	34	50	46
No. of producing prefectures	47	46	43
No. of distinct product entries	1207	1001	903
Data truncation			
No. of $T_nj(l) = 1$ or 0	369343	241871	239703
No. of $T_nj(l) = 1$	15841	10803	11565

Table 2: Summary Statistics

Parameter	Cabbage No Q, No S	Cabbage Q, No S	Cabbage Q, S	C-Cab No Q, N S	C-Cab Q, N S	C-Cab Q, S	Lettuce N Q, N Ss	Lettuce Q, N S	Lettuce Q, S
γ_1	0.227	0.228	0.162	0.325	0.325	0.26	0.343	0.345	0.277
	(0.016)	(0.002)	(0.002)	(0.003)	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)
γ_2			0.61			0.665			0.792
			(0.003)			(0.004)			(0.005)
θ		-0.041	-0.158		-0.038	-0.204		-0.089	-0.193
		(0.003)	(0.004)		(0.003)	(0.004)		(0.005)	(0.005)
ϵ	4.957	4.966	5.219	4.138	4.149	4.374	3.355	3.363	3.491
	(0.021)	(0.023)	(0.022)	(0.02)	(0.014)	(0.017)	(0.016)	(0.016)	(0.014)
ρ	-0.84	-0.847	-0.847	-0.82	-0.826	-0.829	-0.859	-0.872	-0.87
	(0.0023)	(0.003)	(0.002)	(0.003)	(0.001)	(0.003)	(0.003)	(0.003)	(0.003)
Num. of Obs.	369343	369343	369343	241871	241871	241871	239703	239703	239703
Log-likelihood	-21404.133	-21344.762	-20234.094	-21404.133	-21344.762	-20234.094	-22296.627	-22151.746	–21571.669

Table 3: Estimation Results

Parameter	Cab Road Dist	Cab HM Dist	Cab HS Spec	C-Cab Road Dist	C-Cab HM Dist	C-Cab HS Spec	Lettuce Road Dist	Lettuce HM Dist	Lettuce HS Spec
γ_1	0.144	0.222	0.146	0.225	0.36	0.251	0.257	0.337	0.254
	(0.002)	(0.003)	(0.002)	(0.003)	(0.004)	(0.003)	(0.003)	(0.004)	(0.004)
γ_2	0.593	0.653	0.462	0.618	0.714	0.647	0.764	0.846	0.563
	(0.003)	(0.004)	(0.007)	(0.004)	(0.005)	(0.01)	(0.005)	(0.006)	(0.012)
θ	-0.173	-0.14	-0.166	-0.213	-0.165	-0.2	-0.206	-0.176	-0.2
	(0.004)	(0.004)	(0.004)	(0.004)	(0.003)	(0.005)	(0.005)	(0.005)	(0.004)
ϵ	5.272	5.089	5.24	4.404	4.252	4.376	3.509	3.456	3.505
	(0.023)	(0.022)	(0.023)	(0.017)	(0.017)	(0.018)	(0.017)	(0.015)	(0.015)
HS par			0.322			0.009			0.421
			(0.018)			(0.028)			(0.022)
ρ	-0.845	-0.841	-0.847	-0.83	-0.825	-0.829	-0.871	-0.865	-0.87
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.002)
Num. of Obs.	369343	369343	369343	241871	241871	241871	239703	239703	239703
Log-likelihood	-19347.496	-23247.471	-20153.728	-13148.843	-15946.852	-13612.545	-20971.987	-23598.581	-21500.773

Table 4: Estimation Results

Welfare Gains (% increase)	Core	Periphery
Friction to No Ad-valorem costs	0.132%	0.07%
Friction to No Specific costs	25.133%	22.131%
Friction to No Friction	30.413%	31%
Size of the trade costs		
τ	1.067	1.192
t	1.281	1.955
t/τ (Specific/Ad-valorem cost)	120.017%	163.974%

Table 5: Average Welfare Gains

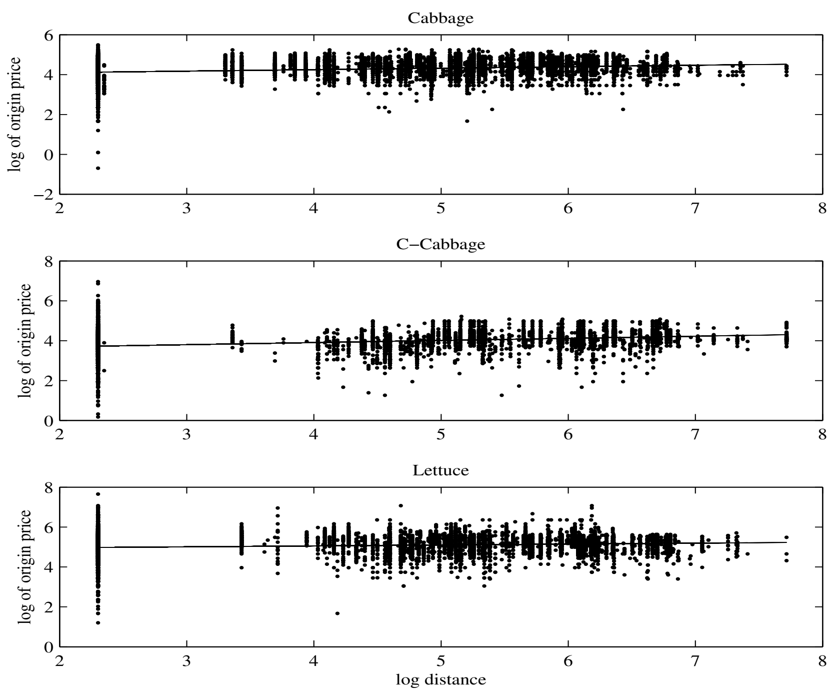


Figure 1: Logs of distance and source price relationship

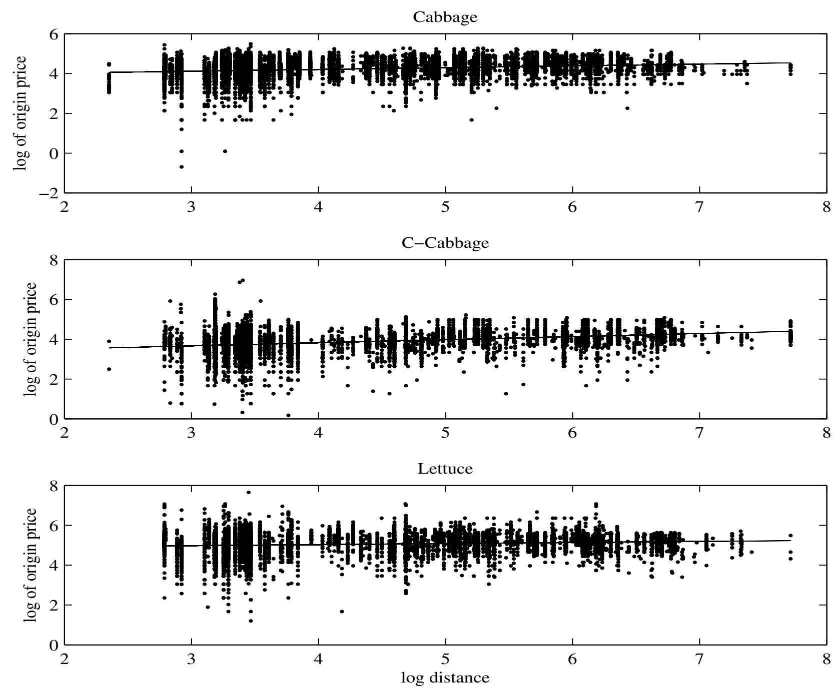


Figure 2: Logs of distance and source price relationship (Head–Mayer internal distance measure)

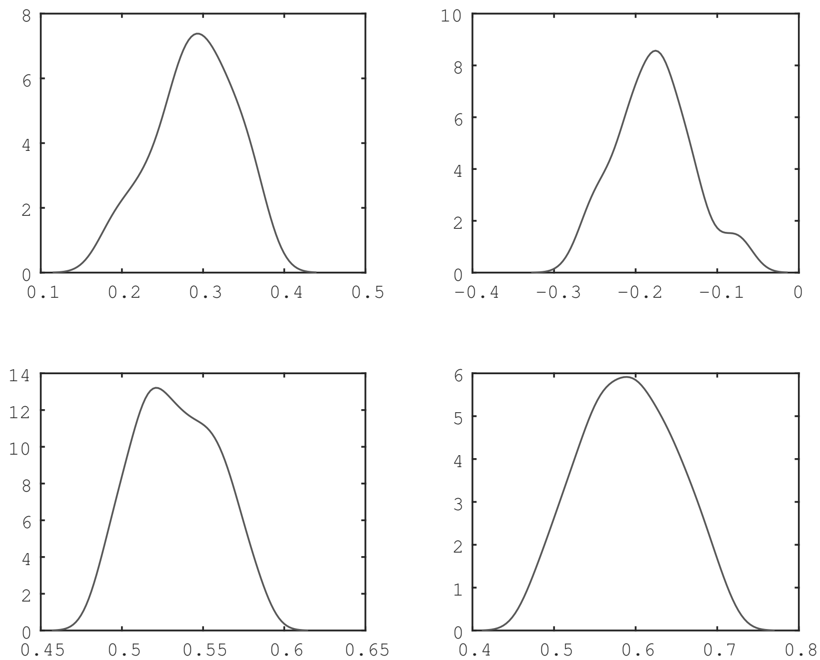


Figure 3: Kernel densities of estimators of distance and quality elasticities

The Japanese and Chinese Models of Industrial Organisation: Fighting for Supremacy in the Vietnamese Motorcycle Industry[1]

Mai Fujita

Abstract
This paper explores the consequences of the emerging rivalry between Japanese and Chinese manufacturers. It focuses specifically on industrial organisation, one of the key factors that underlie the competitiveness of manufacturing industries. The question to be asked is what happens when distinctive models of industrial organisation, coming from Japan and China, clash in a developing country. An in- depth longitudinal analysis of the Vietnamese motorcycle industry adopting a modified version of the global value chain governance theory shows that a decade- long industrial transformation resulted in organisational diversity. The implications of the analysis for the literature on industrial organisation are discussed.

Keywords: industrial organisation, Vietnam, China, Japan, motorcycle industry
JEL classification: L10, L22, L62

1. Introduction

In the 1980s, the Japanese manufacturing industry was at the forefront of research on economic development and competitiveness. In an attempt to determine the sources of Japanese competitive advantage, researchers examined how the distinctive models of intra- and inter-firm organisation – characterised by lean production and trust-based supplier relations – contributed to the sustainment of superior product development and manufacturing performance (Smitka 1991; Clark and Fujimoto 1990, 1991; Nishiguchi 1994; Dyer 1996; Fujimoto 1999; Lecler 2004). It is now acknowledged worldwide that the hierarchical, captive model of inter-firm organisation consisting of

[1] This research was partially supported by Grant-in-Aid for Scientific Research (C) on "Assembler-Supplier Relationship and the Growth of Local Component Suppliers in the Vietnamese Motorcycle Industry" (Project No. 20510243) of the Japan Society for Scientific Research.

a powerful lead firm and closely aligned suppliers helped Japanese manufacturing firms to achieve superior product development and productivity performance; thus, establishing leading positions on major world markets, where consumers valued high quality, product differentiation, and fast product innovation.

The influence of the Japanese model was not restricted to the domestic market. As Japanese firms expanded abroad via FDI, the original model was transferred and adapted to different country contexts. As Japanese and local firms engaged in rounds of organisational competition and adaptation in the host country environment, various hybrid forms of industrial organisation emerged, which resulted in increased organisational diversity (Cusumano and Takeishi 1991; Sako 1992; Helper and Sako 1995; Guiheux and Lecler 2000; Ernst 2002; Sturgeon 2007). The Japanese model was also adopted independently in both developed and developing countries by local producers seeking to improve the productivity of their operations (Kaplinsky 1995; Posthuma 1995a, 1995b; Harriss 1995; Humphrey et al. 1998).

Two decades later, the global industrial landscape has changed. As the growth centres of the world's leading manufacturers have shifted to developing countries, Japanese manufacturers face major challenges from Chinese firms, which have attained overwhelming cost advantages by means of a distinctive form of industrial organisation. The existence of a uniquely Chinese model of industrial organisation has not been recognised widely. In a separate paper (Fujita 2013a), based on the literature and my own analysis, I sought to establish the key features of the Chinese model of industrial organisation, which I found to be characterised by intense price-based competition between a large number of lead firms and suppliers engaged in arm's-length transactions. Such an organisational model has enabled Chinese firms to attain remarkable levels of price-based competitiveness that challenge the Japanese industry leaders.

This paper investigates the new patterns of rivalry emerging out of the rise of the Chinese model of industrial organisation. It does so by examining what happens when the two models of industrial organisation, coming from Japan and China respectively, clash in a third Asian developing country that seeks to establish its competitive industry. Which model is more adaptable to local conditions? Is one superior to the other? Do they exist side by side? Does competition open up space for a distinctively different model of industrial organisation? How do firm responses vary over time? These are the questions that this paper seeks to address.

Indeed, the aforementioned questions are at the forefront of research on economic development and competitiveness. There has long been a discussion on the relevance of models of industrial organisation for the pace and patterns of economic development. This line of research asks: how important have models of industrial organisation been in their countries of origin; how relevant are they for other countries; can they be transferred; and, if so, what adjustments need to be made? These and similar questions were raised by a group of researchers in a special issue of *World Development* in 1995.[2] The overall conclusion reached was that research on industrial organisation needs to extend beyond models to analyse the trajectories of diffusion and adaptation (Humphrey 1995).

However, although the importance of analysing trajectories of organisational change is widely recognised, this has rarely been done systematically. One of the major obstacles in this regard has been the lack of a conceptual device for systematically explaining the complex processes of organisational transformation, which are shaped by a myriad of factors – technological, strategic, institutional, and social. Nevertheless, recent theoretical development in the field of global value chain (GVC) governance perhaps offers a way forward (Gereffi et al. 2005).

The present paper utilises an adapted version of Gereffi et al.'s (2005) framework of GVC governance developed by Fujita (2013a) to describe and explain the short- and medium-term dynamics of organisational adaptation arising from the clash of Japanese and Chinese models. In so doing, it seeks to highlight the challenges and tensions that firms might face in the process of organisational transformation, and how such problems could be overcome.

In examining the clash of the Japanese and Chinese models in a third country context, the paper takes the context of Vietnam and examines the case of its motorcycle industry. The rationale for focussing on this sector is because the motorcycle industry is the one in which a direct clash between the two models is most prominent, and Vietnam was the first locality outside China in which they clashed head-on and fought for supremacy. It is now well known that the massive imports of low-priced Chinese motorcycles into Vietnam in the early 2000s had a huge impact on the Japanese industry leaders (Cohen 2002). What is less well known is that there were repeated

[2] Special issue on 'Industrial Organization and Manufacturing Competitiveness in Developing Countries', Vol. 23 No.1.

rounds of organisational adaptation triggered by the emergence of Vietnamese motorcycle assemblers inheriting the Chinese organisational model. The ensuing competitive adaptation of both Japanese and Chinese organisational models generated enormous industrial dynamism, eventually leading this latecomer developing country to emerge in a decade as one of the world's major motorcycle producers.[3]

This paper examines how the Japanese and Chinese models were transformed through competitive adaptation in Vietnam over a period of a decade. Specifically, it addresses the following main research question:

> *How has the clash between Japanese and Chinese organisational models affected the organisational transformation of the Vietnamese motorcycle industry?*

This research question is explored through an examination of the Vietnamese motorcycle industry over the decade following the late 1990s. The focus is on two sets of value chains representative of the Japanese and Chinese models of industrial organisation respectively. Drawing on data collected at different periods from interviews and surveys of lead firms and suppliers, this study engages in an in-depth, longitudinal analysis of how the two sets of value chains were transformed as the respective lead firms competed for supremacy in the Vietnamese market.

The remainder of the paper is structured as follows. Section 2 reviews the existing literature, identifies research gaps, and elaborates questions and corresponding hypotheses derived from previous research. Section 3 presents the conceptual framework. Section 4 discusses the research methodology and operationalises the key concepts. Sections 5 and 6 comprise the empirical core of the paper, presenting analyses of the dynamic transformation of the Japanese and Chinese models of industrial organisation respectively in the Vietnamese motorcycle industry. Section 7 summarises the findings of the paper and discusses its contribution to the literature on organisational models and trajectories.

2. Literature Review

[3] Production of motorcycles in Vietnam began in 1996 (General Statistics Office 1999). In 2006, domestic production and sales recorded 2.1 and 2.4 million units, respectively, making the country the world's fourth largest producer of and market for motorcycles after only China, India and Indonesia (General Statistics Office 2009; Honda Motor Co., Ltd. 2008).

The purpose of this section is to review the existing literature of direct relevance to the research question explored in this paper. This covers three main strands of literature: the literature on models and trajectories of industrial organisation in general; the literature on Japanese and Chinese models of industrial organisation in particular; and the emergent literature on the Vietnamese motorcycle industry. Based on gaps identified in the course of this review, the section concludes by refining the research question and presenting resultant hypotheses.

2.1 Industrial Organisation: From Models to Trajectories

The 1980s and 1990s saw a flourish of research on industrial organisation. Spurred by the varieties of patterns by which industries were organised – from large and vertically integrated business corporations to clusters of small, networked firms, or hierarchical networks consisting of a dominant lead firm and layers of smaller suppliers, researchers looked into the origins of different patterns and their implications for economic competitiveness (Chandler 1977; Dore 1983; Smitka 1991; Womack et al. 1990; Clark and Fujimoto 1991; Sako 1992; Nishiguchi 1994; Piore and Sabel 1984; Langlois and Robertson 1995; Sturgeon 2002). Those patterns recognised as particularly successful were codified into *models* of industrial organisation (Humphrey 1995).

Research did not stop at codifying established practices into models but went on to analyse how such models were applied in practice. While a model essentially defines the key elements of successful experiences, “the experiences upon which the model is constructed continue to change” (Humphrey 1995: 151). Moreover, when models are transferred, the contexts in which they operate often differ markedly from those upon which the experiences were based.

The existing body of research has looked into how models evolved over time in the country of origin in response to changes in external economic conditions, technological change, or competitive pressure (Lecler 1999, 2004; Lamming 2000; McCormick 2004; Sturgeon 2007), and how models transferred to different contexts have gone through processes of hybridisation, adaptation, or localisation (Cusumano and Takeishi 1991; Helper and Sako 1995; Guiheux and Lecler 2000). Very often the result was “neither a copy of the original model nor a replica of existing local patterns, but something different” (Westney 1999: 387). The varieties of country and industry experiences analysed in the literature clearly demonstrate the importance of going beyond models to analyse the trajectories of diffusion and adaptation (Humphrey 1995). However, although the importance of analysing trajectories is widely acknowledged, this has rarely been done systematically.

First, few previous studies have illuminated the actual *processes* by which organisations change. What they have done is either to compare the status of an organisation at a given point in time in a given setting – often after successful transformation has been completed – with the defining features of the original model; or to compare prevailing practices among different groups of companies, for example, firms of different nationalities located in a certain country or firms of the same nationality but located in different countries (Cusumano and Takeishi 1991; Sako 1992; Helper and Sako 1995).

As a result, the actual processes of organisational diffusion and adaptation, which is where insights relevant for firms and policy makers originate (Humphery 1995), remain largely underexplored. With what timing and in what sequence do key features of the model change? What tensions and challenges do organisations face in the process, and how do they overcome them? Very little of the existing literature examines these issues.

Second, there have been limited attempts to systematically explain *why* organisations evolve in the way they do. On the basis of the existing literature, there seems to be a broad consensus that the driver of organisational change typically comes from a lack of fit between the elements of organisation and the environment (Westney 1999). The problem with such a line of argument is that there has been no incisive debate on what precisely is meant by the ‘environment’.

Existing empirical research mainly refers to the following three dimensions of the environment: (1) local market conditions, for example, producer competition and consumer preferences (Helper 1991; Lecler 1999, 2004; Humphery 2000; Sturgeon and Van Biesebroeck 2010); (2) competence levels and the existence or absence of a local component supply base (Sadler 1994); and (3) institutional factors such as legal and regulatory environments, capital markets, employment systems, culture, and social and moral norms (Dore 1983; Sako 1992).

However, given the lack of a systematic attempt to deconstruct the concept of the environment into a series of concrete, operational variables, we still do not know which factors are most important, how they interact with each other, or how they shape the processes of organisational change. Unless these questions are tackled, research can hardly be expected to pin down the fundamental factors that trigger (or impede) the transformation of industrial organisation. Thus, the mechanisms by which variables interact in shaping the processes of organisational transformation remain underexplored.

The above two research gaps seem to stem at least in part from the lack of an appropriate theoretical framework for categorising the various forms of inter-firm organisation or explaining the circumstances under which they emerge in terms of a series of concrete, operational variables. Recent theoretical development in the field of GVC governance has made important contributions in this regard. This paper adopts the revised version of the GVC governance framework for conducting systematic analysis of trajectories of organisational change.

2.2 Japanese and Chinese Models of Industrial Organisation in the Motorcycle Industry

In studying industrial organisation, particularly illuminating are the industries in which contrasting models of industrial organisation coexist because interactions between different models often create new dynamics of organisational transformation.[4] With the long dominance of the Japanese model and the rise of a new organisational model emerging from China, the motorcycle manufacturing sector became an example of such industries (Fujita 2013a).

The Japanese model of industrial organisation was developed out of the need to effectively achieve incremental product and process improvements in a proprietary product. Since motorcycles had an integral product architecture, lead firms took the lead in fine-tuning component designs and providing a quality guarantee to their consumers for the product system as a whole (Otahara 2009a, 2009b). Accordingly,

[4] This seems to explain why the car industry, in which contrasting models of industrial organisation have emerged in the US and Japan, has been studied so widely.

they adopted a combination of centralised control and generous assistance in governing long-term relations with a fixed group of suppliers, which were expected to endeavour to achieve performance targets set by the lead firms, often by ceding autonomy (Fujita 2013a).

As Japanese manufacturers started to set up overseas production bases from the 1960s onwards, the organisational model established in Japan was replicated abroad. Lead firms sought to develop long-term relations with local suppliers. Where the local component supply base was lacking, this entailed provision of technical assistance to the suppliers.[5]

Compared to the long-established prominence of the Japanese model, the rise of its Chinese counterpart is a recent phenomenon. This model emerged in the early 1990s, driven by a large number of indigenous motorcycle manufacturers producing low-priced imitations of Japanese models. Contingent on de facto standardisation of a few dozen popular Japanese models, large numbers of assemblers and suppliers, both of whom were equipped with limited levels of technological competence, engaged in arm’s-length transactions. With its strength lying in low costs and flexibility, the arm’s-length organisational model enabled Chinese motorcycle manufacturers to capture the lion’s share of the huge yet volatile domestic market where consumers put priority on low prices and intellectual property rights are only weakly protected.

The above summary of the existing literature suggests that we now know that the Japanese model of industrial organisation rose to prominence in the 1980s, and that it was transferred to both developed and developing countries – with manufacturers taking the lead in nurturing the pool of competent component suppliers demanded by this model. We also know that a second discrete model emerged in China. However, we know less about what is emerging out of the rivalry between the two models. Which model is superior? Which is more adaptable to third-country conditions; especially in the developing world, where the bulk of global motorcycle sales are concentrated (Fujita 2007)?

Such an overarching enquiry can be deconstructed into a series of more specific questions. In terms of the Japanese model, the key question is whether it can meet the

---

[5] This occurred not only in developing countries such as Thailand (Higashi 2006) and Indonesia (Thee 1997; Sato 2011) but also in developed countries such as Italy (Horiuchi 1998).

Chinese challenge. Whilst the Japanese model has exhibited extraordinary strength in catering to sophisticated customers in the developed world, can it be adapted to compete with the Chinese model in developing country markets? With regard to the Chinese model, there has thus far been no attempt to study whether it can be successfully transferred. What changes are required if it is to work in different contexts? This paper attempts to answer these questions.

2.3 The Dynamics of Organisational Adaptation: The Vietnamese Motorcycle Industry

The Vietnamese motorcycle industry provides an excellent case through which to address the research gaps identified above. Vietnam was the first locality – after China itself – in which the Japanese and Chinese models clashed head-on. Because Vietnam is a new context for both models, neither has an advantage over the other; both must adapt to local Vietnamese conditions and fight for supremacy in this emerging market.

On the basis of the existing research on the Vietnamese motorcycle industry (Fujita 2005, 2006, 2007, 2008, 2011, 2012; Intarakumnerd and Fujita 2008, 2009; Pham Truong Hoang and Shusa 2006; Pham Truong Hoang 2007; Nguyen Duc Tiep 2006, 2007; The Motorbike Joint Working Group 2007), its development was process can be broadly divided into three stages.

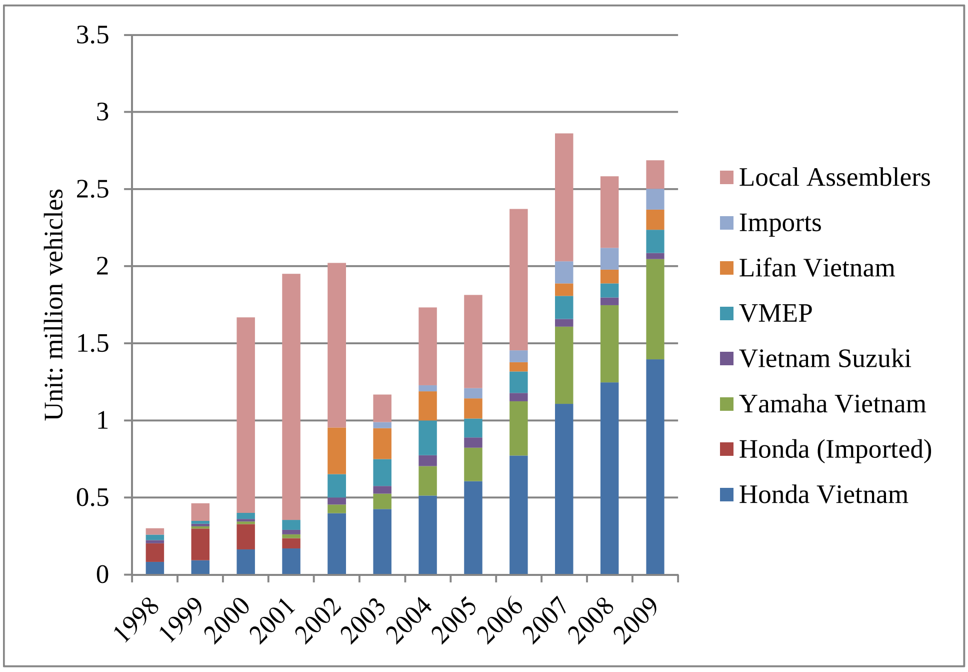
In Stage I (mid-1990s to the end of the decade), three Japanese motorcycle manufacturers were the key players. Following the Vietnamese government's decision to launch an import substitution policy to promote the domestic production of motorcycles, Honda, Yamaha, Suzuki and Taiwan's Sanyang established local factories (Fujita 2006). As their sophisticated products were priced substantially higher than what ordinary Vietnamese consumers could afford, motorcycle sales as a whole stagnated, but Japanese–brand motorcycles still accounted for the bulk of the market (Figure 1). This small, protected market hardly attracted any scholarly attention at this stage.

It was during Stage II (2000–2004) that the Vietnamese motorcycle industry attracted wide interest from businesses, researchers, and policymakers in Vietnam and abroad. In the early 2000s, massive volumes of low-priced imitations of Japanese-brand motorcycles were imported from China – a phenomenon often dubbed the ‘China shock’ (Fujita 2007). Since the Vietnamese government had prohibited the import of assembled vehicles, Chinese imports arrived in the form of knockdown component kits that were assembled by more than 50 local firms (hereafter referred to as ‘local assemblers’). With prices as low as a third to a quarter of foreign-brand models, these imitations quickly penetrated the medium- and low-income consumer markets that had hitherto been unexploited by Japanese firms. The market expanded four-fold in the late 1990s, and local assemblers of Chinese motorcycles commanded roughly 80% of these extended sales (Figure 1).

The China shock provoked a series of reactions from incumbent producers and policymakers. As Vietnam became a symbol of an expanded Chinese threat that had already become apparent in China, Japanese companies initiated company-wide efforts to regain market shares. This culminated in the launching of a new, low-priced model by Honda Vietnam (HVN) in 2002. The new model, named Wave Alpha and priced at approximately one-third of its previous models, quickly gained popularity as the low-quality of Chinese motorcycles had by now become apparent to Vietnamese consumers (The Motorbike Joint Working Group 2007).

The Vietnamese government responded by enacting a series of policy changes to restore order and promote the sound development of the industry. However, the uncoordinated, sudden, and often arbitrary ways in which policy changes were enacted – frequently running contrary to previously announced plans and/or discriminating against foreign motorcycle manufacturers (Fujita 2011) – created serious side effects.

Figure 1. Motorcycle Sales in Vietnam by Manufacturers



Notes:

(1) VMEP (Vietnam Manufacturing and Export Processing Co., Ltd.) is a 100% invested subsidiary of Taiwan's Sanyang Motors, and Lifan Vietnam is a joint venture between China's Lifan Group and a Vietnamese SOE.

(2) Data on "Honda (Imported)" was available from the Motorbike Joint Working Group (2007) up to 2005 but the figures were zero from 2002 onwards. Data on "Imports" was provided by General Statistics Office (various years).

Source: Prepared by the author on the basis of the Motobike Joint Working Group (2007), Industrial Research Institute (2011) and General Statistical Office (various years).

First, restrictions on the importation and registration of motorcycles were introduced. In September 2002, the Vietnamese government suddenly announced that imports of motorcycle components for the year should be limited to 1.5 million units (Cohen 2002). This was followed by restrictions on motorcycle registration[6] and limits on investments in expansion of production capacity by foreign motorcycle manufacturers[7] from 2003. Whilst these measures were intended to prevent the uncontrolled proliferation of motorcycles on Vietnam's streets, the consequence was stagnation of the overall market growth, with annual sales of motorcycles declining from over 2 million in 2002 to less than 1.5 million in 2003–4 (Figure 1).

[6] Circular 02/2003/TT-BCA by the Ministry of Public Security dated 13 January 2003 limited motorcycle registration to one vehicle per person. Decision 98/2003/QD-UB by the Hanoi People's Committee dated 14 August 2003 prohibited new motorcycle registration in four central districts of Hanoi.

[7] Prime Minister's Decision 147/2002/QD-TTg dated 25 October 2002.

Second, in an attempt to encourage the development of local assemblers into fully fledged motorcycle manufacturers, the government stepped up the enforcement of local content rules, which hitherto had been circumvented by local assemblers,[8] and instituted standards for motorcycle manufacturers, with the requirement that a minimum of 20% of local content had to be achieved by in-house manufacturing of key components.[9]

Notably, some of the aforementioned policies were implemented in ways that explicitly favoured local assemblers. When the government suddenly introduced quantitative restrictions on component imports in September 2002, local assemblers received favourable allocation of import quotas, whilst insufficient quota allocation to HVN and Yamaha Vietnam (YVN) even drove these companies to temporarily suspend their production.[10] From 2003 onwards, as noted above, the government restricted foreign motorcycle manufacturers from investing in the expansion of production capacity beyond the original proposals granted by the Vietnamese authorities upon the issue of FDI licences. This turned out to be damaging to foreign motorcycle manufacturers because the rapid expansion of the market in the 2000s had not been envisaged in the 1990s. HVN, in particular, suffered because this policy hampered the company’s ambitions to use the Wave Alpha to regain lost market shares.

A new phase of industrial development (Stage III; 2005–2008) began as the end of the policy turbulence brought about rapid, FDI-driven growth. Diminishing academic interest in the industry notwithstanding, this was in fact the time in which the most dynamic development occurred (Fujita 2011). In 2005, the Vietnamese government abandoned restrictions on motorcycle registration[11] together with the policy that had

---

[8] The local content rules were originally announced at the end of 1998 for implementation from the beginning of 1999 (Decision of the Ministry of Finance 1994/1998/QD-TTg dated 25 December 1998). Its full implementation was delayed until the beginning of 2001 due to opposition from local assemblers (Ishida 2001).

[9] Prime Minister’s Decision No.38/2002/QD-TTg dated 14 March 2002.

[10] Of the total of 1.5 million motorcycle component imports permitted for the whole year, local assemblers were allocated 900,000 units whilst foreign motorcycle manufacturers only received 600,000 (Cohen 2002).

[11] Circular No. 17/2005/TT-BCA of the Ministry of Public Security dated 21 November 2005 rescinded legislation limiting motorcycle registration to one vehicle per person and only in the locality for which each held household registration.

prevented foreign motorcycle manufacturers from investing in additional production capacity.[12] As a result, domestic motorcycle sales climbed to 2.8 million units in 2007, far exceeding figures during the China shock (Figure 1).

Japanese firms chose to satisfy the growing market in Vietnam via FDI for local production, following their conventional approach to the localisation of production in countries with large demands for their products.[13] Accordingly, they actively invested in expansion of production capacity, capturing an increasing share of this fast-growing market. In the meantime, local assemblers lost their market share but still held roughly one-third of the sales as of 2006 (Figure 1); surviving by catering to low-income consumers in the rural areas where Japanese-brand models had still not penetrated.

Of the three stages of development, the existing literature on industrial organisation focuses almost exclusively on Stage II, the period immediately following the China shock. Previous studies have emphasised the major changes that both HVN and local assemblers implemented to their sourcing practices immediately after the initial clash. Pham Truong Hoang (2007), Mishima (2007), and Otahara (2009a) all argue that HVN responded to the China shock by significantly diversifying its component sources to include non-Japanese suppliers in Vietnam and even local suppliers in China. Pham Truong Hoang (2007) also analyses the manner in which local assemblers responded to policies requiring local sourcing and investment in in-house manufacturing of components. On the basis of case studies of four assemblers, he argues that they shifted away from arm's-length supply systems towards those based on long-term, trust-based relations with suppliers.[14]

---

[12] Official document No. 1854/VPCP-HTQT issued by the Government Office on 11 April 2005.

[13] From its early years, "to explore the world market, to produce where the demand is" has been at the core of Honda's mission (http://www.honda.co.jp/50years-history/009.html, accessed 2 October 2011).

[14] The four case studies nevertheless indicate varieties of ways in which local assemblers responded to market and policy challenges: maintaining arm's-length linkages, vertically integrating component manufacturing, and spurring cooperative relationships with suppliers (Pham Truong Hoang 2007). However, the author does not discuss which of these patterns is dominant, a shortcoming that is probably due to a failure to provide the reasons as to why the four assemblers were selected in the first place. In any case, this research did not include the two assemblers that the present study refers to as A1 and A3 – firms it found to be increasingly dominant in Stage III.

Nevertheless, the above discussion on the stages of Vietnamese motorcycle industrial development suggests that analysing the short-term impact of the China shock may not be sufficient for an understanding of the dynamics of the competitive adaptation of the two models. First, the existing literature acknowledges that the reactions of HVN and local Vietnamese assemblers were devised as emergency measures to cope with the immediate competitive threat (to HVN) and policy requirements (for local assemblers). It remains to be seen whether these adaptations prove to be sustainable in the longer term.

Second, the period immediately following the China shock was one of policy turbulence. Such a distorted and arbitrary legislative environment hardly enabled firms to implement long-term, sustainable adaptations to their sourcing practices. Given that the period of turmoil was immediately followed by a more stable phase (Stage III), it is essential that an analysis of industrial organisation in the Vietnamese motorcycle industry should be extended to cover this period. However, no previous studies have done this.

The temporal aspect of observation also raises the question of what factors cause industrial organisation to evolve. Virtually all of the previous studies cited above assume, explicitly or implicitly, organisational patterns are determined by that lead firms depending on the characteristics of the products they produce – whether design architecture, prices, or quality levels. Accordingly, their focus has been exclusively on the lead firms, whilst suppliers – the other key actor in the value chains – have been left out of the analyses.

In Japanese chains, it was the need for radical cost reduction that compelled HVN's adjustment to sourcing practices (Mishima 2007; Otahara 2009a). In respect of local assemblers, the need to raise product quality and policy requirements eventually led some assemblers to invest in in-house production of components and/or to adopt long-term, trust-based relations with their suppliers (Pham Truong Hoang 2007).

Owing to its almost exclusive focus on product characteristics, research has hitherto overlooked the very essence of industrial organisation, that is, power relations between firms, which in turn are determined by the nature and levels of capabilities possessed by the respective parties (Sturgeon 2008; Palpacuer 2000; Humphrey and Schmitz 2008). A lead firm has the capacity to enforce particular types and levels of requirement on suppliers. However, such capacity has its limits because some suppliers may acquire power as they accumulate new competencies that are difficult to replace or explore new customers (Schmitz 2004; Sturgeon 2008). The relative power relations of lead firms and suppliers are central to research on the dynamics of industrial organisation but no previous studies have analysed them.

2.4 Research Questions and Hypotheses

In view of the research gaps identified above, this paper will examine the evolutionary dynamics of the Japanese and Chinese models of industrial organisation in the Vietnamese motorcycle industry. It addresses the following overarching research question:

> *How has the competition between Japanese and Chinese organisational models affected the organisational transformation of the Vietnamese motorcycle industry?*

For the purpose of analysis, this question is divided into two sub-questions.

Sub-question 1: *How did the Japanese and Chinese organisational models evolve in Vietnam?*

The literature suggests that the two models converged within a few years of their direct clash, as Japanese motorcycle manufacturers expanded their component sources to include non-conventional sources for the purpose of spurring competition between suppliers, and local assemblers developed long-term, trust-based relations with their suppliers.

Hypothesis: *The two models converged within a few years of their initial clash in Vietnam.*

The second sub-question is concerned with explaining the organisational transformation that eventually occurred.

Sub-question 2: *What factors drove the organisational transformation of the Vietnamese motorcycle industry?*

Existing empirical research emphasises that *the nature of the products*, which the lead firms adjust in order to cope with competitive pressure, is the key variable in explaining the dynamics of an organisational model.

Hypothesis: *Organisational transformation is explained primarily by product characteristics determined by the lead firm.*

3. Conceptual Framework and Operationalisation of Key Concepts

This section develops a theoretical framework for describing and explaining different forms of industrial organisation, which is based on a revised version of Gereffi et al.'s (2005) theory of global value chain (GVC) governance developed by Fujita (2013a). The section begins by introducing the concept of value chain governance, followed by a consideration of five dominant governance types. It then discusses the two key variables that determine value chain governance and presents a revised framework that uses these two variables to explain the emergence of the five aforementioned types of value chain governance. The section concludes with operationalisation of the key concepts.

3.1 Industrial Organisation: Meaning and Type

An industry comprises (groups of) firms engaged in one or more value-adding function that is required to bring products to market – typically referred to as a value chain (Sturgeon 2001). The literature on industrial organisation has evolved around the broad question of how the upstream to downstream functions surrounding a product are aligned to different (groups of) firms, and how relations between these firms are coordinated. Starting with the literature on large integrated corporations (Chandler 1977) and transaction cost economics (Williamson 1979), through to theories on network forms of organisation (Powell 1990) and the GVC approach (Gereffi et al. 2001; Schmitz 2004; Gereffi et al. 2005; Sturgeon 2008), the resultant large body of work has demonstrated the range of market and non-market mechanisms through which inter-firm relations are coordinated. These mechanisms – referred to by the GVC approach as types of value chain *governance* – are important because they influence competitive performance of industries and development prospects for local firms participating in value chains (Sturgeon 2002; Schmitz 2004).

While there are myriad patterns of value chain governance, Gereffi et al. (2005)

classified value chain governance into five dominant types, which were mapped onto a spectrum running from low to high levels of explicit coordination (Figure 2). At one end of the spectrum is the arm's-length market in which transactions are mediated by market forces. At the other end of the spectrum there is a hierarchy in which coordination takes the form of an internal command structure within a vertically integrated corporation. In between these two extremes, there are intermediate or network forms of organisation that are neither based on markets nor a hierarchy (Powell 1990; Jones et al. 1997). In ascending order of explicit transactional governance, these are:

- Modular chains, in which product standardisation reduces the frequency and intensity of interaction, as well as the level of mutual dependence between a lead firm and its suppliers
- Relational chains, which are characterised by complex and intense interaction between mutually dependent parties
- Captive chains, in which a powerful lead firm makes extensive intervention and exercises control over smaller and dependent suppliers

Figure 2. Types of Value Chain Governance

Degree of Explicit Coordination		Type	Description
Low		Market	Arm's-length transactions mediated by market forces
	Network Types	Modular	Product standardisation enables firms to exchange complex information without intense interaction or mutual dependence
		Relational	Intense two-way interaction and mutual dependence
		Captive	Lead firms make extensive intervention and exercise control over dependent suppliers
High		Hierarchy	Vertically-integrated organisation

Source: The author, based on Gereffi et al. (2005).

3.2 Determinants of Value Chain Governance

Why do different forms of governance such as those discussed above exist? And under what circumstances do particular governance forms emerge? The strength of Gereffi et al.'s (2005) formulation of GVC governance theory is that it provides a systematic device for answering these questions. Specifically, they seek to explain the dynamics of value chain governance in terms of three variables: (1) the complexity of information exchanged in a transaction; (2) the degree to which such information can be codified; and (3) the supplier's capability level relative to the requirements of a transaction.

This study follows the overall structure of this framework, but makes the following adaptations. First, for the sake of simplicity, the first two variables are grouped into one broader category: the nature of product and process parameters exchanged in transactions.

Second, whereas Gereffi et al. (2005) concentrate on the *codifiability* of parameters, this study focuses on the degree to which these parameters are *standardised,* a related yet distinct concept. This is because degrees of product and process standardisation constitute one of the essential factors that differentiate the Japanese and Chinese models of industrial organisation in the motorcycle industry.[15]

Third, the present study's framework incorporates lead firm capability in addition to supplier capability. Because the primary focus of Gereffi et al. (2005) is on the *global* value chains that are coordinated by major transnational corporations (TNCs), they implicitly assume that lead firms possess the sophisticated capability necessary to coordinate value chains. On the contrary, the present study does not take lead firm capability as a given in view of the fact that it addresses the organisational model emerging in a developing country context. Rather, it acknowledges that a lead firm may be constrained by a shortage of capability in its attempt to establish certain types of chain governance.

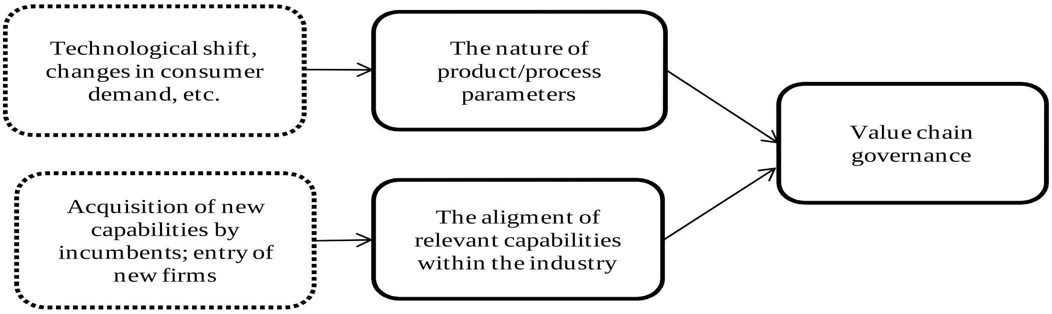
Fourth, rather than narrowly focussing on *relative* levels of capability, that is, whether or not supplier capability meets the level required by lead firms, the present study highlights the various *types* of capability that different governance mechanism models impose on both lead firms and suppliers.

The basic structure of this adapted framework is shown in Figure 3, in which value chain governance is determined by two variables: the nature of product and process parameters communicated in transactions; and the alignment of relevant capabilities

[15] This adaptation becomes critical in formulating the conditions under which captive chains emerge. Whereas Gereffi et al. (2005) focus on the *codifiability* of parameters in the form of lead firm instructions, the *non-standard* nature of product and process parameters turned out to be critical in explaining why Japanese motorcycle manufacturers had instituted explicit governance mechanisms in coordinating transactions with their suppliers.

within the industry. The following subsections examine the two variables individually.

Figure 3. Value Chain Governance: An Explanatory Framework



Source: The author, adapted from Gereffi et al. (2005) and Langlois and Robertson (1995).

3.2.1 The Nature of Product and Process Parameters

The nature of product and process parameters determines the need for transactional governance. It is not the case that every transaction requires explicit coordination; the extent to which transactional governance is required depends primarily on the type of product being traded (in this case, motorcycle components). The specific focus will be on levels of complexity and degree of standardisation, both of which are influenced by factors such as technological innovation and changes in consumer demand.

In respect of simple products, which also tend to be standardised, there is limited need for instituting explicit transactional governance: if components are simple and standardised, product/process parameters can be specified and communicated with ease. Supplier performance is easily observable in the form of delivered outputs and thus detailed monitoring mechanisms are not required. Moreover, as standard products do not require transaction-specific investment, there is no need to implement safeguards against the risks of opportunism (Williamson 1979). Standard products can also be produced by a range of suppliers, sold to a variety of lead firms, or produced for stock and supplied as necessary (Gereffi et al. 2005).

The need for coordination increases as products become complex and differentiated, that is, as they start to take on new demands beyond price level (Schmitz 2006; Humphrey and Schmitz 2008). Examples include differentiated components that are more difficult to design and/or manufacture; higher quality levels; tighter delivery requirements in terms of either frequency or punctuality; and additional functional requirements (e.g. suppliers take on design responsibilities in addition to manufacturing). Implementing new requirements such as these often constitutes an additional burden with regard to the communication of product and/or process parameters between the lead firm and its suppliers. It also necessitates additional mechanisms to ensure that parameters are adhered to, for example, detailed monitoring (Schmitz 2006).

The need for explicit governance also depends on the extent to which parameters are standardised. On the one hand, non-standard parameters require explicit coordination because they incur additional coordination costs and transaction-specific investment in physical and/or human resources (Williamson 1979). This is particularly the case for products with integral design architecture. Because such products are characterised by complex mapping from functional elements to physical components and tightly coupled interfaces among interacting physical components, they call for fine-tuning between the whole product and its component parts if overall product performance is to be maximised (Ulrich 1995; Baldwin and Clark 2000). Designing these products requires the coordination of detailed design tasks (Ulrich 1995), and their manufacture necessitates transaction-specific investment, both of which call for explicit governance mechanisms to be in place.

On the other hand, even when the product is complex, industry-wide product and/or process standards may reduce the need for explicit governance (Gereffi et al. 2005). In industries that produce products with modular architecture, standards make it possible to communicate product and/or process parameters without intense interaction, which releases firms from being locked into particular trading relationships (Langlois and Robertson 1992, 1995).

3.2.2 The Alignment of Relevant Capabilities

The need for transactional governance, however, does not mean that such mechanisms can necessarily be implemented in practice. This is where the second variable of the alignment of relevant capabilities within the industry comes into play. Governance means that a given firm enforces parameters over other firms, a dynamic that demands the ability to wield power (Schmitz 2006; Sturgeon 2008). The relative power relations between a lead firm and its suppliers, in turn, are determined primarily by the types and levels of capability enjoyed by the respective parties (Sturgeon 2008; Schmitz 2006; Palpacuer 2000).

A lead firm’s capacity to impose parameters on its suppliers usually stems from their core competencies in strategic value chain functions (Palpacuer 2000; Schmitz 2006). In capital-intensive sectors such as the automotive industry, such strategic functions typically include product development, marketing, and manufacturing of core components. These functions often constitute the key sources of competitive advantage enjoyed by the lead firm because they require knowledge- and experienced-based assets that are difficult for others to imitate, and because they provide economies of scale for the firms that control these functions (Palpacuer 2000: 378).

A lead firm’s control over strategic value chain functions matters because it tends to create two types of dependence on the part of the suppliers. First, lead firm control over strategic functions leaves suppliers with non-core functions (Palpacuer 2000), rendering them *functionally* dependent on the lead firm in marketing their products. Second, because dominance in respect of product, marketing, and/or branding often enables lead firms to gain a high degree of control over the market (Gereffi 1999; Kaplinsky and Morris 2000), they often overwhelm suppliers with huge purchasing power (Sturgeon 2008), rendering them *financially* dependent.

The size of orders takes on particular importance in industries in which product and process parameters are non-standard. Because non-standard products often impose the additional cost of product-specific investment in physical and human resources, a lead firm will face difficulty enforcing non-standard parameters on its suppliers unless orders are large enough to make production economically viable.[16]

However, it is necessary to analyse lead firm competency in relative terms. Because power is relational, suppliers may also acquire it by building core competencies, that is, technical or service capabilities that are difficult to replace and become indispensable to the lead firm (Schmitz 2006; Sturgeon 2008; Palpacuer 2000). Suppliers can also gain the generic capability to assume responsibility for a bundle of functions, such as product design, process development, purchasing, and production, which enables them to serve a diverse pool of customers and switch customers if necessary (Sturgeon 2008). In contrast, where suppliers only possess capabilities that are easily substituted and/or are embedded in relations with specific customers, the lead firm retains the capacity to choose and replace suppliers, thus keeping supplier power under control (ibid.).

[16] Sturgeon et al. (2008) corroborate this point in arguing that the concentrated structure of the car manufacturing industry helps each firm to impose its own idiosyncratic standards on suppliers.

3.3 The Revised Framework

Table 1 shows how the five governance types mentioned in Section 2.1 can be explained in terms of different combinations of the two variables outlined in the previous subsection. When product and process parameters are simple and standardised, *market-based chains* emerge. This type of chain makes limited capability demand of lead firm and suppliers alike, the minimum requirements being that they possess routine assembly capability and routine component manufacturing capability respectively.

When industry-wide standards of compatibility enable complex parameters to be exchanged without explicit coordination, *modular chains* emerge whereby suppliers acquire generic manufacturing capacity and related service capabilities that enable them to serve multiple lead firms simultaneously. On the other hand, while the minimum requirement of the lead firm is routine assembly capability using mutually compatible components sourced from suppliers, modular chains enable it to focus on creation, penetration and defence of markets for its end products (Sturgeon 2002).

As product and process parameters become complex and non-standard, three types of chain governance may emerge depending on the alignment of relevant capabilities. The first case is one in which the lead firm and its suppliers are equipped with complementary competencies that cannot easily be sourced elsewhere. Such a situation gives rise to a *relational chain* whereby the lead firm and its suppliers are engaged in intense two-way interaction; the two parties are mutually dependent and the power relation is symmetrical (Gereffi et al. 2005).

Table 1. Types of Chain Governance and their Determinants

	Product/ Process Parameters	Lead Firm Capability	Supplier Capability
Market	Simple	No specific requirements beyond routine manufacturing/assembly capabilities	
Modular	Complex/ Standard	A minimum of routine assembly capability suffices. Lead firms usually focus on creation, penetration and maintenance of markets for end products.	Generic manufacturing and related service capabilities.

Relational	Complex/ Non-standard	Lead firms and suppliers possess complementary competencies that are hard to substitute.	
Captive		Capacity to exercise dominance over suppliers, which usually stems from control over strategic chain functions.	A minimum of the basic ability to engage in a narrow range of simple tasks is required. Suppliers develop capabilities in accordance with the lead firm's interventions.
Hierarchical		Capability to conduct the value-adding functions in question.	Supplier capability is withheld.

Source: Adapted from Gereffi et al. (2005), Sturgeon (2002), Langlois and Robertson (1995), Sturgeon et al. (2008), Schmitz (2006), Sturgeon (2008), and Palpacuer (2000).

The second case is characterised by substantial asymmetry in capability levels between a large, competent lead firm and smaller, less competent suppliers. Competence and power asymmetry lead to a *captive chain* whereby the lead firm engages in extensive intervention, such as active monitoring and technical assistance; while suppliers develop their capabilities – typically, in a narrow range of tasks – under the lead firm's guidance (Schmitz 2004, 2006).

The last case is one in which limited available external capability makes outsourcing unfeasible, meaning that the lead firm is compelled to conduct the required function(s) in-house, that is, to create a *hierarchy*. A hierarchy may also result from cases of substantial asymmetry in competence levels (i.e. the second case discussed above) but where the lead firm is either unwilling or unable to engage in extensive intervention.

3.4 Operationalisation of Key Concepts

For the purpose of empirical analysis, indicators have been developed for the key concepts (Table 2). Given the lack of quantifiable indicators for key variables, the analysis of trajectories focuses primarily on the *direction* of change in the status of the key variables over time, for example, an increase or decrease in the degree of complexity of product parameters.

The indicators of supplier capability require further explanation. Drawing on the technological capability (TC) literature (Lall 1992; Bell and Pavitt 1995), this study focuses on the *type and level of capability* possessed by suppliers. With regard to type, reflecting the capability requirements that the Japanese and Chinese organisational models impose on suppliers, the key distinction is between *new product introduction* (product development and design) and *production*. The latter is further divided into the equipment-related and production management dimensions (Sato and Fujita 2009). In terms of level, the focus will be on whether suppliers starting at routine operation for the domestic market (*operational* level) can progress to the level at which they are able to maintain stable and continuous operations that fulfil the requirements of foreign customers (*assimilative* level), and further to level at which suppliers are able to make minor yet original improvement to the existing products or production activities (*adaptive level*) (ibid.).

Table 2. Operationalisation of Concepts

(a) Determinants of Governance Types

Key Concepts		Indicators
Nature of Product/ Process Parameters	Level of Complexity	General product characteristics (e.g. price levels) The way in which the lead firm specifies product/process requirements to suppliers
	Level of Standardisation	General product features (e.g., whether product designs are proprietary or standardised) The way in which the lead firms specifies product/process requirements to suppliers
Structure of Relevant Capabilities within the Industry	Lead Firm Capability	Whether or not the lead firm engages in key functions, e.g. product development, marketing, and production of core components The scale of orders placed to suppliers The capacity to switch suppliers
	Supplier Capability	Changes in the number of suppliers, and types and levels of capability possessed (For new suppliers) Suppliers' experience prior to entry into respective value chains

(b) Governance Types

	Pattern of Dependence	Coordinating Mechanism
Types of Data Required	Lead firm: availability of alternative sources of components Suppliers: number of customers; percentage of sales to respective lead firms; size of orders	Mechanisms used to communicate product/process parameters and ensure that they are met
Markets	Neither side is dependent on the other	Limited communication of information beyond price levels
Modular		Communication of complex parameters without intense interaction enabled by industry-wide standards
Relational	Mutual interdependence	Intense two-way exchange of information

Captive	Small suppliers dependent on a large lead firm	Lead firm takes the lead in sharing of long- and short-term targets; performance monitoring; regular sharing of information on products and processes; provision of technical/financial assistance
Hierarchy	Vertically integrated corporation	Firm's internal command

Source: The author, with reference to Palpacuer (2000), Schmitz (2006), Sturgeon (2008), Kaplinsky and Morris (2000), and Sako (1992).

4. Methodology

This section explains the methodology adopted in the empirical research project, that is, the retrospective case study method, criteria for selection of cases, and methods of data collection and analysis.

4.1 Research Design: Retrospective Case Study

In order to analyse the decade-long dynamics of change in industrial organisation, this paper adopts the retrospective case study method (de Vaus 2001; Glick et al. 1995; Tuma and Hannan 1984). In the present context, this method involves tracing the processes of organisational transformation by observing the sequence of historical events occurring in specific sets of value chains with several intervals. Table 3 provides a summary of the overall case study design. In an attempt to illuminate how and why the Japanese and Chinese models of industrial organisation were transformed in the Vietnamese context over time, this study analyses two sets of value chains representative of the Japanese and Chinese models in Vietnam respectively. Each of them are analysed by means of an embedded case study design, which combines the analysis of the overall context with that of embedded subunits (Yin 2003). In accordance with the conceptual framework presented in the previous section, the focus is on the lead firm(s) and its/their main first-tier suppliers.

The transplanted Japanese model is represented by value chains independently developed and governed by HVN for the following reasons. First, HVN remained the single most important motorcycle manufacturer in the Vietnamese motorcycle industry throughout the period of investigation (Figure 1). Second, among Japanese motorcycle manufacturers in Vietnam, HVN was the hardest hit by the China shock but also reacted with the most fundamental adjustments. By contrast, YVN's consistent focus on the high-end market limited direct Chinese competition (Fujita 2005); and Vietnam Suzuki (VNS)'s market shares were too small for the China shock to have an observable impact (Figure 1).

Table 3. Case Study Design

	Japanese Model	Chinese Model
Cases	HVN chains	Vietnamese–Chinese chains as a whole
Case Study Design	Embedded case study design Analysis of context: Analysis of HVN value chains as a whole Analysis of embedded subunits: HVN as the lead firm, and major Japanese (*keiretsu* and non-*keiretsu*) and Vietnamese suppliers	Embedded case study design Analysis of context: Analysis of the local motorcycle assembly industry as a whole Analysis of embedded subunits: (Stage II) Four major lead firms (Assemblers A1, A2, A4, and A5) and their Vietnamese, Taiwanese, and Korean suppliers (Stage III) Five major lead firms (Assemblers A1, A3, A4, A5, A6) and their Vietnamese, Chinese, Taiwanese and Korean suppliers
Data Sources	Context: interviews with Honda's various units in Vietnam, Thailand and Japan; published and unpublished statistics; company website Embedded cases: interviews, factory visits, company websites, reports, newspapers	Context: published and unpublished Vietnamese government statistics; reports; newspapers Embedded cases: interviews, factory visits, questionnaire surveys, company websites

Source: The author.

The case study of HVN's value chain combined investigation of the overall context and that of embedded subunits including HVN as the lead firm, and major Japanese and Vietnamese suppliers. A total of 11 Japanese and 10 Vietnamese suppliers were purposefully selected as embedded subunits on the basis of the following criteria. First, cases were limited to suppliers of components that usually had model-specific designs, which, therefore, required close coordination between lead firms and suppliers. These included suppliers of metal and plastic components, dies, and moulds. Second, for the purpose of highlighting structural changes within the chains, cases were selected based on the requisite level of diversity: *keiretsu* and non-*keiretsu* suppliers among Japanese suppliers; state-owned and private companies among Vietnamese suppliers; and suppliers that had joined HVN value chains at various stages of industrial development. Third, an attempt was made to ensure that a sufficiently large number of cases were covered. The study ultimately selected 10 out of a total of 18 Vietnamese suppliers and

11 out of a total of 26 Japanese suppliers operating in HVN's value chain as of 2007.[17]

The Chinese model is represented by Vietnamese–Chinese chains developed by local Vietnamese motorcycle assemblers.[18] Unlike the analysis of the Japanese model, the focus is not limited to those value chains developed by specific lead firm(s) because their small size, repeated entry into and exit from the market, and the emergence of a *shared supply base* serving the local motorcycle assembly industry at large (see Section 6.2) calls for coverage of Vietnamese–Chinese chains as a whole.[19]

Analysis of the Chinese model also combines that of context and embedded subunits. The former relies on analysis of the local motorcycle assembly industry as a whole. In respect of the latter, six local assemblers were selected from lists of those operating as of 2000 and 2006 respectively[20] according to the following criteria. The first one was the *critical case* criterion, in which priority was given to assemblers that were sufficiently large in terms of the scale of production.

Second, selection was based on two types of replication logic in case study research: literal replication (predicting similar results across cases) and theoretical replication (predicting contrasting results but for predictable reasons) (Yin 2003). Since assemblers' product strategies and performance started to diverge at a late stage of industrial development, cases were selected to include assemblers adopting different product strategies and sourcing practices. On the basis of the author's previous research (Fujita 2006), the key distinction was between one group of assemblers that concentrated on the production of low-priced imitations of Japanese-brand motorcycles,

---

[17] These include Vietnamese suppliers V1-9 and V13 and Japanese suppliers J1-11.

[18] Lifan Vietnam, the only Chinese-invested motorcycle manufacturer, was not selected on account of its small market shares and its focus on engine production rather than motorcycle assembly (The Motorbike Joint Working Group 2007: 27).

[19] The distinction between Japanese and Vietnamese–Chinese chains is similar to the contrast drawn by Sturgeon and Lee (2005: 35) in reference to supplier networks in the automotive sector whereby Toyota's supplier network competes with that of General Motors' and the electronics industry, in which strategic outsourcing by groups of lead firms has led to the rise of a shared supply network. A striking feature of the present case is that contrasting supplier networks have emerged within a single industry.

[20] The 2000 list was provided by the Vietnamese Ministry of Industry, and the 2006 list was provided by the General Statistics Office.

and another group that prioritised quality improvement, and the development of own designs and brand names often at the expense of higher prices.

Third, cases were selected so as to make use of data obtained from the author's previous fieldwork, and accessibility to assemblers for additional rounds of fieldwork. Since data from previous fieldwork only included information on three assemblers (A1, A4 and A5), attempts were made to incorporate additional embedded case assemblers that were known to have played major roles in stages II and III. Assembler A2, which in 2000 had had the largest turnover of 51 local assemblers,[21] and assemblers A3 and A6, which were found to be expanding sales in Stage III, were added as embedded cases.

As a result of the selection process, the author ended up with six assemblers (A1-6) as embedded subunits. Assemblers A1, A2 and A3 belonged to one category of assemblers concentrating on the production of low-priced imitations of Japanese-brand motorcycles. Assemblers A5 and A6 were typical examples of the other category of assemblers prioritising the development of own designs and brand names and quality improvement. Assembler A4 fell somewhere in between the two categories.

Suppliers were also analysed as embedded subunits in the Vietnamese–Chinese chain. Data were obtained for a total of 24 suppliers of different nationalities (5 Chinese, 7 Taiwanese, 1 Korean, and 11 Vietnamese).[22] Attempts were made to ensure that cases included suppliers playing key roles in value chains developed by both of the aforementioned emergent groups of assemblers.

4.2 Data Collection and Analysis

In an attempt to analyse the trajectories of organisational transformation over the decade from the late 1990s, this study combined three main sources of data. The first dataset derived from the author's previous fieldwork conducted in 2001, 2002, 2003, 2004 and 2005. Since the industry in question had undergone dramatic transformation involving many entries and exits, high staff turnover, and the frequent personnel

[21] Based on the list of local assemblers provided by the Vietnamese Ministry of Industry.

[22] These include Chinese suppliers C1-5, Taiwanese suppliers T1-7, Korean supplier K1 and Vietnamese suppliers V13-23.

changes typically observed in foreign affiliate, the present study would not have been possible without data from these previous rounds of fieldwork. Although they were driven by different research questions, they provided a great deal of information on lead firm production strategies and sourcing practices, lead firm–supplier relations, and the development of suppliers' capabilities.

Data obtained in previous rounds of fieldwork were compiled in the form of interview recordings, transcriptions, and notes (mainly from Vietnamese companies); interview notes (mainly from Japanese, Taiwanese, Korean, and Chinese companies); questionnaire surveys; notes taken during factory visits; company brochures and presentation materials; and other materials provided by firms. The present study therefore commenced with the interpretation and coding of existing materials in accordance with the operationalised indicators presented in Section 3.

Second, additional rounds of fieldwork were conducted specifically for the present study in order to collect data on new developments after 2005 and, wherever possible, to obtain retrospective data on earlier years. The basic strategy was to follow up with lead firms and suppliers approached in previous fieldwork, but attempts were also made to incorporate those that had not been included in the earlier studies but had come to play important roles in Stage III.[23] Additional interviews with HVN and local assemblers, as well as their key suppliers, were also conducted between 2007 and 2009.

The fieldwork study of local assemblers requires further explanation. A major challenge was the difficulty in accessing assemblers for additional rounds of fieldwork (A3, A4, and A6 agreed to be interviewed whilst A1 and A5 refused). The challenges were addressed by the following measures. One was to conduct questionnaire surveys of local assemblers in collaboration with the Vietnam Institute of Economics, Vietnam Academy of Social Science in 2007, to which A1, A3, A4, A5 and A6 agreed. Another was to access a former employee. Since access could be made to the former procurement manager (2002–4) of assembler A2, a series of interviews was conducted to obtain information on the company in the early 2000s.

[23] Examples include local assemblers A3 and A6, and suppliers J10, J11, C1, V7, V9, and V16. Information on newly-emerging companies was obtained from newspapers and interviews with firms and industry experts.

In order to complement limited amount and quality of data on local assemblers, the author also interviewed Taiwanese, Korean, Chinese and Vietnamese suppliers that had worked closely with these local assemblers over the years. The former transpired to be easier to access and became precious sources of information on Vietnamese–Chinese chains. Towards the last stage of the fieldwork, the author presented the main lines of argument on Vietnamese–Chinese chains to these suppliers and other industry experts and asked for their feedback. This exercise helped to confirm the validity of arguments and indicate where adjustment was necessary.

The third source of data was that on local supplier capability which was collected for a different part of this research project focussing on trajectories of supplier capability formation.[24] Of the 21 suppliers covered in the fieldwork on local suppliers, data for 18 of them were revealed to be suitable for the present study.[25] In-depth interviews were conducted with these 18 suppliers to identify the types and levels of capability acquired by such firms in Japanese and Vietnamese–Chinese chains at different stages of industrial development.

The full list of firms interviewed and surveyed is included in Appendix. In addition to interviews and questionnaire surveys, this study also made use of the following additional data sources: published and unpublished statistics, Vietnamese and Japanese newspapers, reports and research papers on the industry, and presentations and lectures given by representatives of firms analysed as embedded cases.

All the fieldwork materials were coded and tabulated using the indicators presented in Section 3. The following sections will present the results of the analysis as a synthesis of insights obtained from various levels of analysis. While individual firm-level case reports had been prepared in the course of the analysis, the details of the individual cases will be included only where necessary.

5. The Emergence and Transformation of the Japanese Model in Vietnam

Sections 5 and 6 present the empirical analyses of the transformation of Japanese and

[24] See Paper III in Fujita (2013b).

[25] The remaining three were second-tier suppliers to Japanese motorcycle manufacturers, which were beyond the scope of this study.

Chinese organisational models respectively in Vietnam. Each is structured in chronological order, with subsections running from earlier to later stages of industrial development. Each subsection begins by discussing the features of the two determinants of industrial organisation – namely, the nature of the product and the alignment of relevant capabilities – in the respective value chain at each stage of industrial development. It then goes on to analyse the form of industrial organisation that emerged under the prevailing conditions.

Section 5 focuses specifically on how Honda, the leading global motorcycle manufacturer, transferred its conventional organisational model to Vietnam, and how it was transformed in the short- and the medium-term after its clash with the Chinese model. The discussion proceeds in the following order:

- Stage I: the industry's start-up phase, designed to observe the status of the transferred Japanese model before its clash with the emergent Chinese model
- Stage II: the period of the China shock and its repercussions, designed to observe the immediate response of actors in Japanese chains to the direct clash with the Chinese model
- Stage III: the period of FDI-led development, designed to observe the medium-term impact of the clash with the Chinese model and the situation after unstable policy conditions impeding organisational adjustments were cleared

5.1 Stage I: A 'Foster Parent' Variant Emerges

The empirical analysis of the Japanese model begins with the assessment of Honda's relations with its suppliers in the early years of its operation in Vietnam when the market was small and the local component supply base was underdeveloped. The following subsections examine how the company attempted to cope with the initial challenges and assess the key features of the emerging form of industrial organisation.

5.1.1 The Need for Explicit Coordination: Non-standard Designs and High Quality

Upon launching local production in Vietnam, Honda basically sought to replicate the conventional product strategy it had perfected in Japan and earlier overseas investment locations: launching its own sophisticated models developed at home and manufacturing them locally to high quality standards. In the 1990s, HVN launched two models in Vietnam, both of which carried proprietary (and thus non-standard) designs developed at the company's R&D headquarters in Japan.[26] One was adapted from an existing model produced in Thailand, and the other was developed exclusively for the Vietnamese market, carrying components customised to this particular model. The company also instituted its own component quality standards to be applied at its production bases in Asia.[27]

Not only were product/process parameters idiosyncratic, they were also complex. HVN's emphasis at this stage was clearly not on price competitiveness, the two models launched in the 1990s being priced as high as US$2,000.[28] This reflected not only high quality levels but also a lack of scale economies, dependence on imported components, and monopoly rents.[29] Unsurprisingly, sales stagnated as price levels were far above the reach of ordinary citizens; while the limited number of consumers who could afford the high prices opted for Honda-brand motorcycles imported from Thailand that were priced at broadly similar levels (Nguyen Tran Que and Hoa Huu Lan 1998). However, this did not lead HVN to adjust its product strategy at this stage.

HVN's emphasis on the non-price dimensions of competitiveness was confirmed by its suppliers. Detailed drawings provided by the company specified detailed product and process parameters (interviews with V1 #2, #4; V2 #1; V3 #1). As will be discussed in more detail below, none of the suppliers interviewed by the author were asked to reduce their prices at this stage.

Apparently, Honda made limited effort to adapt its product strategy to the demands of Vietnamese consumers. After all, Vietnam was still a small, emerging market and the only major competitors were Honda-brand motorcycles imported from Thailand. Stagnating sales notwithstanding, the company was not compelled to seriously reconsider its product strategy.

---

[26] This discussion of models launched in the1990s is based on an interview with HVN #2.

[27] *Nikkei Sangyo Shimbun (Nikkei Business Daily) Newspaper*, 25 May 1999.

[28] The prices were US$1,990 and US$2,044 respectively (Nguyen Duc Hien 2004: 234).

[29] A Vietnamese government inspection in 1998 found that HVN had earned profits of US$18,154,000 – or US$221 per vehicle sold (calculation by the author) – in the company's second full year of operation (Ha Huy Thanh et al. 2003: 332).

5.1.2 Misaligned Capability/Power Structure

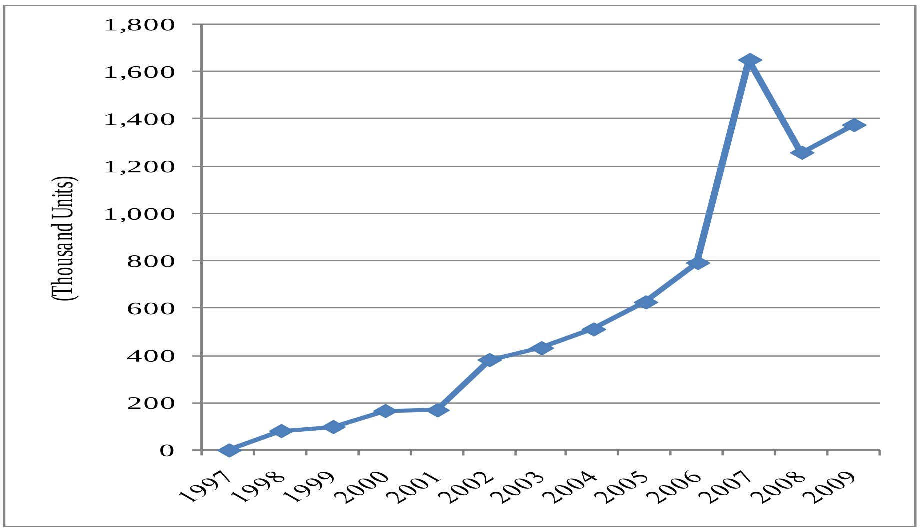
As one of the world's leading manufacturers of motorcycles since the 1960s, Honda enjoyed product and branding leadership that had remained unchallenged for decades. The company also controlled virtually all key value chain functions, including product development, designs of all components other than a limited number of core items, marketing, and branding (Fujita 2013a). As of the late 1990s, the company's operations in Vietnam focussed on production, while product development and design were undertaken in Japan.

Yet, even such product, technological and marketing leadership transpired to be insufficient for HVN to gain control over the Vietnamese market. As stated above, since its products were out of the reach of ordinary Vietnamese consumers, motorcycle sales stagnated in the 1990s (Figure 1). The fact that it was the single largest motorcycle manufacturer in Vietnam notwithstanding, HVN's production in the 1990s remained small (Figure 4); indeed, far lower than 300,000 units per year – the level generally recognised by Japanese manufacturers of motorcycle components as the minimum scale needed for efficient production (Mishima 2007).

The Vietnamese government demanded that foreign motorcycle manufacturers expand local sourcing of components.[30] To meet this requirement, Honda adopted its conventional approach of sourcing from the following two types of suppliers (interview with HVN #1), both of which transpired to be in short supply in Vietnam. First, Japanese suppliers – especially members of the Honda Group (*keiretsu*) – were preferred because of their proven record of manufacturing competence in serving Honda in Japan and abroad. However, despite indications that Honda explicitly or implicitly asked *keiretsu* suppliers to establish production bases in Vietnam notwithstanding (interviews with J6 #1; J7 #1), few of them did so because the country was still regarded as risky investment location (JETRO 1996; Ichikawa 2001) and the anticipated size of orders was too small.

Figure 4. HVN's Annual Motorcycle Production

[30] Circular of the State Committee for Cooperation and Investment 1536/UB-VP dated 11August 1994.



Source: Honda Motor Co., Ltd. (various years).

Second, Honda also sought to mobilise relatively large, well-established local companies. However, given the underdeveloped status of Vietnam's mechanical industries at this stage,[31] only four such firms were initially admitted into HVN's value chain (Table 4). Even though they were relatively large and well-established by Vietnamese standards, none of them had previous experience of manufacturing machinery components or serving foreign customers. This is evident from Table 5, which shows production capabilities possessed by Vietnamese suppliers in Japanese chains including three of the four suppliers that were admitted into HVN's chains in the 1990s (V1, V2 and V3).

Consequently, HVN's value chain remained underdeveloped. As of 1998, the local content ratio was only approximately 44% (Table 4), which included components that HVN manufactured in-house, the majority of parts being necessarily imported, mainly from Japan. In 1998, HVN's supply networks in Vietnam only consisted of 16 first-tier

[31] This is evident from remarks made by experts who visited local Vietnamese companies engaged in processing metal, plastic and rubber products in 1995. Having visited nine major local companies, they remarked, "Visiting…local companies for the first time, we were surprised to find that their levels were far [lower] than the component manufacturers we have known and have instructed [in other Asian countries] in the past. We have come to think that instructing these companies will require a great deal of patience and new ideas" (JETRO 1996: 1).

suppliers: 12 Japanese companies, 5 of which belonged to the Honda Group,[32] and 4 local firms.

Table 4. HVN's Local Sourcing

	1998	2001	2004	2007
Local Content Ratio	44%	52%	83%	90%
Total Number of Suppliers in Vietnam	16	20	43	58
Japanese Suppliers	12	15	18	26
of which members of Honda Group	5	6	6	11
Taiwanese and Korean Suppliers	0	0	12	14
Vietnamese Suppliers	4	5	13	18
of which members of VEAM	0	0	1	3

Note: VEAM (Vietnam Engine and Agricultural Machinery Corporation) is a state-owned business group that contributes 30% capital to HVN.
Source: The author's interviews with HVN (#1, #2, #3). Suppliers belonging to the Honda Group and VEAM were respectively enumerated by the author on the basis of Toyo Keizai Inc. (2009) and VEAM's website (http://www.veam.com.vn/?act=thanhvien, accessed 1 August 2012).

Table 5. Production-related Capabilities Acquired by Vietnamese Suppliers in Japanese Chains

	Before Stage I	Stage I	Stage II	Stage III
V1	Production of household plastic items	Operational	(n/a)	Adaptive
V2	Production of bicycle components	Operational	Operational - assimilative	Assimilative-adaptive
V3	Production of household metal items	Operational	Operational	Assimilative
V5	Production of household plastic items		Operational	Operational-assimilative
V6	Production of wire harnesses for export to Japan		Assimilative	Adaptive
V7	Production of machinery components for SOEs		Operational	Assimilative
V8	(not yet established)			Assimilative
V9	Production of machinery components for SOEs			Operational
V13	Production of machinery components for SOEs		Operational	Assimilative

Notes:
(1) n/a = data not available.
(2) For the period prior to entry into a Japanese chain (the unshaded area), main lines of business are shown.
(3) For the period after entry into a Japanese chain (the shaded area), the level of equipment-related and production management capabilities acquired by each supplier is shown. In case levels of the two types of capabilities differed, the lowest and highest

[32] Suppliers J2, J6 and J10 even enjoyed direct capital investment from Honda's Thai affiliate.

levels.

Source: The author's interviews with suppliers (Fujita 2013b).

In short, Honda's global leadership in product, technology and branding notwithstanding, the company had yet to establish sufficient market power to exert control over the albeit limited number of suppliers that possessed low levels of manufacturing competence.

5.1.3 The Lead Firm as a Generous Provider of Assistance

Limited lead firm control over the market combined with Vietnam's dearth of component suppliers to constrain HVN in its attempts to exercise dominance. The result was a 'foster parent' variant of the captive model, whereby the lead firm relied primarily on the assurance of long-term orders, and the provision of technical and financial assistance to induce the suppliers' commitment to meet its requirements.

The key features of the emerging organisational model are evident from the pattern of lead firm–supplier dependence. On the one hand, the need to increase local contents in accordance with government requirements, combined with the difficulty of finding alternative domestic sources of components, meant that HVN was dependent to a great extent on its incumbent suppliers. Given non-standard product parameters and demand below the minimum level required for efficient production, orders were commissioned straight to a fixed group of suppliers.

On the other hand, supplier dependence on HVN varied (Table 6). Even with modest orders, Japanese suppliers were largely dependent on HVN as they had no other major customers. This was particularly the case with regard to members of Honda Group, who invested in Vietnam specifically with the aim of doing business with Honda.[33] By contrast, local Vietnamese suppliers typically maintained the output of their traditional products. This was the practice of all of four Vietnamese suppliers interviewed by the author that entered the HVN value chain in the 1990s; while business with HVN accounted for a relatively minor proportion of their sales (Table 6).

[33] Three of the four Honda Group suppliers interviewed by the author explicitly mentioned that they invested in Vietnam with the aim of serving Honda (interviews with J2 #1, #2; J6 #1; J7 #1). No information was available on the remaining supplier (J3).

As stated above, in order to induce suppliers' commitment to achieve its targets, HVN played the role of a 'foster parent' – a generous provider of assistance. The company's extensive use of assistance at this stage is evident from the author's interviews with suppliers. For members of the Honda Group, patronage took the form of financial support. This was a means by which HVN could reward its suppliers for taking the risk of investing in the equipment and/or training required specifically for serving Honda; given that the company was unable to provide suppliers with what they most wanted: large and stable orders. Two of the four Honda Group suppliers interviewed (J2 and J3) pointed out that HVN had applied preferential prices for the first few years so that they could gain a quick return on their investments. As a result, supplier J3 recorded a profit as early as the second year of operation (interview #1), and supplier J2 completely eliminated its losses by the early 2000s (interview #2).

For local Vietnamese suppliers, patronage took the form of technical assistance. Without the provision of such help over an extended period, it was virtually impossible for local Vietnamese companies to meet HVN's requirements. All of the four Vietnamese companies selected by HVN as first-tier suppliers upon the launch of its local production were interviewed by the author at different times. They had all received technical assistance, typically in the form of repeated visits of experts to their factories over a few years to provide advice and suggestions (interviews with suppliers V1 #1; V2 #1, #2; V3 #1, #2; V4 #1).

Table 6. Suppliers' Dependence on HVN

(a) Japanese Suppliers

Name	Honda Group	Start of Trans-actions	Components	Ranking by Turnover		Dependence on HVN and Changes in the Volume/Content of Orders		
				2002	2006	Stage I	Stage II	Stage III
J1	*	1997	Steel/ aluminium components	2nd	(reorganised into J10)	100% dependent on HVN.	100% dependent on HVN. Orders for increased variety of components and types of processing required.	(Reorganised into supplier J10 in 2005.)
J2	*	1997	Silencers	3rd	3th	100% dependent on HVN.	100% dependent on HVN and its suppliers. Orders for increased variety of components.	100% dependent on HVN and its suppliers. Further increase in variety of components.
J3	*	1997	Brake system	7th	7th	Highly dependent on HVN.	Highly dependent on HVN but started exporting components to Japan.	Dependent on HVN for 52% of sales while exports increased to 23%. Increased orders for sophisticated components from HVN.
J4		1997	Dies and moulds	(not included)	(bankrupt in 2004)	(n/a)	Highly dependent on HVN but traded with VNS, YVN and manufacturers of consumer electronic products.	(Bankrupt in 2004.)
J5		1997	Plastic components	(not included)	(not included)	(n/a)	Dependent on HVN for 40% of sales but traded with YVN and consumer electronics manufacturers.	Dependence on HVN decreased to 20%. Increased production of electronic components.
J6	*	1998	Shock absorbers	4th	1st	Almost completely dependent on HVN	Highly dependent on HVN but also supplied limited quantities to YVN and VNS. Lost orders for certain types of components upon the launch of the Wave Alpha but recovered them within a few years.	Dependent on Honda for 95% of sales (including HVN for 85% and exports for 10%). Orders for increased variety of components.
J7	*	1998	Electronic components	5th	2nd	(n/a)	Dependent on HVN for 65% of sales.	(n/a)
J8		1998	Plastic components	(not included)	(not included)	Many customers in other industries	Many customers in electronics and other industries.	(n/a)

Table 6. Continued

Name	Honda Group	Start of Trans-actions	Components	Ranking by turnover		Dependence on HVN		
				2002	2006	Stage I	Stage II	Stage III
J9		2001	Aluminium components	(not included)	(not included)	(n/a)	(n/a)	90% of sales in 2006 from motorcycle components, including supply to HVN and YVN. Volume and variety of orders from HVN reduced by 2008.
J10	*	2004	Steel/ aluminium components	(not yet established)	4th	(not yet established)	100% dependent on HVN and its suppliers.	100% dependent on HVN and its suppliers.
J11	*	2005	Transmission	(not yet established)	35th	(not yet established)	(not yet established)	100% dependent on HVN and its suppliers.

(b) Vietnamese Suppliers

Name	VEAM Member	Start of Trans-actions	Components	Ranking by Turnover		Dependence on HVN and Changes in the Volume/Content of Orders	
				2002	2006	Stages I to II	Stage III
V1		1997	Plastic components and moulds	(not included)	(not included)	Dependence on HVN increased from 16% in 2001 to 41% in 2002.	Dependent on HVN for 40% of sales in 2008. Orders for high-precision components and moulds since 2006. Orders from buyers in other industries also increased.
V2		1997	Metal components	(not included)	13th	Dependence on motorcycle components increased from 22% in 1998 to 85% in 2003 (mostly HVN).	Dependent on motorcycle components for 87% of sales in 2008. Increased volume and variety of orders from HVN and its suppliers.
V3		1997	Metal components	12th	(not included)	Dependent on motorcycle components for 60% of sales in 2001 (mostly HVN).	Dependent on HVN for 50–60% of sales. Volume of orders increased but concentrated on components requiring relatively simple processing.
V4		1997	Metal stamped components	(not included)	(not included)	Dependence on HVN increased from 30–40% in the 1990s to 70% in 2002. Volume and variety of orders increased.	Dependence on HVN reduced to 40–45% in 2008. Volume and variety of orders not increased while supplier expanded transactions in other products.

Table 6. Continued

Name	VEAM Member	Start of Trans-actions	Components	Ranking by Turnover		Dependence on HVN and Changes in the Volume/Content of Orders	
				2002	2002	Stages I to II	Stage III
V5		2000	Plastic components	(not included)	(not included)	Dependent on motorcycle components for less than 10% of sales in 2002 (mostly HVN).	Dependence on HVN increased to 40% in 2007. Orders falling by 2008 and concentrated on components requiring relatively simple processing.
V6		2001	Wire harnesses	(not included)	(not included)	(n/a)	Dependent on HVN for 40% of sales in 2008. Volume and content of orders unchanged.
V7	*	2001	Metal engine components	(not included)	(not included)	Dependent on HVN for 42% of sales in 2002.	Dependent on HVN for 60% of sales in 2008. Orders increased, including processing for high-precision engine components.
V8		2004	Dies and moulds	(not included)	(not included)	(not yet established)	Dependent on HVN for virtually 100% of sales in 2008.
V9	*	2005	Metal engine components	(not included)	(not included)	(not yet started transactions with HVN)	Dependent on HVN for one-third of sales in 2008. Orders increased, including processing for high-precision engine components.
V13	*	2004	Metal components	(not included)	45th	(not yet started transactions with HVN)	Dependent on HVN for 80% of sales in 2008. Orders increased in volume and variety.

Notes:

(1) 'Ranking by Turnover' indicates placement of respective suppliers among all registered motorcycle component suppliers included in lists provided by the General Statistics Office.

(2) 'Not included' indicates that the supplier was omitted from the list, which typically occurred when suppliers were registered under other industries because their main product lines were not motorcycle components.

Source: The author's interviews.

For its part, HVN made relatively limited use of its ability to impose demanding requirements on its suppliers – a key feature of the captive model. While HVN's quality stipulations constituted a challenge to most local suppliers, they were given ample time to study procedures and strive to reach the requisite standards (interview with V2 #1). The small volume of orders also meant that delivery requirements were loose, a factor that is evident from the author's interview with supplier J3, one of the Honda Group suppliers.

> In those days [the 1990s], when we could not make the delivery deadline specified by HVN, our local staff even requested them to adjust their production timetable. Now [at the time of the interview i.e. 2004] it is difficult to imagine that such a practice was going on. (J3 #1)

In summary, HVN's differentiated, proprietary products called for explicit governance mechanisms. Even though HVN remained the sole coordinator of its value chain, the limited volume of orders and an underdeveloped local component supply base constrained it in the establishment of its dominance in terms of imposing challenging targets on its suppliers. The outcome was that HVN adopted the role of a 'foster parent' in attempting to nurture the capabilities of its suppliers. Moreover, in the absence of major competitors, HVN was not compelled to reconsider its strategies at this stage.

5.2 Stage II: Partial Transformation of the 'Foster Parent' Variant

This subsection considers Honda's short-term response to the new challenges posed by the China shock. Faced with the need to spur price-based competitiveness, HVN sought to adjust its organisational model but such an attempt only produced limited progress at this stage. The following examines the factors that drove HVN's organisational adjustment as well as those that impeded it, and discusses the form of industrial organisation that emerged out of the adjustment.

5.2.1 Impetus for Transformation: Radical Price Reduction

The impetus for organisational change came from a radical shift in emphasis of HVN's product strategy from non-price to price-based competitiveness. When the Vietnamese market began to be flooded with massive numbers of low-priced imitation motorcycles, for the first time, Honda realised the huge unexploited demand at the bottom end of low-income markets like Vietnam. This led Honda to initiate a company-wide effort to develop a low-priced model in an attempt to prevent the entry of Chinese motorcycles into Southeast Asia, where the Japanese company had held market leadership for decades (Higashi 2006; Sato 2011). In collaboration with the R&D headquarters and mother factory in Japan and production base in Thailand, Honda's regional R&D base in Thailand developed a low-priced model with exceptional acceleration (Ohara et al. 2003; Ohara 2006b). Priced at approximately one-third of HVN's existing models,[34] the Wave Alpha was launched in Vietnam in January 2002.

The launch of this low-priced model had significant impact on parameters imposed on suppliers. On the one hand, the complexity of parameters was reduced. Price reduction targets demanded by HVN upon the launch of the Wave Alpha on four of the Honda Group suppliers of core components interviewed by the author ranged between 40% and 50% (Table 7), which was far beyond the targets achieved by routine incremental improvements in productivity.

Table 7. Responses of Honda Group Suppliers to the Launch of the Wave Alpha

Name	Price Reduction Margin Requested by HVN	Supplier's Response to HVN's Requests	Results
J2	40%	Priority was to avoid loss of orders. The supplier decided to accept HVN's targets before actually coming up with ways of meeting them.	The supplier won orders for all existing types of component.
J3	50%	Priority was to avoid loss of orders, even if the supplier initially incurred losses.	The supplier won orders for all existing types of component. It later came up with ways to achieve cost reduction.
J6	(n/a)	The supplier made internal attempts at cost reduction and suggestions for specification changes to HVN.	The supplier only won orders for 3 of 16 existing types of component.
J7	40%	The supplier provided quotations in accordance with the extent of cost reduction it could achieve.	The supplier lost orders for one of two existing types of component but won orders for other components as it was able to meet HVN's target price.

[34] Upon its initial launch, the price of the Wave Alpha (US$719) was 36% of the official price of HVN's most popular model, the Super Dream, in 2000 (US$1,990) (Nguyen Duc Hien 2004: 234). This was followed by the launch of a low-priced model in Thailand in June 2002, the Wave 100.

Source: The author's interviews (J2 #1; J3 #1; J6 #1; J7 #1).

In the meantime, in order to achieve such a radical cost reduction, Honda reduced its product specifications to the levels considered necessary for the Vietnamese market. For example, the maximum driving speed applied in defining product and process parameters for the Wave Alpha was set at 80 kilometres per hour. Even though this was much lower than standard levels applied to Honda's other overseas markets, it was considered sufficient for use in the Vietnamese context where traffic congestion prevented motorcycle use at higher speeds (Amano and Shintaku 2010: 799).

On the other hand, the non-standard nature of parameters was maintained. With the aim of reducing product development costs, Honda made extensive use of component designs utilised in its existing models (Ohara et al. 2003) rather than renewing the whole vehicle system – the conventional Japanese approach to product development (Fujita 2013a). However, the Wave Alpha was still non-standard in the sense that component designs were customised to Honda.

In summary, HVN's priority shifted from quality to price reduction. The company's product and process parameters were still non-standard but less complex than in the previous stage, and thus could be communicated between the lead firm and its suppliers with relative ease.

5.2.2 Lead Firm Attempts at Realigning Capabilities

The shift in HVN's production strategy was accompanied by corresponding changes to the structure of the company's value chain. In order to reduce component procurement costs, HVN sought to substantially expand sources in Vietnam and abroad (interview #2). Apart from the need to exploit new sources of lower-priced components, expanding local sourcing became a priority, as this enabled HVN to save on import tariffs and to conform to the local content stipulations implemented by the Vietnamese government in the early 2000s. Increasing the number of suppliers – especially those with high levels of price-based competitiveness – was also expected to put competitive pressure on incumbent suppliers.[35]

[35] This effect is clearly illustrated in an interview with Japanese *keiretsu* supplier J2 #1 in 2002. Noting that Honda was engaged in an extensive search for new suppliers, the general director commented

Since one could hardly expect Japanese FDI in component manufacturing to increase immediately (Ichikawa 2001), HVN inevitably had to depend on non-conventional component sources in expanding local supply. The remarkable increase in HVN's local content ratio from 52% in 2001 to 83% in 2004 (Table 4) was achieved primarily by incorporating non-Japanese suppliers into the company's value chain. As Honda engaged in an extensive search for suppliers in Vietnam by mobilising experts from Japan,[36] numerous Taiwanese, Korean and Vietnamese suppliers were admitted into the company's value chain (Table 4). Another noteworthy development was that HVN sought to import components for the first time from China. Upon the launch of the Wave Alpha, HVN sourced 27 types of component from local Chinese companies servicing Honda's joint venture motorcycle manufacturer in China (interview #2).

While the above developments might look impressive, the key question is the extent to which such adjustments changed the alignment of relevant capabilities and power relations between lead firm and suppliers. Apparently, HVN hoped to achieve two aims simultaneously: to enhance its purchasing power, and to spur price-based competition between suppliers. Both conditions had to be met if HVN were to exploit market forces whilst maintaining its non-standard product and process parameters. However, this strategy only achieved partial success at this stage because the company was prevented from realigning the necessary structure of capabilities to achieve these aims.

On the one hand, by reducing prices, HVN sought to rapidly expand its sales volume, which would not only enable the lead firm and its suppliers to realise economies of scale but also allow HVN to exercise purchasing power over its suppliers. Indeed, this seemed a likely scenario in 2002.[37] However, HVN's ambitions were blocked by a series of restrictions introduced by the Vietnamese government from 2002 onwards on

---

that the price-based competitiveness of local suppliers would pose a real threat to Japanese companies.

[36] The search for potential suppliers conducted in the years 2001–2 was the most extensive in HVN's history to date, covering as many as 80 companies (interview with HVN #4).

[37] A few Japanese suppliers noted that in 2002 they had been requested by HVN to prepare for rapid capacity expansion (interviews with J2 #1; #2; J4 #1), which clearly demonstrates HVN's ambitions before quantitative restrictions on imports of components were imposed (Section 2.3). Also, when HVN's annual production exceeded one million units in 2007, the company's administrative manager noted, "We could finally achieve what we had endeavoured to achieve for a long time" (interview HVN #3).

motorcycle registration and the capacity expansion of foreign invested motorcycle manufacturers (as discussed in Section 2.3). The resultant slow growth of the market as well as HVN's inability to invest in expansion of production capacity meant that the company's annual production increased modestly. In fact, it had only reached some 400,000 units by 2004 – above the 300,000-unit minimum level required for economically viable non-capital-intensive production but barely sufficient for the lead firm to exercise purchasing power over suppliers.

On the other hand, HVN's attempt to increase the number of suppliers was aimed at breaking its dependence on incumbent suppliers and spurring competition between them as well as new ones. Again, this strategy was thwarted by the limited manufacturing capabilities of newly admitted suppliers together with the aforementioned small purchase volume. While some Taiwanese suppliers had good track records of supplying components to Honda in Taiwan (interview with HVN #2), only one of the four Vietnamese suppliers interviewed by the author and admitted to HVN's value chain in Stage II had ever served foreign customers (Table 5).

The shortage of supplier capability had to be dealt with by lead firm intervention in the form of technical assistance. However, as will be discussed below, quality problems recorded by several suppliers – those in China in particular – were so serious that HVN was eventually compelled to stop placing orders with them (interview #2) – the sort of decision Honda makes only in truly exceptional circumstances (interview #3). By 2004, only a few types of components – as opposed to 27 upon the initial launch of the Wave Alpha – were imported from China (interview with HVN #2).

In the meantime, the radical price reduction targets announced by HVN upon launching of the Wave Alpha compelled the incumbent suppliers – including those belonging to Honda Group – to take urgent measures to reduce production costs. All such suppliers interviewed by the author, both Japanese and Vietnamese, eventually achieved HVN's price reduction targets with their own cost reduction efforts.[38] For instance, supplier J6 won contracts for only three out of the sixteen types of components upon the initial launching of the Wave Alpha, but because of significant

[38] Examples of measures taken by interviewed suppliers to achieve targets include the localisation of imported components and materials; productivity improvement in plant operations; and downward adjustments to product and/or process specifications (subject to Honda's approval) (interviews with J2 #1; J3 #1; J6 #1).

productivity improvements, company won back contracts for all of the remaining thirteen types of components by 2004 (interview #1).

In short, HVN's attempt at realigning capability within its chain with the aim of achieving substantial cost reduction was only partially successful at this stage; first, because government policy impeded HVN in expanding production; and second, because supplier capabilities took time to develop.

5.2.3 The Constant Struggle to Introduce Market Forces

As a result of the partial realignment of capabilities, the emerging pattern of transactional governance was shaped by a tension between the need to achieve radical price reduction – which called for increased use of market forces – and absence of the capability alignment required for the effective functioning of market forces.

HVN's attempts at making use of market forces may be clearly observed in the company's ordering procedure upon the launch of the Wave Alpha, orders being no longer commissioned straight to a fixed group of suppliers but based on competition determined by price. Prior to the launch of the new model, HVN announced radical price reduction targets and asked for quotations from an increased number of suppliers (interviews with J2 #1; J3 #1; J7 #1). Table 7 summarises the responses of four incumbent suppliers, all of which had direct capital relations with Honda. They were thus compelled to meet a price reduction target ranging between 40% and 50% or risk losing orders. In this regard, in 2004, the general director of supplier J6 recalled: "[Upon launching of the Wave Alpha,] we received pressure [from Honda that they] would switch to Taiwanese, Korean, or Chinese suppliers if we could not achieve the target prices" (interview #1). In August 2002, the general manager of supplier J2 indeed admitted that the decision was whether to accept the cost reduction target presented by Honda or to lose orders (interview #1).

However, responses varied. Suppliers J2 and J3 strove to meet targets on the understanding that they would be obliged to sacrifice profits or even incur losses during initial years. On the other hand, suppliers J6 and J7 gave up supplying some of the components for which they were asked by HVN to provide quotations. The fact that even supplier J6, with which Honda had direct capital and personnel relations, won orders for only 3 out of the 16 types of component that the company had previously supplied to HVN illustrates the lead firm's determination to trade with the cheapest available source *regardless of nationality or keiretsu ties*.[39] This marked an important shift away from Honda's conventional sourcing practices. Indeed, suppliers were expected to *independently* come up with measures to meet the stringent targets imposed on them, financial support previously granted to such suppliers having been terminated by this stage.

Although the above changes in HVN's ordering practices might look impressive, the new alignment of lead firm and supplier capabilities prevented the sustained operation of price-based competition, a situation that eventually led to the revival of previous patterns of dependence. First, HVN's limited purchase volume meant that dual sourcing was not feasible: to the extent that non-standard component designs were maintained, parts could be simultaneously sourced from more than one supplier only when the size of production was sufficiently large to allow each of the suppliers to exploit economies of scale. HVN regarded this threshold to be the annual production of one million units (interviews #3, #4), an output level that, as discussed above, had not been reached by the end of Stage II.

Second, as noted in Section 5.2.2, the limited manufacturing capability of newly admitted suppliers posed a serious constraint to HVN's attempts to use them to spur competition between suppliers. This, combined with the efforts of incumbent suppliers to meet HVN targets, resulted in the revival of the traditional mutual dependence between the lead firm and its old suppliers.

Third, limited supplier capabilities also forced HVN to continue to act as a 'foster parent' or provider of technical assistance. New entrants were offered technical assistance in the form of periodic monitoring and joint problem-solving exercises (interviews with V5 #1; V7#1); although the time frame of assistance was found to be generally shorter than it had been in respect of suppliers entering HVN value chain in the 1990s, the former – as discussed above – extending for between one and two years, while the latter was approximately six months (interviews with V5 #1; V7#1).

---

[39] An important point to note is that most of the components adopted in the Wave Alpha carried designs previously developed for Honda's pre-existing models (Ohara et al. 2003). The fact that suppliers had not participated in component design processes is likely to have been a key consideration behind the sourcing approach adopted for this particular model.

The above findings show that the magnitude of short-term adjustment was not as substantial as the existing literature suggests after all. While HVN's response to the China shock did include a number of radical changes to conventional sourcing practices, they were largely emergency measures intended to deal with immediate needs. Within a few years, it became apparent that the existing capability structure constrained the sustained functioning of market forces, the result being the revival of traditional patterns of dependence and persistence of lead firm assistance.

5.3 Stage III: Transformation into an 'Institutionalised Competition' Variant

As the industry entered the phase of rapid FDI-led development, fundamental changes took place in HVN's value chain. The company's attempts to introduce market forces into transactional governance, which had only partially succeeded in the previous stage, culminated in what the present study refers to as an 'institutionalised competition' variant of the captive model. This variant of the captive organisation systematically combines the advantages of long-term, close relations with a fixed group of suppliers and the benefits of market forces with the aim of extracting constant performance improvement out of suppliers. The following subsections describe and explain the transformation of HVN's value chain during this most dynamic stage; analysis that no previous study has explicitly attempted.

5.3.1 Shifting Market Demand: The Increasing Complexity of Parameters

The third stage of industrial development was characterised by increasing sophistication of consumer demand. As a result of rising levels of income and serious quality problems experienced with Chinese motorcycles in the early 2000s, urban Vietnamese consumers began to aspire to a better quality of motorcycle, while demand for low-priced imitations was limited to low-income consumers in rural areas (The Motorbike Joint Working Group 2007).

In response to the changing market landscape, Honda implemented a number of important adjustments to its product strategy. First, the complexity of product parameters increased. Reflecting the growing market, the number of new models launched by HVN increased substantially by Stage III (Table 8). In order to respond to the increasing sophistication of consumers, HVN launched a greater number of models that adopted new component technologies, higher precision levels, and/or renewed external styling (interview with HVN #4). These changes were reflected in price levels: HVN models launched between 2006 and 2008 were priced between US$932 and US$1,564 – higher than the increased price of the Wave Alpha (US$807) in 2007.[40]

Second, process parameters also grew more complex. HVN's emphasis shifted from the one-off radical price reduction in the previous stage to incremental yet continuous improvement in *overall QCD levels*. Of these three criteria, the highest priority was attached to quality levels. Asked about the company's focus in 2007, HVN's manager remarked:

> [Of QCD], quality is the most important. Since Vietnamese consumers demand very high levels of quality, we need to keep on paying close attention to [our] quality levels…We emphasise quality at source. That is, we ask suppliers to guarantee quality levels within their production processes. (HVN #3)

Table 8. New Models Registered by Year

	2001	2002	2003	2004	2005	2006	2007	2008	Total
HVN	2	1	5	6	9	17	27	35	102
Local Assembler A1	28	11	4	28	105	112	191	66	545
Local Assembler A2	19	15	0	10	8	8	15	0	75
Local Assembler A3	10	1	5	25	43	56	112	8	260
Local Assembler A4	8	6	4	8	23	16	9	9	83
Local Assembler A5	19	9	4	7	8	21	15	3	86
Local Assembler A6	0	1	2	5	10	12	10	1	41

Source: The author, from data obtained from the Vietnam Register (http://www.vr.org.vn), accessed 6 January 2009.

It is worth emphasising that HVN began to demand that suppliers ensure *quality at source*. This was in sharp contrast to the company's standards in Stage II, when it tolerated defects in components imported from China so long as price advantages outweighed the cost of inspecting 100% of the parts (interview with HVN #2). However, such preoccupation with quality does not mean that price was no longer

[40] Prices quoted in various issues of *Oto-Xe May (Automobiles and Motorcycles)*.

important. Unlike the one-off cost reduction in the early 2000s, suppliers were now requested to achieve incremental cost reductions of 5% every year (interview with HVN #5). With a growing volume of orders (see below), delivery deadlines also became increasingly tight, most Japanese and some Vietnamese suppliers being required to implement ‘just in time’ delivery several times a day.[41]

In terms of degree of standardisation, the non-standard nature of product parameters was maintained. However, since approximately 2004, the company’s regional R&D base in Thailand started to make extensive use of common component designs for internal parts across models to be launched in Thailand, Indonesia and Vietnam (interview with Honda R&D Southeast Asia #1). Whilst this marked a significant move away from the Honda’s conventional approach to the renewal of most component designs when launching new models, the fresh approach enabled the company to develop large varieties of models at low cost, while realising economies of scale in manufacturing (ibid.).

In short, HVN’s product and process parameters became increasingly complex, extending to non-price dimensions and demanding in terms of requisite levels. While component designs continued to be specific to Honda, the use of common parts across models laid the foundations for the realisation of economies of scale in manufacturing and lead firm purchasing power over suppliers.

5.3.2 Full Realignment of the Capability Structure

Whilst shifting demand certainly influenced the direction and degree of organisational transformation, even more important was the driver for change coming from within the value chain: the shifting alignment of capabilities. This occurred partly as a result of HVN’s active attempt to create the necessary conditions for transforming its ‘foster parent’ model of industrial organisation, and partly as a result of incidental changes in Vietnamese government policy that were beyond the company’s control.

On the one hand, the policy changes discussed above led to significant expansion of the market as a whole, as well as HVN’s market shares in particular. As the government abandoned a series of legislation that had repressed the overall market

[41] The frequency of deliveries in 2007–2008 ranged between 5–8 times a day (interviews with suppliers J2 #2; J3 #3; J6 #2; J10 #1; V1 #3).

growth, sales of motorcycles increased rapidly, even exceeding levels during the China shock (Figure 1). Japanese lead firms expanded their shares as they were released from constraints on expansion of production capacity. HVN's annual production in particular exceeded one million units by 2007 (Figure 4). This was an important landmark because such purchase volume not only exceeded the minimum efficient scale even for components requiring capital-intensive production processes, but also called for the dual sourcing of each type of component (interviews with HVN #3, #4). Accordingly, HVN started to exercise huge purchasing power over its suppliers.

On the other hand, the number of suppliers in Vietnam as well as their overall capability levels increased remarkably. First, as a consequence of the rapid market expansion, FDI from component suppliers with established records of serving Japanese motorcycle manufacturers increased, including Honda Group suppliers that had previously been hesitant to invest in Vietnam. Of the total of 38 investment licences granted to Japanese motorcycle component manufacturers between 1992 and 2007, as many as 20 projects were licensed between 2004 and 2007.[42]

Second, as a result of HVN's attempts to mobilise and nurture local suppliers from the late 1990s, the capability levels of Vietnamese firms improved substantially. This is clear from the author's in-depth case studies of HVN's first-tier Vietnamese suppliers (Table 5). By Stage III, most of the suppliers had reached the assimilative level whilst some even progressed to the adaptive level for one or more dimension of their production activities. Such improvement in the production-related capabilities of local suppliers is corroborated by the assessment of HVN managers. In 2009, the company's procurement manager remarked that, with a number of exceptions, local Vietnamese suppliers were generally able to meet its requirements without the hands-on technical assistance (interview #5).

As a result of the increased number of suppliers in Vietnam and their improved capability levels, HVN's local content ratio and number of suppliers increased rapidly, with the former reaching 90% and the latter reaching 58 by 2007 (Table 4). However, even more significant were the structural changes within the value chain. Having obtained the ability to switch suppliers, HVN reorganised its value chain, adopting differentiated approaches to the following three different groups of suppliers – with

[42] Calculated by the author using data provided by the Ministry of Planning and Investment of Vietnam, which is available in tabulated form in Fujita (2008).

emphasis on what HVN manager referred to as "group suppliers" (interview #5).

The first group consisted of Honda group (*keiretsu*) suppliers. Among the embedded cases, J2, J3, J6, J7, J10 and J11 belonged to this category. Having proprietary component design and/or manufacturing competencies that Honda relied upon, their parent companies in Japan had developed a long-term association with the former mediated by capital and personnel relations.

The second group was Honda's joint venture partner, Vietnam Engine and Agricultural Machinery (VEAM) Corporation, a state-owned business group consisting of more than 20 member companies, traditionally specialising in the production of diesel engines and agricultural machinery. Among the embedded cases, suppliers V7, V9, V13, and V14 belonged to this business group. Although VEAM members did not possess complementary competencies, HVN started to attach growing priority to them as an integral part of its extended corporate group (interview #5). Apart from direct capital ties, high levels of manufacturing competence relative to other local suppliers, a sense of trust that had been built through long-term relations as a joint venture partner, and the executive with a good understanding of Japanese management practices and willing to expand business with Japanese companies also account for HVN's preference to outsource key components to VEAM members (interview with HVN #5).

The third group consisted of suppliers of non-core components, of all nationalities. These suppliers were expected to provide external manufacturing capacity. Suppliers J4, J5, J8, J9, V1–6 and V8 fell under this category.

Suppliers belonging to the first two groups received increasing priority in Stage III. They not only accounted for nearly half of suppliers newly admitted into HVN's value chain between 2004 and 2007 (Table 4) but also began to receive a mounting proportion of HVN's expanded orders. Indeed, Honda Group suppliers received increasing orders not only for core- but also non-core components that had previously been subcontracted to Group 3 suppliers.[43] In localising the production of

[43] In addition to Table 6, the following case provides a clear illustration. After J10 – 100% owned by Honda – was established in 2005 to manufacture a large variety of components, supplier J9 – a Japanese non-*keiretsu* provider of non-core components – was requested to supply sub-components to J10 instead of directly to HVN as the company had done previously. Supplier J9 lost further orders for

high-precision engine components, HVN designated two VEAM suppliers (V7 and V9) to undertake the initial processing of these components (interviews with HVN #4, #5).

In addition to the shifting alignment of supplier capability, progress in Vietnamese trade liberalisation provided HVN with potential access to overseas sources of suppliers, although they remained an unused option at this stage. As part of the country's bid to become a member of the World Trade Organisation (WTO), Vietnam had dismantled local content rules by the end of 2003, and, in accordance with the tariff reduction schedule under the Association of Southeast Asian Nations (ASEAN) Free Trade Area (AFTA), Vietnam reduced its tariffs on most motorcycle components imported from ASEAN-6 countries from 50% in 2005 to 5% in 2006.[44]

Although the high levels of HVN's local content ratio after 2006 are an illustration of the company's preference to source the bulk of its motorcycle parts locally, the company now had the option of importing components at competitive prices from Thailand and Indonesia – the two countries with the most advanced automotive component supply bases in Southeast Asia.[45] Moreover, with the expectation that trade liberalisation under the ASEAN–China Free Trade Area would progress in the not-too-distant future, Honda was eager to make a second attempt at sourcing components from China. Its procurement manger emphasised that limited manufacturing capabilities possessed by suppliers in China – the main reason for the failure of the first trial upon the launch of the Wave Alpha – had improved to a considerable extent by 2008 (interview with HVN #4).

To sum up, the distribution of lead firm and supplier capabilities changed substantially

---

sub-components after 2007 as supplier J10 started to manufacture them in-house (interview with J9 #1).

[44] ASEAN-6 includes Brunei, Indonesia, Malaysia, the Philippines, Singapore, and Thailand. While motorcycle components had long been excluded from Vietnam's tariff reduction schedule for AFTA, the Vietnamese government announced a schedule for these items for the first time at the end of 2004 (Government Decree 213/2004/ND-CP dated 27 December 2004).

[45] Thailand has established itself as the hub of the Southeast Asian automotive industry (Lecler 2002; Higashi 2006). With the largest motorcycle market in Southeast Asia and a longer history of industrialisation, Indonesia is also more advanced than Vietnam in terms of the development of the component industry (Sato 2011).

as a result of both HVN's active attempts to realign capabilities within the industry and incidental policy changes. With its huge purchasing power and accumulating supplier capability, HVN gained the capacity to reorganise its suppliers in accordance with its requirements.

5.3.3 An 'Institutionalised Competition' Variant Emerges

The shifting capability alignment enabled HVN to implement organisational adjustments to meet changing product and process requirements. The result was a form of organisation referred to as an 'institutionalised competition' variant of the captive chain. Key changes in transactional governance were three-fold.

First, the level of supplier dependence on HVN increased substantially regardless of the type of supplier. The large volume of orders meant that suppliers were increasingly dependent on HVN for their sales. By Stage III, this was the case not only with Honda Group suppliers but also local Vietnamese suppliers. Local suppliers like V2, V3, V7, V8, and V13 depended on HVN and its related companies for between 50% and 100% of their sales (Table 6).

Second, HVN's provision of technical assistance diminished and was substituted with less generous forms of lead firm engagement with suppliers: collaborative initiatives for achieving incremental productivity improvement, referred to as value analysis (VA) and value engineering (VE);[46] systematic monitoring of supplier performance; and joint problem-solving exercises in the cases of troubles (interviews with HVN #4, #5). All three of the aforementioned groups of suppliers were subject to stringent QCD performance targets, which were incrementally upgraded every year (ibid.). Since most suppliers were more or less capable of reaching such targets, technical assistance beyond systematic monitoring and troubleshooting was offered only selectively with regard to strategically important targets. Group 2 suppliers became strategic targets as they were subcontracted high-precision engine components calling for sophisticated production-related capabilities (ibid.).

[46] VA and VE refer to activities designed to obtain the best value of a component by analysing its function and cost. In Japanese manufacturing industries, these techniques have been widely applied by lead firms and suppliers as joint problem-solving exercises aimed at mutual gain (Asanuma 1989; Sako 1992; Nishiguchi and Brookfield 1997).

Third, HVN's made use of what this study refers to as 'institutionalised competition' among a pool of carefully selected suppliers.[47] This form of competition is distinguished from market competition in arm's-length organisation in that (1) the scope of competition is limited to those suppliers that pass a careful selection process, the lead firm essentially maintaining long-term relations with each of them; and (2) selection of suppliers is not based principally on price but rather on comprehensive ratings of QCD performance, the assessment of VA and VE proposals submitted by suppliers, and the lead firm's policy on the allocation of business shares[48] (Sako 1992; Asanuma 1989).

In practice, the implications of institutionalised competition varied according to type of supplier. Those of non-core components (Group 3) faced increasingly intense competition, and since alternative sources could be found for them, HVN retained the capacity to actually switch suppliers. Moreover, even after a contract was awarded, HVN sought to maintain supplier diligence by adjusting its order volume dependent on QCD performance (interview #5). Supplier V2 remarked that the company had to think carefully in submitting quotations to HVN as it had approximately ten competitors all bidding to supply the lead firm (interview #2). Among suppliers of plastic components, V1 was in receipt of increasing orders for high-precision parts and moulds, while V5 still focussed on relatively simple components and faced diminishing orders (interviews with V1 #2, #4; V5 #2).

By contrast, the substantive degree of competition faced by suppliers in first two groups was apparently weaker. To the extent that HVN opted to expand local sourcing, it had to depend on these suppliers as there were no domestic alternatives equipped with similar levels of capability to supply core components to the required standards. Moreover, with regard to Honda Group suppliers, the fact that the manufacturer had long depended on the component design capabilities of parent companies in Japan or affiliates in Thailand certainly remained a key consideration in HVN's sourcing decisions. As of 2008–09, Honda Group members and VEAM suppliers continued to

---

[47] "Institutionalised competition" is a term coined by Sako (1992); Richardson (1993) alludes to "parallel sourcing"; while Fujimoto (1999) refers to patterns of supplier competition in the domain of product development in the Japanese automobile industry as "development competition". Similar practices are also discussed by Asanuma (1989).

[48] Asanuma (1989) does not discuss what lead firm "policy" specifically means, but HVN's emerging priorities in terms of Honda Group and VEAM suppliers are typical examples.

receive orders from HVN for 100% of the components they specialised in (interviews with HVN #4, #5; J2 #2; J3 #2; J6 #2; J10 #1; J11 #1).

However, there were indications that even these suppliers were beginning to experience growing competition. By Stage III, HVN had started to solicit quotations even for core components from multiple sources – typically suppliers in China – with the aim of applying pressure to the candidates (interview #3). Indeed, all Honda Group suppliers interviewed by the author between 2007 and 2009 expressed concern about growing competition with overseas suppliers, including subsidiaries of their parent companies located in other Southeast Asian countries. For example the general director of supplier J3 noted that the company was stepping up its efforts to reduce costs in the face of competition not coming only from Thailand and Indonesia but also from China in the longer term (interview #2). And the general director of J2 remarked: “So far HVN has only asked for quotations from us, but they tell us that they will buy from whichever source offers the lowest price; we face intense price-based competition” (interview #2).

In short, the shifting capability alignment enabled HVN to fully adjust its value chain to meet changing product requirements. The result was an ‘institutionalised competition’ variant of the captive organisational model, which not only combined the benefits of long-term, collaborative relations with suppliers and the advantage of market forces, but also incorporated adaptations to meet market, industrial and policy conditions prevailing in Vietnam. The preferential sourcing approach in respect of the VEAM Corporation and the soliciting of quotations from companies located abroad are examples of such modifications.

5.4 Summary and Discussion

The in-depth empirical analysis in this section shed light on the dynamic transformation of HVN’s value chain over a decade from the late 1990s. In terms of the first sub-question, it was argued that the seemingly radical organisational shift immediately after the China shock emphasised in the existing literature transpired to be short-lived, while a more dynamic and longer-lasting organisational transformation occurred in the medium term. By this time, HVN’s value chain had been transformed from a ‘foster parent’ variant of the captive model into an ‘institutionalised competition’ variant – a hybrid organisational form that systematically combined the conventional advantages of long-term relations with suppliers and the benefits of market forces. In the end, Honda managed to weather challenges emanating from China by modifying its organisational model rather than transforming it into something different.

With regard to the second sub-question, the empirical analysis demonstrated that the nature of the product was not sufficient to explain the trajectory of organisational transformation. While HVN was quick to adjust its product strategy, the functioning of the market forces it had intended to introduce was constrained by the existing alignment of lead firm and supplier capabilities. HVN's production volume was critical in removing this obstacle. By lowering prices, it sought to increase its scale of production but this happened only after the Vietnamese government reversed its restrictive policy towards foreign motorcycle manufacturers.

When HVN's production was finally permitted to expand, it started to exert huge purchasing power over its suppliers. As an increasing number of foreign firms were attracted to the growing market, supplier capabilities also started to accumulate. An important point to note is that even though some suppliers could not be substituted *domestically*, the capabilities they possessed were not indispensable to HVN in the sense that there were *regional* alternatives. This explains why the accumulation of supplier capabilities did not result in a shift to a relational chain. Rather, it was the combination of HVN's huge purchasing power and growing supplier capabilities – but not complementary competencies – that allowed HVN to exploit institutionalised competition to extract constant improvement in manufacturing performance out of its suppliers.

On the whole, the analysis in this section has demonstrated that the Japanese organisational model in its original form was not readily adaptable to the emerging Vietnamese market. Although HVN was quick to adjust its product strategy in response to the China shock, and actively sought to realign the capability structure in order to create conditions conducive to the effective functioning of the market forces it intended to introduce, these attempts failed to produce immediate results. This is because the government introduced policies that explicitly discriminated against foreign motorcycle manufacturers, and supplier capabilities took time to be nurtured or realigned. It was eventual incidental policy change as well as medium-term progress in accumulation of supplier capabilities that laid the foundations for the dynamic transformation of the Japanese model in Stage III, a shift that enabled HVN to establish itself as an increasingly dominant actor in the Vietnamese market.

6. The Emergence and Transformation of the Vietnamese–Chinese Chain in Vietnam

This section turns the focus to the Chinese organisational model. Rather than being *transplanted* by a major TNC – as had been the case with the Japanese model – the Chinese model emerged spontaneously in Vietnam in the early 2000s, as Chinese exporters of motorcycle components, Vietnamese assemblers of imported components, and component suppliers of different nationalities independently reacted to growing business opportunities. Local Vietnamese motorcycle assemblers emerged as lead firms that initially assembled imported Chinese components, but gradually expanded local sourcing as the government stepped up its enforcement of local content rules.

In an attempt to examine the dynamic trajectories of organisational transformation, the analysis now focuses on the second and third stages of Vietnamese motorcycle industrial development:

- Stage II (2000–2004), when the Chinese model emerged in Vietnam
- Stage III (2005–2008), when the model was transformed as lead firms and suppliers reacted to challenges posed by Japanese motorcycle manufacturers

6.1 Stage II: The Emergence of Market-based Chains

The empirical analysis begins by examining the features of the Chinese model as it emerged in the early 2000s. Taking account of the dispersed structure of this sector of the industry at this stage, the emphasis is on sector-level analysis, which is complemented by analysis of embedded cases of several relatively large assemblers.

6.1.1 Minimal Coordination Requirements: Low Quality and De facto Standardisation

The types of motorcycles produced by local Vietnamese assemblers were strikingly different from the Japanese-brand vehicles that had prevailed in the domestic market, the product and process parameters of the former being highly standardised and simple.

First, the high level of standardisation requires elaboration. The existing literature on Vietnamese motorcycle assemblers points out that *modularisation* allowed arm's-length networks to prevail in this sector (Pham Truong Hoang 2007; Nguyen Duc Tiep 2006; The Motorbike Working Group 2007). However, the present study found otherwise. Rather than transforming motorcycles from integral to modular design architecture, Chinese manufacturers used several popular Japanese models as de facto standards for duplicative imitation of the external configuration (Ohara 2001; Ge and Fujimoto 2004) – the phenomenon that this paper refers to as the de facto standardisation of Japanese models. As argued in Fujita (2013a), standardisation of this sort is at best partial because full compatibility of components can only be guaranteed insofar as they are manufactured in precise accordance with the original Japanese base model drawings. This was not the case in China, where uncoordinated duplicative imitation gave rise to components that were not strictly compatible.

The present study found that a similar situation prevailed in Vietnam in the early 2000s. In this period, de facto standardisation centred on an even smaller number of Honda's popular models than in China. The author's interviews of motorcycle retailers in Hanoi and Ho Chi Minh City in August 2002 found that the overwhelming majority of products imitated two of Honda's most popular models, Dream and Wave, most of them featuring C100 or C110 engines with Chinese brands.[49] Embedded cases of assemblers also confirmed de facto standardisation of a limited number of Japanese models. As of the early 2000s, all three assemblers for which detailed data were available (A1, A2 and A4) produced imitations of Dream and/or Wave (interviews and/or factory visits at A1 #1; A2 #1; A4 #3).

As had been the case in China, de facto standardisation of Japanese models in Vietnam failed to ensure component compatibility because duplicative imitation took place not on the basis of a single, detailed drawing but was invariably the result of uncoordinated, repeated duplication of products available on the market, many of which themselves carried minor modifications to original designs (Pham Truong Hoang 2007), with varying yet generally low levels of precision (interviews and/or factory visits at V15 #1,

[49] The most ubiquitous imitation brands (e.g. 'Hongda') and/or popular Chinese brands such as Loncin, Lifan and Zongshen were displayed on engine covers (the author's field visits, and interviews with motorcycle retailers in Ho Chi Minh City and Hanoi in August 2002).

#2; V18 #1; V19 #1).

The second feature is simple product and/or process parameters. This was confirmed by the lack of lead firm requirement beyond price level. The two embedded assemblers for which detailed interview data are available (A2 and A4) only specified the names of base models or provided samples for replication at best, and neither provided detailed drawings or specifications in terms of precision levels, materials, or production processes (interviews with A2 #1; A4 #3). These findings are corroborated by the author's interviews with suppliers, as they were not offered the sorts of detailed lead-firm specifications discussed in the previous section. Suppliers of engine parts explicitly stated that they adopted a single preconfigured design for all their customers (interviews with V17 #1; V19 #2; T6 #1), while suppliers of other components were typically provided with samples for replication (V15 #2; V23 #1; T7 #2).

Rather, the focus of assemblers was overwhelmingly on cost. From 2000 to 2001, the prices of their products ranged between US$445 and US$565,[50] which was roughly a quarter of the official price of HVN's most popular model, the Super Dream (U$S1,990) in 2000 (Nguyen Duc Hien 2004: 234). It was also much lower than the price of the Wave Alpha (US$719), the budget model that HVN launched in 2002. The average price of motorcycles produced by the case assemblers in 2004 was US$470 (Table 9).

In summary, de facto standardisation and emphasis on price-based competitiveness significantly reduced the need for explicit coordination. However, to the extent that de facto standardisation failed to ensure full component compatibility, the need for coordination could not be eliminated completely.

6.1.2 Dispersed Structure, Limited Capabilities

To begin with, the Vietnamese–Chinese chain had a fragmented structure consisting of a large number of assemblers and a moderately large number of suppliers, both of which were small in scale and possessed limited capability. None of these firms held sufficient capability to exercise power over others.

---

[50] 'The unpredictable fever' (*Saigon Times Weekly* dated 17 November 2001); 'Glut of imported motorbikes sparks worries about congestion, accidents' (*Viet Nam News* dated 14 December 2001).

The overall structure of assemblers in the early 2000s can be confirmed on the basis of official statistics as well as embedded cases. As of May 2002, 51 Vietnamese motorcycle assemblers were in operation.[51] Forty-one such firms assembled less than 40,000 units in 2000, while the largest firm (A2) accounted for just 8.8% of the total turnover of all local assemblers. They had limited knowledge of products and/or production processes: of the 51 assemblers registered as of 2002, only 7 had initial investment in own-production capacity (Ha Huy Thanh et al. 2003: 335).

None of the embedded case assemblers, which were known to be among the largest in the early 2000s, had manufacturing experience prior to starting motorcycle production (Table 9). Their focus on the assembly of imported or purchased components also meant that they did not take on product development, design, manufacturing of key components, marketing, or branding.

Based on official statistics, the total number of suppliers participating in the Vietnamese–Chinese chain in 2002 is estimated to be about 50.[52] However, it is suspected that the actual figure was much larger as hundreds of companies entered into the production of relatively simple motorcycle components for local assemblers.[53] With the exception of Taiwanese firms – most of which were specialised providers of components already incorporated into Taiwanese and/or Japanese chains (Chen and Jou 2002) – suppliers in the Vietnamese–Chinese chain possessed limited design and/or manufacturing capabilities.

Virtually all Vietnamese suppliers selected as embedded cases were companies previously engaged in the small-scale production of replacement components, bicycle parts, or household metal and plastic products for the domestic market, and they only acquired rudimentary capabilities in Stage II (Table 10).

---

[51] Data provided by the Ministry of Industry of Vietnam. While this number is smaller than the number of assemblers in China – where Ohara (2006a: 22) notes there were 154 motorcycle manufacturers in 2003 – it can still regarded as very large given the much smaller size of the Vietnamese market.

[52] The author's estimate based on a list of firms producing motorcycle components in 2002 provided by the General Statistics Office, excluding Japanese, Taiwanese, and Vietnamese companies that were known to have participated in the Japanese chain.

[53] Nguyen Duc Hien (2004: 238), citing the report by the Economic and Financial Committee of the National Assembly in 2001, notes that around 550 firms produced motorcycle components.

Unlike the Japanese chain, assembler–supplier relations in the Vietnamese–Chinese chain were fluid. Table 11 shows several suppliers that received orders from local assemblers over short periods of time ranging from a few months to a few years (T1, V13, V14, and V19). This table also indicates that the majority of suppliers simultaneously traded with a large number of assemblers. Suppliers V16, V17, V20, K1, and T6 specifically emphasised that they had no main customer even though they traded with some of the largest local assemblers.

In summary, the Vietnamese–Chinese chain consisted of a large number of assemblers and a fairly large number of suppliers, both of which were small in scale and possessed limited capabilities. Inter-firm relations were fluid and none of them exercised power over others.

Table 9. Profiles of Local Assemblers Selected as Embedded Case Studies

Assembler			A1	A2	A3	A4	A5	A6
Stages for which detailed data are available			Stages II and III	Stage II only	Stage III only	Stages II and III	Stages II and III	Stage III only
Experience prior to entering into motorcycle assembly			Trading consumer electronics	Diverse (trading, tourism, real estate, etc.)	n/a	Trading (motorcycles and other products)	Trading (motorcycles and other products)	Motorcycle dealer
Market share	2000	%	8.5%	8.8%	3.8%	1.9%	1.3%	(not on the list)
		Ranking	3rd	1st	5th	17th	31st	(not on the list)
	2006	%	23.1%	1.8%	8.3%	1.6%	5.1%	2.8%
		Ranking	1st	17th	4th	19th	7th	9th
Annual production (units)		2000	148,000	107,900	72,450	23,731	34,600	(not on the list)
		2007	300,000	(n/a)	95,000	24,000	20,469	30,000
Average price of motorcycles (US$)		2004	365	451 *	(n/a)	439	622	(n/a)
		2007	310	(n/a)	279	373	745	497
Number of new models registered		2001–04	71	44	41	26	39	8
		2005–07	474	31	219	57	47	33
Local content ratio (%)		2003	(n/a)	(n/a)	(n/a)	85	80	(n/a)
Number of suppliers		2007	100	(n/a)	55	60	80	48

Notes:
1) n/a = not available
2) 'Market share' denotes the percentage of the market and rank of respective suppliers of all registered Vietnamese motorcycle assemblers included in lists provided by the Ministry of Industry (for 2000) and the General Statistics Office (for 2006).
3) 'Number of new models registered' denotes the number of new models registered with the Vietnam Register for sales in the domestic market.
4) * The A2 average price is for 2003, while the data for all other assemblers are for 2004.

Sources:
1) Turnover: Ministry of Industry (for 2000) and the General Statistics Office of Vietnam (for 2006).
2) Number of new models registered: The author, based on data from the Vietnam Register (http://www.vr.org.vn), accessed 6 January 2009.
3) All other data obtained from the author's interviews and questionnaire surveys conducted in collaboration with the Vietnam Institute of Economics, Vietnam Academy of Social Science.

Table 10. Capabilities Acquired by Vietnamese Suppliers in Vietnamese–Chinese Chains

	Before Stage I	Stage I	Stage II	Stage III
V13	Machinery components for SOEs		Operational (Prd)	(Shift to other chains)
V14	Machinery components for SOEs		Operational (Prd)	(Shift to other chains)
V15	Bicycle components		Operational (Prd/Eq)	(Shift to other chains)
V16	Bicycle components		Adaptive (Prd)	
V17	Trading		Operational (Eq/PM)	(Shift to other chains)
V18	Bicycle components	Operational (Prd/Eq/PM)		(Shift to other chains)
V19	Bicycle components		Operational (Prd/Eq)	(Shift to other chains)
V20	Replacement components		Operational (Prd/Eq)	Operational (Prd/Eq)
V21	Trading			Operational (Prd/PM)
V22	Trading		Operational (Prd/PM)	(Shift to other chains)

Notes:

(1) For periods prior to entry into or after exit from the Vietnamese–Chinese chain (the unshaded area), main lines of business are given.

(2) For periods after entry into the Vietnamese–Chinese chain (the shaded area), the level of new product introduction and production-related capabilities acquired by each supplier in Vietnamese–Chinese chain by the respective stage is shown.

(3) Types of capability are abbreviated as follows: Prd = new product introduction capability; Eq = equipment-related capability; PM = production management capability.

Source: The author's interviews with suppliers (Fujita 2013b).

Table 11. Suppliers' Dependence on Local Assemblers

Supplier	Entry into V-C chain	Types of Components	Ranking by Turnover		Transactions with Case Assemblers						Number of Customers, Patterns of Dependence	
			2002	2006	A1	A2	A3	A4	A5	A6	Stage II	Stage III
Suppliers that expanded transactions with Group 1 assemblers in Stage III												
V16	2000	Silencers	not included	53rd	X		X			X	Traded with 30 local assemblers in 2002, accounting for 80-90% of the local sales.	Traded with 20 local assemblers in 2008, accounting for 50% of the total sales. 2006 was the peak year. A1, A3, A6 among five largest customers.
V20	1997	Silencers	27th	116th	X		X			X	Traded with a total of 46 companies between 1997 and 2008. As of 2008, had 3 customers, accounting for 10% of sales.	
V21	2004	Shock absorbers	not included	not included	X			X		X	(Not yet established)	Traded with 10 local assemblers in 2009, accounting for 95% of sales. During the peak year, had 50 customers.
C1	2001	Plastic covers, frames, lights	not included	6th & 38th	X		X	X	X	X	(n/a)	Traded with 43 local assemblers in 2007. A1 largest.
C2	2002	Clutches	not included	24th	X					X	Traded with 24 companies in 2004, accounting for 50% of sales. A1 and A6 among largest.	Sales to local assemblers accounting for 56% of sales (number of local assemblers unknown). A1 among largest.
C3	2002	Frames	not included	62nd			X				(n/a)	Traded with 19 local assemblers in 2008. A3 largest. No products/customers other than motorcycle components/local assemblers.
C4	2003	Electric components	not included	60th				X		X	Traded with 30 assemblers in 2004. A4 and A6 among largest.	Traded with 50 assemblers in 2008.
Suppliers that had shifted from Vietnamese─Chinese chains to Japanese chains by Stage III												
T1	1999	Stamped components	not included	9th &11th	(n/a)						Traded with local assemblers only during 1999─2001.	No transactions with local assemblers in 2007.
T2	1998	Shock absorbers	not included	17th	(n/a)						(n/a)	Traded with more 10 local assemblers in 2007, accounting for 25% of sales.

Table 11. Continued

Supplier	Entry into V-C chain	Types of Components	Ranking by Turnover		Transactions with Case Assemblers						Number of Customers, Patterns of Dependence	
			2002	2006	A1	A2	A3	A4	A5	A6	Stage II	Stage III
T3	1997	Electric components	not included	21st	X		X			X	(n/a)	Traded with 16 local assemblers in 2005, accounting for 10% of sales. Only A6 placed regular orders in 2009.
T4	2004	Electric components	not included	25th			(n/a)				Expanded sales to local assemblers in 2002─2003. Accounted for one-third of sales in 2004.	Traded with 4 local assemblers in 2008, accounting for less than 1% of sales.
T5	2000	Silencers	not included	33rd						X	Traded with local assemblers only during 2000─2004. Accounted for less than 5% of the total sales. A6 among the main customer.	(n/a)
K1	1999	Switches	9th	46th			X		X	X	Traded with local assemblers in 2004, accounting for 50% of sales. Six relatively large customers.	Traded with 10 local assemblers in 2008, accounting for 5% of sales. A6 among main customers.
V13	2000	Bearings	not included	45th	X	X					Traded with local assemblers only during 2000─2003, accounting for 20-30% of sales.	No transactions with local assemblers in 2008.
V14	2003	Engine components	not included	not included	(no transactions with any of the six assemblers)						Traded with 3 local assemblers only in 2003, accounting for 10% of sales.	No transactions with local assemblers.
V15	2001	Aluminium die-cast components	not included	not included	(no transactions with any of the six assemblers)						(n/a)	Traded with 5 local assemblers in 2008, accounting for 20% of sales. Maintained long-term transactions with 5 customers.
V17	2001	Clutches	not included	not included	X			X	X		Traded with very large number of customers in 2001, accounting for 100% of sales. A1, A4, and A5 among main customers.	No transactions with local assemblers in 2008.
Suppliers that had shifted from Vietnamese─Chinese chains to other products/industries by Stage III												
V18	1997	Steel components	20th	not included			(n/a)				Traded with a total of 36 companies between 1997 and 2006, accounting for 100% of sales.	

Table 11. Continued

Supplier	Entry into V-C chain	Types of Components	Ranking by Turnover		Transactions with Case Assemblers						Number of Customers, Patterns of Dependence	
			2002	2006	A1	A2	A3	A4	A5	A6	Stage II	Stage III
V19	1999	Engine components	not included	98th	X			X			Traded with 10 assemblers in 2002, accounting for 60% of sales.	The number of customers reduced to 2-3. Share of local assemblers in total sales 5-7% in 2008.
V22	2000	Chains	not included	not included	X						Traded with two local assemblers in 2000–1, accounting for 50% of sales.	Traded with 10 local assemblers in 2009, accounting for 30% of sales.
V23	2002	Wire harnesses	51st	not included	X						Traded with 12 local assemblers in 2004, accounting for 20% of sales. No main customer could be identified. 2002 was peak year.	No transactions with local assemblers in 2008.
Suppliers for which developments after Stage III is unknown												
T6	2001	Hubs	6th	not included			(n/a)				Traded with very large number of customers in 2004, accounting for 42% of sales. Neither total number of customers nor main customers could be identified.	(n/a)
T7	(n/a)	Chains	not included	66th					X		(n/a)	Traded with 30 local assemblers in 2005, accounting for 12% of sales.
C5	2002	Plastic covers	not included	133rd			(n/a)				Traded with 10 local assemblers in 2004.	(n/a)

Notes:

1) Nationality of suppliers can be identified by initial letters of supplier codes as follows: C = Chinese; T = Taiwanese; K = Korean; V = Vietnamese.
2) 'Ranking by turnover' indicates placement of respective suppliers among all registered motorcycle component suppliers included in the lists provided by the General Statistics Office.
3) 'Not included' indicates that the supplier was omitted from the list, which typically occurred when suppliers were registered under other industries because their main product lines were not motorcycle components.
4) 'Transactions with case assemblers' indicate whether the respective supplier conducted business with the respective assembler at any time.

Source: The author's surveys and interviews.

6.1.3 Arm's-Length Linkages in Need of Coordination

The discussion in Section 6.1.1 showed that although standardised and simple parameters prevailed in the Vietnamese–Chinese chain, the requirement for explicit coordination was not eliminated entirely. Specifically, the following two types of coordination requirement remained:

- Coordination needs around product parameters remained to the extent that de facto standardisation only partially ensured component compatibility.
- Low quality requirements notwithstanding, even lower levels of supplier manufacturing competence resulted in coordination needs around process parameters.

The following examines how assemblers and their suppliers coped with these coordination needs via in-depth examination of the three assemblers for which detailed data could be obtained: A1, A2 and A4.

Some assemblers opted for vertical integration. Assemblers A1 and A4 conducted in-house manufacturing of components in cooperation with Chinese and Taiwanese partners respectively. Although investment in in-house manufacturing was often made in response to the government policy (see Section 2.3), the fact that it was a costly option for those with small production capacity notwithstanding, these assemblers explicitly noted the advantages of the practice. In this regard, assembler A4 noted:

> We want to produce low-price but good-quality motorcycles for [our] customers. Therefore, we face many difficulties in sourcing components locally – the quality is not stable. So, we need to produce some components even though it is not efficient and drives up costs. (A4 #1)

Asked to compare sourcing components from China, sourcing locally, and manufacturing them in-house, a manager of assembler A1 responded:

> Manufacturing components in-house is the best option – in terms of advantages in both cost and quality. The key is that we endeavour to increase the quality of our products. (A1 #1)

Implicit in the above comment is that this company saw no possibility of implementing mechanisms for imposing its quality requirements on external suppliers.

However, even with these assemblers, in-house manufacturing was typically limited to a few types of component only. In the main, lead firms engaged in arm's-length transactions with their suppliers in the sourcing of the majority of components.

First, two assemblers interviewed by the author (A2 and A4) explicitly noted that they adopted a trial-and error approach, switching suppliers whenever they found one to be unsatisfactory. This is evident from remarks made by the former procurement manager of assembler A2, the largest assembler in 2000:

> Back in the early years [2000–2001], the number of suppliers was limited and thus it was difficult to switch suppliers. However, we still tried different suppliers in search of those that were stable – in terms of quality, payment, prices and delivery.
>
> (A2 #1)

Second, a lack of explicit governance is also evident from the ordering procedure.[54] Given the very small scale of production, local assemblers placed orders on an ad hoc basis.[55] Transactions typically began with the assembler providing the supplier with either a sample for replication or very simple component specifications (e.g. type of component, type of base model, and/or colour). The supplier then provided the lead firm with a sample together with a price quotation. If the lead firm accepted both the sample and the price, the two parties signed a 'basic contract', which normally lasted for a year but did not bind the assembler in terms of either volume or frequency of orders.

Clearly, arm's-length transactions of the sort discussed above failed to provide solutions to coordination needs around product and process parameters. However, although the problem of low quality could simply be left unresolved, the lack of component compatibility posed a serious problem because assemblers were often faced with components that could not be assembled. These instances were typically dealt with by ad hoc, ex post adjustments by suppliers with the sole intention of making the components *assemblable*. Suppliers were often asked by customers to modify components once delivered as they were incompatible with adjacent parts (interviews with V13 #1; V15 #2; K1 #2). Nevertheless, such piecemeal modifications fell short of full component compatibility, leading to products that were inferior in quality and performance to original models.

In short, limited lead firm and supplier capabilities resulted in a situation in which coordination issues arising from the shortcomings of de facto standardisation were left unattended. Market-based transactions characterised by ad hoc coordination achieved low prices but at the expense of low quality.

6.2 Stage III: Emergence of Coordination from Below

This section analyses the responses of local assemblers to fresh challenges in a new stage of industrial development: the rapid growth of foreign motorcycle manufacturers combined with increasing sophistication of market demand. Since the sector began to take a concentrated structure, the analysis starts by briefly discussing the overall structure of the

[54] Unless otherwise noted, the description of ordering procedure in this paragraph is based on interviews with assemblers A2 #1; A4 #4 and suppliers V13 #1; V15 #2; V17 #1; V19 #2; V23 #1; T6 #1; T7 #1.
[55] Even in assembler A2, which recorded the largest turnover in 2000, the average size of each order was only 100–200 units (interview #1).

industry and then proceeds to detailed analyses of a limited number of the largest assemblers and their key suppliers.

6.2.1 Meeting the Japanese Challenge: Two Contrasting Approaches

As the new stage of industrial development commenced, local assemblers were faced with fresh challenges. First, HVN's penetration of the middle-income market now posed a real threat as it actively invested in production capacity expansion after 2005 (Section 5.3.2). Second, the upward shift in consumers' preferences discussed in Section 5.3.1 put pressure on local assemblers to increase the quality of their products. Having experienced serious quality issues with Chinese motorcycles, Vietnamese consumers were no longer willing to accept low prices at the expense of poor quality.

Local assemblers responded to the new challenges with two distinct approaches.[56] One group of assemblers focussed on producing a larger variety of models carrying imitated designs at low costs, targeting the low-income rural market that the Japanese manufacturers had not penetrated. Another group of assemblers prioritised the improvement of product quality, developing own product designs and/or brand names, even if this should be at the expense of higher prices.

The two contrasting approaches can be observed in the embedded cases of the five assemblers for which detailed data are available for Stage III (Table 9). Assemblers A1 and A3 belong to the former category. They are similar in that they kept product and process parameters simple and standardised, specifying few requirements beyond price level. A number of suppliers explicitly noted that assemblers in this category – A1 in particular – specified limited quality requirement (C1 #2, #3; V16 #2; V21 #1). The low prices of their products are also an indication that their target was low-income consumers. As Table 9 shows, the average price of these assemblers' products in 2007 was less than half that of the Wave Alpha, US$801.

These assemblers continued to capitalise on Japanese designs as de facto benchmarks. However, unlike the case in Stage II, these assemblers started to make minor (largely cosmetic) modifications to several key components. Alterations to plastic covers and frames, which affected the external appearance of the motorcycle, were of particular importance (interviews with assembler A4 #4; supplier C1 #2, #3).

The above approach to the modification of de facto standard models enabled these assemblers to achieve a remarkable expansion of product variety, as well as speed and flexibility in launching new models. This is most clearly observed in assemblers A1 and A3. Table 8 shows that the number of new models registered by these assemblers increased rapidly after 2005. By this stage, assemblers exploited not only Honda's two most popular

---

[56] This finding was initially derived from the author's in-depth analysis of a small number of assemblers (Fujita 2006) but it was corroborated by interviews with suppliers operating in the Vietnamese–Chinese chain, particularly C1 #2, #3; K1 #3; T3 #2; V16 #2; and V21 #1.

motorcycles but also a much larger range of Japanese models – including new ones launched after 2005 – as de facto standards for duplicative imitation (interviews with supplier C1 #2, #3). Moreover, they launched a large number of new products by mixing and matching components with minor modifications (interviews with suppliers C1 #3; K1 #2, #3). Supplier K1, which simultaneously traded with HVN and local assemblers, described the strength of this group of assemblers as the flexibility and speed with which they were able to adjust product strategy:

> [They] are sensitive to market information. They try to obtain information on Honda's future models using their connections with the Ministry of Industry, and replicate these products in advance. To cope with the regulations on intellectual property, they combine different types of components. Honda cannot change its product strategy quickly, but [local assemblers] can change [product strategy] within a week.
> (K1 #2)

Assemblers A5 and A6 belonged to the latter category of assemblers. Unlike those in the other group, notable changes were observed in their products. The complexity of product and process parameters increased as these assemblers attached priority to quality. Suppliers to these assemblers noted that – although by no means on the scale exacted by Japanese manufacturers – they were more demanding in terms of quality, for which they were willing sacrifice economy of price (interviews with C1 #2; T3 #2; V21 #1). Accordingly, the average prices of their products were higher than those of the assemblers in the former category (Table 9). Product parameters also grew less standardised as these assemblers sought to develop their own designs and brands.[57] Assembler A6 in particular had adopted customised designs for some of its models by 2007, for the manufacture of which suppliers were provided with design drawings together with samples (interviews with assembler A6 #1 and A6's supplier, T3 #2).

Assembler A4 fell between the two categories, in that it did not opt to develop own-product designs or brands and kept product parameters standardised. However, the company did seek to increase the quality of its products, resulting in higher prices than those of assemblers A1 and A3 (interview with A4 #4).

In short, two discrete groups of local assemblers emerged in Stage III, each of which adopted a different product strategy. Yet, the question remains as to which of the two came to represent the dominant actor within the industry. This puzzle is addressed in the next subsection.

6.2.2 Consolidation of Assemblers and Rise of Supplier Capabilities

In Stage III, the local assembly sector of the Vietnamese motorcycle industry was substantially restructured, assemblers being consolidated into a small number of large

[57] Institute for Industry Policy and Strategy (2007: 39) also notes A5 and A6 are among those assemblers that invest in own-product designs and brands.

companies. By 2006, the number of active local assemblers had been reduced to 28, roughly half that of 2000.[58] Accordingly, the market grew more compact, and it was those assemblers that concentrated on price-based competiveness (the first group discussed above) that captured the bulk of the sales share. As Table 9 shows, the largest assembler (A1) accounted for 23% of the total turnover of local assemblers in 2006, and the four largest firms (inclusive of assemblers A1 and A3) together enjoyed a 50% share.[59] In contrast, assemblers that focussed on non-price-based competitiveness (the second group discussed above) accounted for a much smaller market share.

However, there was little indication that either group of assemblers had amassed new capabilities. Those in the second category developed their own products by mobilising external capabilities rather than building their own internal capabilities: A5 collaborated with Chinese partners (questionnaire survey in 2007), while A6 outsourced product design to overseas companies (interview #1).

Consolidation progressed on the suppliers' side as well. As local content rules were relaxed in 2003, local assemblers as a whole began to depend increasingly on imported components (Table 12), relying on local sourcing only when parts were available at competitive prices. Table 11 classifies suppliers in the Vietnamese–Chinese chain according to their positions in Stage III. Of those interviewed by the author, several quickly expanded sales to local assemblers, the largest firms in particular such as A1 and A3 (V16, C1, C2, C3, and C4). At the same time, the remaining suppliers faced diminishing sales to local assemblers, and they either shifted to the Japanese chain or other industries.

Table 12. Value of Imported Components per Vehicle Sold (Unit: US$)

	2000	2001	2002	2003	2004	2005
HVN	692	641	275	231	203	218
Local Assemblers	506	338	181	179	420	396

Source: The author, based on data provided in Institute for Industry Policy and Strategy (2007).

What is striking is the size of turnover and the number of customers the first group of suppliers served at this stage. Supplier C1 had two factories registered as independent companies, which in 2006 ranked as 6th and 38th respectively in terms of turnover of all operational motorcycle component manufacturers in Vietnam, including the largest Japanese suppliers that served 100% of HVN's growing orders. In 2007, this supplier sold over 860,000 units of plastic covers and frames (interview with C1 #1), which more or less accounts for the total number of motorcycles produced by local assemblers in that year (Figure 1). Moreover, these suppliers simultaneously served 20 to 50 local assemblers in Stage III (Table 11), which was in fact more than the aforementioned number of officially

[58] Based on a list of motorcycle assemblers operational in 2006 provided by the General Statistics Office.
[59] Based on a list of motorcycle assemblers operational in 2006 provided by the General Statistics Office.

registered local assemblers in 2006.[60]

Suppliers expanding their sales to local assemblers are particularly notable for the extent to which they built design and manufacturing capabilities. Moreover, unlike suppliers under the Japanese model, the accretion of new capabilities in the Vietnamese–Chinese chain was achieved primarily through suppliers' *independent* volition rather than as the result of explicit demand from or assistance of lead firms. As the most prominent example, C1 had invested in generic manufacturing competencies in order to achieve reasonable quality, prompt delivery, and low prices, whilst mobilising the capability of the company's R&D centre in China to reverse-engineer existing component designs and conduct minor cosmetic modifications (interview #1). The ability to conduct large-scale manufacturing to reasonable quality standards was developed by importing equipment and machinery from China and mobilising Chinese engineers (ibid.). The huge production volume also enabled the company to exploit economies of scale.

Likewise, V16, a Vietnamese supplier of silencers, was one of the few local suppliers continuing to operate in the Vietnamese–Chinese chain in Stage III. This firm was the only local supplier subjected to in-depth analysis by this study that had acquired an *adaptive* or basic innovative level of new product introduction capability (Table 10). Whereas it had replicated existing products in the 1990s, it subsequently gradually started to make cosmetic and functional modifications to standardised designs (interviews #1, #2). This was achieved through its own R&D efforts and attempts to engage with assemblers. The supplier independently established an R&D department, investing in design equipment, software, and testing and measuring equipment, as well as training its own design engineers (interview #1).

In short, the local motorcycle assembly sector was consolidated into those assemblers that focussed on price-based competitiveness in standardised models with minor external modifications. Consolidation also progressed on the suppliers' side, which resulted in the rise of those with manufacturing and design competencies.

6.2.3 The Rise of Supplier-Driven Coordination

The result of the rapid consolidation of lead firms and suppliers amounted to de facto mutual dependence between large assemblers and large, competent suppliers. The results of questionnaire surveys conducted in 2007 show that assemblers A1, A3, A4, A5 and A6 developed relatively long-term relations with a limited number of key suppliers that extended for between three and six years, suggesting that the relations between lead firms and suppliers had stabilised.

However, this does not imply Japanese-type organisation in which lead firms and suppliers are locked into particular relations. Assemblers expressed strong preference to avoid

[60] This is likely to be because some assemblers had shifted their focus to other lines of business where they were officially registered, yet continued to produce motorcycles on a small scale.

dependence on specific suppliers. Table 13 shows that all of five assemblers under study cited the optimum number of suppliers for each type of component as two to three in order that they should not be dependent on specific firms. Remarkably, no major differences were observed between the two groups of assemblers. Neither were suppliers locked into relations with specific customers, a finding that is clearly illustrated by the large number served by suppliers surviving to Stage III (Table 11).

Table 13. Assemblers' Preferred Number of Suppliers of Each Component

	Number of suppliers*	Reason
A1	2–3	Competition based on quality and price is beneficial
A3	2–3	Allows the assembler to take the initiative.
A4	2–3	Allows suppliers to compete based on quality and price.
A5	2–3	Allows the selection of suppliers based on price, quality and delivery.
A6	2–3	Avoids passivity and defensiveness.

Note: * Assemblers were asked to choose between one, two to three, or more than three.
Source: The author's questionnaire survey conducted in 2007 in collaboration with the Vietnam Institute of Economics, Vietnam Academy of Social Science.

Thus far, it has become clear that the local motorcycle assembly sector came to be dominated by a small number of large assemblers producing low-priced, standardised models with minor external modifications. While their success is plausible given that they catered to the extreme low-end section of the Vietnamese market that even HVN's budget model had not penetrated, the question remains as to how they managed to resolve coordination issues around product and process parameters. First, the limits of de facto standardisation – as discussed at length in Section 6.1 – remained in place. These assemblers should have been able to achieve at least reasonable quality levels since their target consumers were no longer willing to accept low quality just because the products were cheap. Second, the assemblers were able to make minor modifications to original Japanese component designs, a factor that compounded coordination requirements. The question is therefore one of how firms met the necessary level of coordination.

This question was explored via in-depth analyses of the embedded cases assemblers A1 and A3, and their largest suppliers. The findings suggest that it was the suppliers rather than the assemblers that took the lead in dealing with coordination issues. By dealing systematically with non-compatibility problems arising from de facto standardisation and making modifications to component designs on behalf of their customers, these suppliers became the key force driving the transformation of the Vietnamese–Chinese chain.

Such supplier-driven changes are demonstrated by the in-depth analysis of suppliers C1 and V16 discussed above. C1 rapidly expanded sales to local assemblers by utilising design competencies and generic large-scale manufacturing capacity to provide the complete, fine-tuned component modules that were most critical to the assemblers; incorporating minor cosmetic modifications, and processing them to reasonable quality, prompt delivery, and low cost standards. Although the supplier produced a large variety of motorcycle components, it focussed most sharply on plastic covers, frames and lights (interview #2). This is because local assemblers attached the highest importance to these component modules in terms of product differentiation, meaning that their manufacture called for exacting design work given that they essentially determined the external appearance of the whole vehicle.[61] Each year, C1 launched an average of four designs incorporating minor modifications to these most necessary modules (interview #1). The three types of component that comprised the modules were fine-tuned with each other in order to maximise the performance of the module as a whole. Moreover, unlike the ad hoc, ex post adjustments typically observed in Stage II, supplier C1 systematically adjusted the interfaces of these modules with adjacent components at the initial stages of contact with assemblers (interview #2).

V16 provides another case in point. Its main products, silencers, were critical to local assemblers because they affected both the product's performance and its external appearance. This supplier continued to operate in the Vietnamese–Chinese chain in Stage III as it made effective use of its design and manufacturing capabilities to conduct minor cosmetic and/or functional modifications to the existing designs of this important component on behalf of its customers, because "local assemblers did not have design drawings and did not know anything about technical parameters" (interview #1). Based on surveys of local assemblers, motorcycle dealers, and final consumers, V16 regularly launched new designs which reflected the latest market trends and policy requirements and carried the company's own brand name (interviews #1, #2).

In contrast, there was little indication that the sourcing practices of assemblers A1 and A3 were substantially different from those that had prevailed in Stage II, which suggested that the impetus for organisational innovation did not come from lead firms. Apart from the fact that their relations with key component suppliers had stabilised and been sustained over the long term, there was no evidence that the procedure for placing orders had changed in comparison to the previous stage as described in Section 6.1. Suppliers that continued to trade with either assembler A1 or A3 in Stage III, namely, C1, V16 and V21, noted that the manner in which these assemblers specified and monitored component quality and precision levels remained unchanged (interviews with C1 #2; V16 #2; V21 #1). None of these suppliers were provided active monitoring by assemblers A1 or A3, as noted by supplier C1:

> As for assemblers like A1 and A3, because the size of their orders is very large, they do not check the quality of the components carefully. Their complaints mostly concern wrong colours. (C1 #2)

The result of these supplier-driven changes was 'coordination from below', which

[61] Interviews with supplier C1 #3 and assembler A4 #4. Ge and Fujimoto (2005: 98–9) note that this was also the case in China.

addressed those coordination issues arising from the limitations of de facto standardisation without assemblers or suppliers being locked into particular relations or having to engage in intense communication. With the ability to conduct reverse engineering, design modification, and large-scale manufacturing, the two suppliers discussed in detail above together with several others formed a “shared supply base” (Sturgeon and Lee 2005) for local assemblers as a whole, including major assemblers such as A1 and A3 as well as other firms operating on a smaller scale.

Although the above features of this emerging industrial organisation apparently resembled a modular chain (Sturgeon 2002; Gereffi et al. 2005), the coordination pattern emerging in Stage III of the Vietnamese motorcycle industry should be distinguished from such a chain because: (1) de facto standardisation was partial in that it did not do away with coordination requirements; and (2) standardisation did not extend to the whole vehicle. Because of this partiality, suppliers C1 and V16 still had to adjust component interfaces for each of their customers, although they managed to reduce the time and cost of modifications by implementing them systematically.

Nevertheless, albeit partial, supplier-driven coordination was the form of organisational adaptation best suited to the market conditions and capability alignment prevailing in Vietnam at the time. For suppliers, exploiting de facto standardisation to serve numerous customers made economic sense because in Vietnam’s fragmented market, pooling orders from multiple assemblers was the only way to achieve sufficient economies of scale (Fujita 2011). For assemblers who lacked both design and manufacturing competencies, relying on competent suppliers was the easiest and fastest route to solving the immediate problems of non-compatibility; increasing product variety by achieving cosmetic modifications to several key components; and exploiting the cost advantage of large-scale production.

6.3 Summary and Discussion

This section analysed the emergence and transformation of the Chinese model in Vietnam. In respect of the first sub-question concerning the trajectory of organisational transformation, the findings presented in this section did not render support to the argument of the empirical research to date, which has focussed on a small number of assemblers operational up to Stage II to argue that they started to develop long-term, trust-based relations with their suppliers.

Conversely, the foregoing analysis showed that in Stage III several powerful suppliers took the lead in addressing coordination needs on behalf of their customers without lead firms or suppliers having to engage in intense communication or being locked into particular relations. This suggests that even assuming a lead firm-driven shift towards trust-based relations had obtained among a certain group of assemblers in Stage II, it was still likely to be a transitory. The limited knowledge of products and production processes possessed by local assemblers also suggests that such networks even if they had existed were unlikely to have been sustainable. The research design adopted in this paper was critical in showing the overriding trend of organisational transformation in this sector of the Vietnamese motorcycle industry; that is, empirical research based on the integration of industry-level and firm-level data facilitated the analysis of changes in the operations of both lead firms and suppliers over an extended period of time.

With regard to the second sub-question concerning the determinants of organisational transformation, it was argued that the product characteristics emphasised in the existing literature are in themselves insufficient to explain the phenomenon. De facto standardisation of Japanese models and low quality requirements reveal why arm's-length linkages prevailed in the early 2000s but do not account for the emergence of supplier-driven coordination in Stage III.

The empirical findings showed that the driver for change came primarily from the rise of supplier competencies. This was in sharp contrast to the Japanese chain, in which the lead firm actively sought to realign the capability structure to create conditions conducive to the effective functioning of its organisational adjustment. By independently accumulating complementary competencies in conducting minor design modifications to existing models and manufacturing them in large quantities to reasonable standards, a small number of suppliers – including those analysed in depth as embedded case studies – formed a shared supply base for large and small assemblers seeking to increase the product variety of low-priced, standardised models aimed at the low-income market still unexploited by HVN.

7. Conclusion

This paper began by highlighting the challenges that the newly emerging Chinese model of industrial organisation posed to the conventional Japanese model. What can we learn from the rivalry between these two models in a third country context? How does its analysis contribute to the literature on models and trajectories of industrial organisation? By integrating extensive primary and secondary data collected at different points in time, this paper sought to describe and explain the decade-long organisational transformation in the Vietnamese motorcycle industry resulting from the direct clash of two contrasting models of industrial organisation. This concluding section summarises the empirical findings corresponding to the two sub-questions, and discusses the contribution of this paper to the wider body of literature on industrial organisation.

First, this paper asked a 'how' question on the dynamic evolution of industrial organisation in the Vietnamese motorcycle industry: *How did the Japanese and Chinese organisational models evolve in Vietnam?* The literature suggests that these two models converged; however, the present study found that such convergence was short-lived. What seemed like important changes in both Japanese and Chinese models in the early 2000s were eventually abandoned, while more dynamic, long-lasting changes got underway at a later stage of industrial development. In the end, the Japanese model shifted from one variant to another variant of the same captive model of industrial organisation. The Chinese model essentially remained one of loosely coordinated organisation throughout the period of analysis; although it came to be characterised by several competent suppliers playing partial yet critical coordinating roles in later years. Fundamental differences between the two models continued to persist in the medium term.

Second, this study examined the reasons for these organisational changes; that is, *what factors drove the organisational transformation of the Vietnamese motorcycle industry?* The literature emphasises the nature of the product that respective lead firms manufactured. Yet, the longitudinal analysis in the present paper found that explaining short- and medium-term trajectories of organisational transformation required another variable – that of the changing capability alignment in the respective value chains.

The transformation of the Japanese model into an institutionalised competition variant can be explained in terms of changing capability alignment in *both* the lead firm and its suppliers, that is, lead firm acquisition of purchasing power and increasing supplier capabilities but not complementary competencies. It was HVN that took the lead in nurturing the necessary capabilities – not only its own but also those of its suppliers – although it took time and the dismantling of policy constraints before such initiatives started to produce the desired results. Conversely, the transformation of the Chinese model can be explained primarily in terms of the formation of supplier capabilities, that is, the rise of specialist suppliers with design modification and large-scale manufacturing competencies.

In addition to empirical findings specific to the Vietnamese motorcycle industry, this paper also makes an important contribution to the broader body of literature. First, by systematically tracing the long-term transformation of two industrial organisational models, this paper shed new light on the processes through which organisations evolve over time. The empirical findings showed that organisational transformation was far from a smooth and automatic process. In practice, such processes involved challenges, struggles and tensions. The results were diverse hybrids or intermediate forms of industrial organisation that did not necessarily correspond to the five most typical governance forms. The empirical findings indicate that the captive model – the conventional form of Japanese industrial organisation – can in practice be implemented as two distinct variants, each with strikingly different implications for competitiveness and supplier development. ‘Coordination from below’ in the Vietnamese–Chinese chain is another example of a hybrid form of organisation. Albeit partial, this provided effective means for local assemblers and suppliers to meet Japanese challenges under the conditions prevailing in Vietnam.

Second, this study systematically explained the trajectories of organisational change in terms of two elaborate and operational variables: the nature of product/process parameters and the alignment of relevant capabilities. While much of the previous theoretical and empirical research has focussed on chain governance in its most orthodox forms, these patterns emerge only where specific combinations of these two variables are present. Where models are transferred to different contexts or where they meet new competitive challenges, there may be many instances in which ideal sets of conditions for intended organisational adaptation are unavailable. It is indeed such misalignments of variables that created the aforementioned challenges, struggles and tensions.

Indeed, contrary to Gibbon et al.'s (2008) contention, the two variables did not transpire to be structural constraints to transactions. These variables were heavily influenced by the strategic actions of firms in the value chain, and it was in fact such actions of lead firms and/or suppliers aimed at realigning these variables – albeit with limitations – that drove industrial organisation to full or partial transformation. HVN made active attempts to realign the capability structure in order to create the necessary conditions for the effective functioning of the market forces it sought to introduce. In Vietnamese–Chinese chains, coordination needs arising from the partial nature of de facto standardisation were simply left unattended in the early years because none of the actors had the capacity to deal with them. These needs were eventually met by the rise of competent suppliers that had both the will and the capacity to play a partial yet critical role in implementing the requisite coordination.

Finally, the empirical findings of this study also provide important insights into the emerging rivalry between the Japanese and Chinese models of industrial organisation. In terms of its capacity to exploit the potential (unrealised) market demand and to capitalise on the existing alignment of relevant capabilities, the Vietnamese case demonstrates that the Chinese model initially proved more adaptable to developing country conditions. However, in the medium term, the Japanese model gained supremacy over the Chinese model as Japanese lead firms made certain – but not fundamental – adjustments to the nature of their products, while actively realigning the capability structure. Conversely, while the Chinese model lost supremacy in the medium term, it nevertheless continued to function in an adapted form as suppliers gained the complementary competencies required by local assemblers. The result of repeated rounds of organisational adaptation was enhanced organisational diversity. After a decade, the two models continued to exist side by side, both retaining the essential features of the original models yet incorporating important adjustment.

References

Amano, Tomofumi and Junjiro Shintaku, 2010. Honda Nirin Jigyo no ASEAN Senryaku: Teikakaku Moderu no Tonyu to Seihin Senryaku no Kakushin (ASEAN Strategy in Honda's Motorcycle Business: Launching of Low-Priced Models and Innovation in Product Strategy). *Akamon Management Review*, 9(11), pp.783-806 (in Japanese).

Asanuma, Banri, 1989. Manufacturer-Supplier Relationships in Japan and the Concept of Relation-Specific Skill. *Journal of the Japanese and International Economies*, 3, pp.1-30.

Baldwin, Carliss Y. and Kim B. Clark, 2000. *Design Rules: The Power of Modularity*.

Cambridge, Massachusetts and London: The MIT Press.

Bell, Martin and Keith Pavitt, 1995. The Development of Technological Capabilities. In: I. ul Haque ed. *Trade, Technology and International Competitiveness*. Washington, DC: Economic Development Institute of the World Bank, pp.67-101.

Chandler, Alfred D, Jr., 1977. *The Visible Hand: The Managerial Revolution in American Business*. Cambridge, Massachusetts: Harvard University Press.

Chen, Dung-Sheng and Sue-Chiang Jou, 2002. Weakening Transplanted Production Networks: A Case Study of Taiwan's Motorcycle Production Network in Vietnam. Paper presented at the Conference on Taiwanese Firms in Vietnam: Networks and Labour, organised by Asia Pacific Research Programme, Academia Sinica and Institute of Sociology, National Taiwan University on 11 October 2002.

Clark, Kim B. and Takahiro Fujimoto, 1990. The Power of Product Integrity. *Harvard Business Review*, 68(6), pp.107-118.

Clark, Kim B. and Takahiro Fujimoto, 1991. *Product Development Performance: Strategy, Organization, and Management in the World Auto Industry*. Boston, Massachusetts: Harvard Business School Press.

Cohen, Margot, 2002. Biker Wars. *The Far Eastern Economic Review*, November 7, p.46.

Cusumano, Michael A. and Akira Takeishi, 1991. Supplier Relations and Management: A Survey of Japanese, Japanese-Transplant, and U.S. Auto Plants. *Strategic Management Journal*, 12(8), pp.563-588.

de Vaus, David, 2001. *Research Design in Social Research*. London, Thousand Oaks and New Delhi: Sage Publications.

Dore, Ronald, 1983. Goodwill and the spirit of market capitalism. *British Journal of Sociology*, 34, pp.459-82.

Dyer, Jeffrey H., 1996. Specialized Supplier Networks as a Source of Competitive Advantage: Evidence from the Auto Industry. *Strategic Management Journal*, 17, pp.271-291.

Ernst, Dieter, 2002. Evolutionary Aspects: the Asian production networks of Japanese electronics firms. In: Michael Borrus, Dieter Ernst and Stephan Haggard eds. *International Production Networks in Asia: Rivalry or Riches?* London and New York: Routledge, pp.80-109.

Fujimoto, Takahiro, 1999. *Evolution of a manufacturing system at Toyota*. Oxford: Oxford University Press.

Fujita, Mai, 2005. Betonamu no Nirinsha Sangyo (Vietnam's Motorcycle Industry). In: Yuri Sato and Moriki Ohara eds. *Ajia no Nirinsha Sangyo: Kiso Joho to Kigyo Ichiran (Asian Motorcycle Industry: Basic Information and List of Companies)*. Chiba: Institute of Developing Economies, pp.113-129 (in Japanese).

Fujita, Mai, 2006. Betonamu no Nirinsha Sangyo: Shinko Shijo ni okeru Jiba Kigyo no Sannyu to Sangyo Hatten (Vietnam's Motorcycle Industry: The Entry of Local Enterprises into a Newly-emerging Market and Industrial Development). In: Yuri Sato and Moriki Ohara eds. *Ajia no Nirinsha Sangyo: Jiba Kigyo no Bokko to Sangyo Hatten Dainamizumu (Asia's Motorcycle Industry: The Rise of Local Companies and the Dynamism of Industrial Development).* Chiba: Institute of Developing Economies, pp.323-365 (in Japanese).

Fujita, Mai, 2007. Local Firms in Latecomer Developing Countries amidst China's Rise: The case of Vietnam's motorcycle industry. Discussion Paper No. 97. Chiba: Institute of Developing Economies.

Fujita, Mai, 2008. Betonamu Nirinsha Sangyo no Hatten to Kozo Henka: Jiba Kigyo wo meguru Kankyo no Henka wo Chushin ni (The Development and Structural Changes in the Vietnamese Motorcycle Industry: Focussing on the Changing Environment Surrounding Local Firms). In: Shozo Sakata ed. *Henyo Suru Betonamu Keizai to Keizai Shutai (Changing Economy and Economic Entities in Vietnam)*. Chiba: Institute of Developing Economies, pp.119-145 (in Japanese).

Fujita, Mai, 2011. Value Chain Dynamics and Local Suppliers' Capability Building: An Analysis of the Vietnamese Motorcycle Industry. In: Momoko Kawakami and Timothy J. Sturgeon eds. *The Dynamics of Local Learning in Global Value Chains: Experiences from East Asia*. Basingstoke: Palgrave Macmillan, pp.68-99.

Fujita, Mai, 2012, How sectoral systems of production promote capability building: insights from the Vietnamese motorcycle industry. *Asian Journal of Technology Innovation*, 20 (S1), pp.111-131 (www.tandfonline.com).

Fujita,Mai, 2013a. Exploring the Sources of China's Challenge to Japan: Models of Industrial Organisation in the Motorcycle Industry. Discussion Paper No.419. Chiba: Institute of Developing Economies.

Fujita, Mai 2013b. The Economic Rise of China and the Transformation of Vietnam's Motorcycle Industry. PhD thesis. University of Sussex.

Ge, Dongsheng and Takahiro Fujimoto, 2004. Quasi-open Product Architecture and Technological Lock-in: An Exploratory Study on the Chinese Motorcycle Industry. *Annals of Business Administrative Science*, 3(2), pp.15-24.

Ge, Dongsheng and Takahiro Fujimoto, 2005. Giji Opun Akitekucha to Gijututeki Rokku-in: Chugoku Otobai Sangyo no Jirei kara (Quasi-open Architecture and Technological Lock-in: The Case of Chinese Motorcycle Industry). In: Takahiro Fujimoto and Junjiro Shintaku eds. *Chugoku Seizogyo no Akitekucha Bunseki (Architecture-based Analysis of Chinese Manufacturing Industries)*. Tokyo: Toyo Keizai Inc., pp.81-115 (in Japanese).

General Statistics Office, various years. *Statistical Yearbook*. Ha Noi: Statistical Publishing House.

Gereffi, Gary, 1999. International trade and industrial upgrading in the apparel commodity chain. *Journal of International Economics*, 48, pp.37-70.

Gereffi, Gary, John Humphrey, Raphael Kaplinsky and Timothy J. Sturgeon, 2001. Introduction: Globalisation, Value Chains and Development. *IDS Bulletin*, 32(3), pp.1-8.

Gereffi, Gary, John Humphrey, and Timothy Sturgeon, 2005. The Governance of Global Value Chains. *Review of International Political Economy*, 12(1), pp.78–104.

Gibbon, Peter, Jennifer Bair and Stefano Ponte, 2008. Governing global value chains: an introduction. *Economy and Society, 37*(3), pp.315-338.

Glick, William H., George P. Huber, C. Chet Miller, D. Harold Doty and Kathleen M. Sutcliffe, 1995. Studying Changes in Organizational Design and Effectiveness: Retrospective Event Histories and Periodic Assessments. In: George P. Huber and Andrew H. Van de Ven eds. *Longitudinal Field Research Methods: Studying Processes of Organizational Change*. Thousand Oaks, London, and New Delhi: Sage Publications, pp.126-153.

Guiheux, Gilles and Yveline Lecler, 2000. Japanese Car Manufacturers and Component Makers in the ASEAN Region: a Case of Expatriation under Duress – or a Strategy of Regionally Integrated Production? In: John Humphrey, Yveline Lecler and Mario Sergio Salerno eds. *Global Strategies and Local Realities: The Auto Industry in Emerging Markets*. Basingstoke and New York: Macmillan Press and St. Martin's Press, pp.207-233.

Ha Huy Thanh, Bui Tat Thang, Do Huu Hao, Do Thu Trang, Tran Thu Hien and Phan Mai Huong, 2003. Study on Industrial Policies in Vietnam. In: Akie Ishida ed. *Chiiki Keizai Togo to Betonamu: Hatten no Gen Dankai (Regional Integration and Vietnam: Current Stage of Development)*. Chiba: Institute of Developing Economies, pp.305-405.

Harriss, John, 1995. "Japanization": Context and Culture in the Indonesian Automotive Industry. *World Development*, 23(1), pp.117-128.

Hashino, Tomoko, 2007. The Rise and Growth of Small and Medium-sized Enterprises in Industrial Districts: Mechanical Engineering in the Higashi-mikawa District. *Japanese Research in Business History*, 24, pp.54-75.

Hayashi, Takeshi, 1990. *The Japanese Experience in Technology: From transfer to self-reliance*. Tokyo: United Nations University.

Helper, Susan R., 1991. Strategy and Irreversibility in Supplier Relations: The Case of the U.S. Automobile Industry. *The Business History Review*, 65(4), pp.781-824.

Helper, Susan R. and Mari Sako, 1995. Supplier Relations in Japan and the United States: Are They Converging? *Sloan Management Review*, 36(3), pp.77-84.

Higashi, Shigeki, 2006. Tai no Nirinsha Sangyo: Nihon Burando Kasen Taisei ni Okeru Jiba Kigyo no Taio to Taiko (Thailand's Motorcycle Industry: The Growth of Local Companies under a Japanese Oligopolistic System). In: Yuri Sato and Moriki Ohara, eds. *Ajia no Nirinsha Sangyo: Jiba Kigyo no Bokko to Sangyo Hatten Dainamizumu (Asia's Motorcycle Industry: The Rise of Local Companies and the Dynamism of Industrial Development)*. Chiba: Institute of Developing Economies, pp.243-280 (in Japanese).

Honda Motor Co., Ltd., various years. *World Motorcycle Facts & Figures*. Tokyo: Editorial Office of World Motorcycle Facts & Figures, Honda Motor Co., Ltd.

Humphrey, John, 1995. Industrial Reorganization in Developing Countries: From Models to Trajectories. *World Development*, 23(1), pp.149-162.

Humphrey, John, 2000. Assembler-Supplier Relations in the Auto Industry: Globalisation and National Development. *Competition and Change*, 4, pp.245-271.

Humphrey, John, Raphael Kaplinsky and Prasad V. Saraph, 1998. *Corporate Restructuring: Crompton Greaves and the Challenge of Globalisation*. New Delhi, Thousand Oaks and London: Response Books.

Humphrey, John and Hubert Schmitz, 2008. Inter-firm relationships in global value chains: trends in chain governance and their policy implications. *International Journal of Technological Learning, Innovation and Development*, 1(3), pp. 258-282.

Ichikawa, Kyoshiro, 2001. Betonamu (Vietnam): Honda Vietnam Co., Ltd. *JETRO Censor*, March, pp.34-35 (in Japanese).

Industrial Research Institute, 2011. *Ajia Nirinsha Sangyo 2011 Betonamu hen (Asia's Motorcycle Industry 2011: Vietnam)*. Tokyo: Industrial Research Institute Co., Ltd. (in Japanese).

Institute for Industry Policy and Strategy, 2007. *Master Plan for the Development of Vietnam's Motorcycle Industry in the Period of 2006-2015, with a Vision to 2020*. Institute for Industry Policy and Strategy, Ministry of Industry.

Intarakumnerd, Patarapong and Mai Fujita, 2008. Coping with a Giant: Challenges and Opportunities for Thai and Vietnamese Motorcycle Industry from China. *Science Technology & Society*, 13(4), pp.35-60.

Intarakumnerd, Patarapong and Mai Fujita, 2009. China's threat and opportunities for the Thai and Vietnamese motorcycle industries: a sectoral system innovation system analysis. In: Franco Malerba and Sunil Mani eds. *Sectoral Systems of Innovation and Production in Developing Countries*. Cheltenham and Northampton: Edward Elgar, pp.207-231.

Ishida, Akie, 2001. Betonamu no Baiku Sangyo: Kokusanka no Shido (Vietnam's Motorcycle Industry: Start of Localization). *Ajiken World Trends*, 74, November, pp.30-33.

Japan External Trade Organization (JETRO), 1996. *Heisei 8 Nendo Chusho Kigyo Tekisei Gijutu Fukyu Shido Jigyo Jizen Chosa Hokokusho: Betonamu ni okeru Jidosha, Denki Denshi Sangyo to sono Susono Sangyo ni Kansuru Chosa. (Report on Preliminary Research for Project for Instructing Diffusion of Appropriate Technology for Small and Medium Enterprises, Fiscal Year 1996: Research on the Automobile, Electric and Electronic Industries and their Supporting Industries in Vietnam)*. Tokyo: Japan External Trade Organization (in Japanese).

Jones, Candace, William S. Hesterly and Stephen P. Borgatti, 1997. A General Theory of Network Governance: Exchange Conditions and Social Mechanisms. *Academy of Management Journal*, 22(4), pp.911-945.

Kaplinsky, Raphael, 1995. Techniques and System: The Spread of Japanese Management Techniques to Developing Countries. *World Development*, 23(1), pp.57-71.

Kaplinsky, Raphael and Mike Morris, 2000. A Handbook for Value Chain Research. Prepared for IDRC.

Lall, Sanjaya, 1992. Technological Capabilities and Industrialization. *World Development,* 20(2), pp.165-186.

Langlois, Richard N. and Paul L. Robertson, 1992. Networks and innovation in a modular system: Lessons from the microcomputer and stereo component industries. *Research Policy*, 21, pp.297-313.

Langlois, Richard N. and Paul L. Robertson, 1995. *Firms, Markets and Economic Change: A Dynamic Theory of Business Institutions*. London and New York: Routledge.

Lecler, Yveline, 1999. Recession and Globalization: What Future for Japanese Industrial *Keiretsu*? In: Daniel Dirks, Jean-François Huchet and Thierry Ribault eds. *Japanese Management in the Low Growth Era: Between External Shocks and Internal Evolution*. Berlin: Springer-Verlag, pp.183-205.

Lecler, Yveline, 2002. The Cluster Role in the Development of the Thai Car Industry. *International Journal of Urban and Regional Research*, 26(4), pp.799-814.

Lecler, Yveline, 2004. The Japanese Firms' Purchasing System: Strategic and Structural Changes of the 80s and the 90s. In: Werner Pascha ed. *Systemic Change in the Japanese and German Economies: Convergence and differentiation as a dual challenge*. Oxford and New York: Routledge Curzon, pp.176-202.

Mishima. Kohei, 2007, Betonamu no Nirinsha Sangyo: Gurobaruka Jidai ni okeru Yunyu Daitaigata Sangyo no Hatten (Vietnam's Motorcycle Industry: Development of an Import-Substituting-Type Industry in the Age of Globalization). *Hikaku Keizai Kenkyu (Japanese Journal of Comparative Economics)*, 44(1), pp.61-75 (in Japanese).

The Motorbike Joint Working Group, 2007. *For Sound Development of the Motorcycle Industry in Vietnam*. Hanoi: The Publishing House of Social Labour.

Nguyen Duc Hien, 2004. Chinh sach noi dia hoa va su phat trien cua nganh cong nghiep san xuat xe may Viet Nam (Localization Policy and the Development of the Motorcycle Industry in Vietnam). In: Co quan hop tac quoc te Nhat Ban (Japan International Cooperation Agency) and Dai hoc kinh te quoc dan (National Economic University) eds. *Chinh sach cong nghiep va thuong mai cua Viet Nam trong boi canh hoi nhap, Tap 2 (Industrial and Trade Policies of Vietnam in the Context of Integration, Volume 2)*. Ha Noi: Nha xuat ban Thanh Hoa (Thanh Hoa Publishing House), pp.231-288 (in Vietnamese).

Nguyen Duc Tiep, 2006. Building External Manufacturing Capability in Emerging Markets: Honda's Knowledge Transfer and the Role of Local Suppliers' Responsiveness. *Journal of Asia-Pacific Business*, 7(4), pp.77-95.

Nguyen Duc Tiep, 2007. Chinese Motorcycle Penetration into Vietnam and the Existing Motorcycle Makers: A Case Study of Honda Company. *Economic Bulletin*, 1(4), pp.1-9.

Nguyen Tran Que and Hoa Huu Lan, 1998. Auto and Motorbike Industry – Impact of Vietnam's Policies of Trade and Investment. In: Vo Dai Luoc ed. *Vietnam's Policies on*

Trade and Investment and the Development of Some Key Industries. Hanoi: Social Science Publishing House, pp.123-175.

Nishiguchi, Toshihiro, 1994. *Strategic Industrial Sourcing: The Japanese Advantage*. New York: Oxford University Press.

Nishiguchi, Toshihiro and Jonathan Brookfield, 1997. The Evolution of Japanese Subcontracting. *Sloan Management Review*, Fall, pp.89-101.

Ohara, Moriki, 2001. Chugoku Otobai Sangyo no Sapuraiya Shistemu: Risuku Kanri to Noryoku Kojo Sokushin Mekanizumu kara mita Nicchu Hikaku (The supplier system of the Chinese motorcycle industry: A Comparative study with the Japanese system in view of the mechanisms of risk management and capability upgrading). *Ajia Keizai*, XLII-4, pp.2-38 (in Japanese).

Ohara, Moriki, 2006a. *Interfirm Relations under Late Industrialization in China: The Supplier System in the Motorcycle Industry*. Occasional Paper Series No. 40. Chiba: Institute of Developing Economies.

Ohara, Moriki, 2006b. Nihon no Kanseisha Kigyo: Attoteki Yui no Keisei to Kaigai Shinshutsu (Japanese Motorcycle Manufacturers: The Creation of Dominance and the Move Overseas). In: Yuri Sato and Moriki Ohara eds. *Ajia no Nirinsha Sangyo: Jiba Kigyo no Bokko to Sangyo Hatten Dainamizumu (Asia's Motorcycle Industry: The Rise of Local Companies and the Dynamism of Industrial Development)*. Chiba: Institute of Developing Economies, pp.53-94 (in Japanese).

Ohara, Moriki, Fenglun Tian and Hong Lin, 2003. Chugoku Kigyo no Kaigai Shinshutsu (The Overseas Moves of Chinese Firms). In: Moriki Ohara ed. *Chugoku no Taito to Ajia no Kikai Kanren Sangyo (The Rise of China and Machinery-Related Industries in Asia)*. Chiba: Institute of Developing Economies, pp.53-87 (in Japanese).

Otahara, Jun, 2009a. Kotei Inobeshon niyoru Shinkoku Ro-endo Shijo heno Sannyu: Honda no Nirinsha Jigyo no Jirei (Entry into Low-end Markets in Emerging Markets by Process Innovations: The Case of Honda's Motorcycle Business). *Doshisha Shogaku*, 60(5-6), pp.274-292 (in Japanese).

Otahara, Jun, 2009b. Otobai sangyo: Ro-kosuto Integuraru Seihin ni yoru Kyoso Yui no Chokiteki Jizoku (Motorcycle Industry: Long-Term Maintenance of Competitive Advantage via Low-Cost Integral Products). In: Junjiro Shintaku and Tomofumi Amano eds. *Monozukuri no Kokusai Keiei Senryaku: Ajia no Sangyo Chirigaku (Global Strategy of Manufacturing Management: Industrial Geography in Asia)*. Tokyo: Yuhikaku, pp.185-205 (in Japanese).

Palpacuer, Florence, 2000. Competence-Based Strategies and Global Production Networks. *Competition and Change*, 4, pp.353-400.

Pham Truong Hoang, 2007. Effects of Supply Systems on Firms' Capabilities Building in New Emerging Economies: The Case of Vietnam's Motorcycle Industry. Unpublished PhD thesis. Graduate School of Environment and Information Sciences, Yokohama National University.

Pham Truong Hoang and Yoshikazu Shusa, 2006. Supplier-assembler Network Structure and Capability Improvement of Suppliers in Newly Emerging Vietnam's Motorcycle Industry. *Asian Journal of Technology Innovation*, 14(2), pp.143-165.

Piore, Michael J. and Charles F. Sabel, 1984. *The Second Industrial Divide: Possibilities for Prosperity*. New York: Basic Books.

Posthuma, Anne Caroline, 1995a. Japanese Techniques in Africa? Human Resources and Industrial Restructuring in Zimbabwe. *World Development*, 23(1), pp.103-116.

Posthuma, Anne Caroline, 1995b. Japanese Production Techniques in Brazilian Auto Component Firms: A best practice model or basis for adaptation? In: Tony Elger and Chris Smith eds. *Global Japanization? The transnational transformation of the labour process.* London and New York: Routledge, pp.348-377.

Powell, Walter W., 1990. Hybrid Organizational Arrangements: New Form or Transitional Development? *California Management Review*, 87, pp.67-87.

Richardson, James, 1993. Parallel sourcing and supplier performance in the Japanese automobile industry. *Strategic Management Journal*, 14(5), pp.339-350.

Sadler, David, 1994. The Geographies of Just-in-Time: Japanese Investment in the Automotive Components Industry in Western Europe. *Economic Geography*, 70(1), pp.41-59.

Sako, Mari, 1992. *Prices, Quality and Trust: Inter-firm Relations in Britain & Japan.* Cambridge and New York: Cambridge University Press.

Sato, Yuri, 2011. Local Firms' Capability Development in Captive Value Chains: Evidence from the Indonesian Motorcycle Industry. In: Momoko Kawakami and Timothy J. Sturgeon eds. *The Dynamics of Local Learning in Global Value Chains: Experiences from East Asia*. Basingstoke: Palgrave Macmillan, pp.100-135.

Sato, Yuri and Mai Fujita, 2009. Capability Matrix: A Framework for Analyzing Capabilities in Value Chains. Discussion Paper No. 219. Chiba: Institute of Developing Economies.

Schmitz, Hubert, 2004. Globalized localities: introduction. In: Hubert Schmitz ed. *Local Enterprises in the Global Economy: Issues of Governance and Upgrading*. Cheltenham and Northampton: Edward Elgar, pp.1-19.

Schmitz, Hubert, 2006. Learning and Earning in Global Garment and Footwear Chains. *The European Journal of Development Research*, 18(4), pp.546-571.

Smitka, Michael J., 1991. *Competitive Ties: Subcontracting in the Japanese Automotive Industry*. New York: Columbia University Press.

Sturgeon, Timothy J., 2001. How do we define value chains and production networks? *IDS Bulletin*, 32(3), pp.9-18.

Sturgeon, Timothy J., 2002. Modular production networks: a new American model of industrial organization. *Industrial and Corporate Change*, 11(3), pp.451-496.

Sturgeon, Timothy, 2007. How Globalization Drives Institutional Diversity: The Japanese Electronics Industry's Response to Value Chain Modularity. *Journal of East Asian Studies*, 7, pp.1-34.

Sturgeon, Timothy J., 2008. From Commodity Chains to Value Chains: Interdisciplinary Theory Building in an Age of Globalization. In: Jennifer Bair ed. *Frontiers of Commodity Chain Research*. Stanford: Stanford University Press, pp.110-135.

Sturgeon, Timothy J. and Ji-Ren Lee, 2005. Industry Co-Evolution: A Comparison of Taiwan and North American Electronics Contract Manufacturers. In: Suzanne Berger and Richard K. Lester eds. *Global Taiwan: Building Competitive Strategies in a New International Economy*. Armonk, New York and London, England: M.E. Sharpe, pp.33-75.

Sturgeon, Timothy, Johannes Van Biesebroeck and Gary Gereffi, 2008. Value chains, networks and clusters: reframing the global automotive industry. *Journal of Economic Geography*, 8, pp.297-321.

Sturgeon, Timothy and Johannes Van Biesebroeck, 2010. Effects of the Crisis on the Automotive Industry in Developing Countries: A Global Value Chain Perspective. Policy Research Working Paper No. 5330. Washington, DC: The World Bank.

Thee, Kian Wee, 1997. The Development of the Motorcycle Industry in Indonesia. In: Mari E. Pangestu and Yuri Sato eds. *Waves of Change in Indonesia's Manufacturing Industry*. Tokyo: Institute of Developing Economies, pp.95-135.

Toyo Keizai Inc., 2009. *Kaigai Shinshutsu Kigyo Soran 2009 (Complete Guide to Japanese Overseas Subsidiaries 2009)*. Tokyo: Toyo Keizai Inc. (in Japanese).

Tuma, Nancy Brandon and Michael T. Hannan, 1984. *Social Dynamics: Models and Methods.* New York: Academic Press.

Ulrich, Karl, 1995. The role of product architecture in the manufacturing firm. *Research Policy*, 24, pp.419-441.

Westney, D. Eleanor, 1999. Organization Theory Perspectives on the Cross-Border Transfer of Organizational Patterns. In: Jeffrey K. Liker, W. Mark Fruin and Paul S. Adler eds. *Remade in America: Transplanting and Transforming Japanese Management Systems*. New York and Oxford: Oxford University Press, pp.385-408.

Williamson, Oliver E., 1979. Transaction-cost Economics: The Governance of Contractual Relations. *Journal of Law and Economics*, 22(2), pp.233-261.

Womack, James P., Daniel T. Jones and Daniel Roos, 1990. *The Machine that Changed the World.* New York: Rawson Associates.

Yin, Robert K., 2003. *Case Study Research: Design and Methods*. Thousand Oaks: Sage Publications.

Appendix　List of Firms, Interviews, and Surveys

1. Interviews in Thailand

Firms	Code	Interview details
Honda R&D Southeast Asia	#1	President on 11 January 2010.

2. Interviews in Vietnam

(1) Honda Vietnam (HVN)

Code	Interview details
#1	General Director at the factory on 31 July 2001.
#2	Director of Production and Director of Administration/Chief Financial Officer on 21 September 2004 (includes factory visit).
#3	Director of Administration/Chief Financial Officer on 20 November 2007.
#4	Director and Senior Manager of Purchasing Department on 19 September 2008.
#5	Director, Senior Manager, and Manager of Purchasing Department on 7 March 2009.

(2) Vietnamese assemblers

Firms	Interviews		Surveys
	Code	Details	
A1	#1	Head of Administrative Department on 22 September 2004 (includes factory visit).	2004/ 2007
	#2	Head of Administrative Department on 1 August 2005 (includes factory visit).	
A2	#1	Former procurement manager (2002-2004) at a café in Tokyo on 24 February 2009.	–
	#2	Former procurement manager (2002-2004) at the Institute of Developing Economies, Chiba on 27 February 2009.	
A3	#1	Officer of Administrative Department on 23 November 2007 (includes factory visit).	2007
A4	#1	Vice General Director on 23 September 2004.	2004/ 2007
	#2	Vice General Director on 2 August 2005.	
	#3	Vice General Director and Factory Manager on 4 August 2005 (includes factor visit).	
	#4	General Director and Deputy Director on 22 November 2007.	
	#5	General Director on 4 March 2009.	
A5	–	(Requests for interviews were rejected in 2004 and 2007.)	2004/ 2007
A6	#1	General Director and Deputy General Director on 26 November 2007 (includes factory visit).	2007

(3) Vietnamese suppliers

Firm	Code	Interview details
V1	#1	Director of Planning Department on 17 October 2003.
	#2	Deputy Director on 3 September 2008.
	#3	Chairman; General Director; and Manager of Planning Department on 24 November 2008 (includes factory visit).
	#4	Chairman; General Director; Deputy General Director; Factory Manager; and five other managers on 3 March 2009 (includes factory visit).

V2	#1	President/General Director and Deputy manager of Personnel Department on 5 September 2008 (includes factory visit).
	#2	Director of Technical Department at the factory on 19 November 2008 (includes factory visit).
V3	#1	General Director on 17 September 2008 (includes factory visit).
	#2	Deputy Manager of Technical Department on 20 November 2008.
V4	#1	Vice General Director on 23 August 2002 (includes factory visit).
	#2	Vice General Director on 3 September 2008 (includes factory visit).
V5	#1	General Director on 16 October 2003 (includes factory visit).
	#2	General Director and Director of Technology Department on 9 March 2009 (includes factory visit).
V6	#1	General Director on 17 November 2009.
V7	#1	Director of Production and Director of Finance on 25 September 2004 (includes factory visit).
	#2:	General Director on 11 September 2008 (includes factory visit).
	#3	Two Vice General Directors on 11 March 2009 (includes factory visit).
	#4	General Director at VEAM’s office in Hanoi 13 January 2010.
V8	#1	General Director at the company's factory on 20 November 2008.
	#2	General Director at the company's factory on 5 March 2009 (includes factory visit).
V9	#1	Deputy General Director on 16 September 2008 (includes factory visit).
	#2	Manager of Engineering Department on 21 November 2008 (includes factory visit).
	#3	General Director at the VEAM’s office in Hanoi on 13 January 2010.
V10	#1	Managing Director on 28 July 2005 (includes factory visit).
	#2	President on 15 November 2008 (includes factory visit).
V11	#1	General Director and Director on 9 September 2008 (includes factory visit).
V12	#1	Manager of Finance and Deputy Manager of Sales on 12 March 2009 (includes factory visit).
V13	#1	Deputy General Director on 16 September 2008 (includes factory visit).
	#2	Managers of Technical Department, Equipment Department, Manager of Quality Control Department, and Technical Department No.2 on 21 November 2008 (includes factory visit).
V14	#1	Director and Manager of Technology Department at the company's factory in Ho Chi Minh City on 13 March 2009 (include factory visit).
V15	#1	General Director at the company's factory in Hanoi on 3 August 2005 (includes factory visit).
	#2	General Director at the company's factory in Hanoi on 5 September 2008 (includes factory visit).
V16	#1	General Director on 24 November 2008.
	#2	General Director on 5 March 2009 (includes factory visit).
V17	#1	General Director and Director of Sales Department on 12 September 2008 (includes factory visit).

	#2	General Director and Manager of Accounting Department on 22 November 2008 (includes factory visit).
V18	#1	Director on 4 September 2008 (include factory visit).
V19	#1	General Director on 2 August 2005 (includes factory visit).
	#2	General Director on 8 September 2008 (includes factory visit).
	#3	General Director on 10 March 2009.
V20	#1	General Director on 15 September 2008 (includes factory visit).
	#2	General Director on 10 March 2009.
V21	#1	General Director on 4 March 2009.
V22	#1	Managing Director and Factory Director on 14 March 2009 (includes factory visit).
V23	#1	Deputy Director on 25 September 2004 (includes factory visit).

(4) Japanese suppliers

Firms	Code	Interview details
J1	#1	General Director on 1 August 2005 (includes factory visit).
J2	#1	General Director on 23 August 2002 (includes factory visit).
	#2	General Director on 26 November 2007 (includes factory visit).
J3	#1	General Director on 20 September 2004 (includes factory visit).
	#2	General Director on 19 November 2007.
	#3	General Director on 18 September 2008 (includes factory visit).
J4	#1	General Director on 22 May 2003.
J5	#1	General Director and Factory Manager on 11 November 2003 (includes factory visit).
J6	#1	General Director on 20 November 2004 (includes factory visit).
	#2	General Director, Director and Manager of Purchasing Department on 20 November 2007 (includes factory visit).
J7	#1	General Director on 4 September 2002.
J8	#1	General Director on 27 July 2001 (includes factory visit).
J9	#1	General Director on 26 November 2007 (includes factory visit).
J10	#1	General Director on 17 September 2008 (includes factory visit).
J11	#1	General Director on 15 January 2010 (includes factory visit).

(5) Chinese suppliers

Firm	Interviews		Surveys
	Code	Details	
C1	#1	General Director on 23 November 2007 (includes factory visit).	–
	#2	Manager of Sales Department at a café in Hanoi on 2 March 2009.	
	#3	Manager of Sales Department at a café in Hanoi on 11 March 2009.	
C2	–	–	2004/2007
C3	–	–	2004/2007
C4	–	–	2004/2007

C5	–	–	2004

(6) Taiwanese suppliers

Firm	Code	Interview details
T1	#1	Japanese Technical Advisor on 26 July 2005 (includes factory visit).
	#2	Deputy General Director on 28 November 2007.
T2	#1	Sales and Import Assistant Manager on 27 November 2007.
T3	#1	General Director on 3 August 2005.
	#2	General Director on 6 March 2009 (includes factory visit).
T4	#1	Deputy General Director and Manager of Sales Department on 27 November 2007.
T5	#1	Deputy General Director on 29 July 2005.
T6	#1	Director of Finance Department on 10 September 2004 (includes factory visit).
T7	#1	Deputy General Director on 28 July 2005 (includes factory visit).

(7) Korean supplier

Firm	Code	Interview codes and details
K1	#1	Chief of Financial Department on 10 September 2004.
	#2	General Director on 29 November 2007.
	#3	General Director on 13 March 2009.

(8) Industry experts

Organisations	Code	Interview details
Vietnam Association of Bicycles and Motorcycles (Vinacycle)	#1	Specialist on 23 September 2004.
	#2	Chairman and Chief of Administrative Office on 21 November 2007.
	#3	Chief of Administrative Office on 15 January 2010.

(9) Motorcycle retailers

Organisations	Interviews
Hanoi	Several motorcycle retailers on Hue Street, Hanoi interviewed on 27 August 2002.
	Several motorcycle retailers on Hue Street, Hanoi interviewed on 13 January 2010.
Long An Province	Several motorcycle retailers in Tan An, Long An on 25 July 2005.
Ho Chi Minh City	Several motorcycle retailers in Ho Chi Minh City on 11-12 September 2004.

VIETNAM'S TRADE INTEGRATION WITH ASEAN+3: TRADE FLOW INDICATORS APPROACH

Paper presented at ICES 2015 International Conference
"Asian Economy at the Crossroad: China, India, and ASEAN"

Nguyen Anh Thu
Vu Thanh Huonng
Le Thi Thanh Xuân
VNU University of Economics and Business

***Abstract**: The paper analyzes trade between Vietnam and ASEAN+3 countries including trade structure, intra-ASEAN+3 trade and trade with the rest of the world in the period 2000-2014. Indicators of potential containing reveal comparative advantage(RCA) and trade complementary index are calculated to see potential goods and markets for Vietnam exports. In addition, the paper employs Grubel-Lloyd index of intra-industry trade (IIT) for total trade, each SITC product categories and some key export products. The result shows that trade integration in the framework of ASEAN+3 contributes to promote Vietnam-ASEAN+3 trade in both traditional and non-traditional commodities. IIT index of Vietnam's primary products is relatively high, which indicates that economies of scale in the production of primary goods have not been fully exploited. The result also reveals that there is an increase in IIT index of manufactured products of Vietnam. This reflects trade integration has promoted investment and shifted production network toward potential markets such as Vietnam.*

Key words: ASEAN+3, RCA index, TC index, IIT index, trade integration

1. Introduction

International economic integration has become an inevitable trend in the world. Economic integration brings about a great deal of benefits for countries such as promoting trade and investment. Hence, many countries have made great effort to negotiate and sign bilateral and multilateral Free Trade Agreements (FTA), especially regional FTAs. Cooperation between ASEAN and three Northeast Asian countries including Japan, Korea and China (ASEAN + 3) is considered as an efficient cooperation mechanism. Efficient economic integration contributes to promote trade among ASEAN + 3 countries. In particular, trade between Vietnam and ASEAN + 3 also increased by nearly 9.3 times during the period 2000-2014. In several studies, trade integration between Vietnam and ASEAN + 3, namely the ASEAN Free Trade Area (Vietnam signed in 1995), ASEAN- China FTA, ASEAN – Korea FTA, ASEAN – Japan CEP, Vietnam – Japan EPA (signed respectively in 2004, 2006, 2008 and 2009) has been assessed to affect Vietnam's trade (Urata and Okabe, 2013; Nguyen Anh Thu at el, 2015; Nguyen Anh Thu, 2011).

Vietnam - ASEAN +3 trade impact assessment studies basically adopted various methods such as trade indicators and regression models... However, analysis and evaluation of trade between Vietnam and ASEAN + 3 using intra-industry trade index (IIT) for each SITC code in the period 2000 to 2013 are limited. Therefore, this paper combines potential trade indicators including RCA, and TC with IIT calculation, contributing to analyze more clearly trade between Vietnam and ASEAN + 3, particularly intra-industry trade in the period 2000 -2014.

2. Overview of Vietnam and ASEAN+3 Trade

ASEAN + 3 is an attractive destination for Vietnam to promote trading activities. Favorable geography location and preferential treatments from Free Trade Agreements signed within ASEAN +3 have played an important role in boosting Vietnam's trade with ASEAN +3 countries. According to statistics from UN Comtrade, ASEAN + 3 accounted for more than 50% of total import and export of Vietnam during 2000-2014.

2.1. Vietnam - ASEAN +3 trade from 2000 to 2014

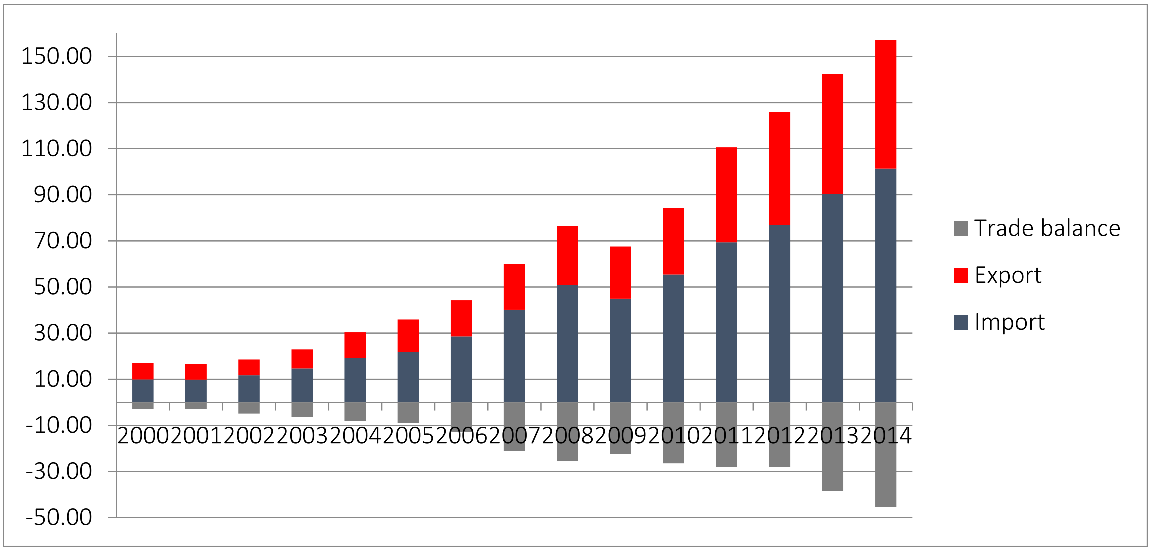


Figure 1. Vietnam – ASEAN +3 Trade from 2000 to 2014 (Unit: Billion US dollars)

Source: UN Comtrade and Vietnam General Department of Customs

Trade values between Vietnam and ASEAN +3 countries increased rapidly during the given period (Figure 1). In 2000, Vietnam and ASEAN + 3 trade was 16.99 billion US dollars and then increased by nearly 9.3 times to reach 157.3 billion US dollars in 2014.. However, in 2009, due to the world economic crisis, Vietnam- ASEAN +3 trade decreased by 11.74%. After that, thanks to positve signs of global economy recovery as well as commitment to cut down tariff and non-tariff barriers from FTAs in the region, Vietnam – ASEAN + 3 trade values continued to increase until now. In the recent years, Vietnam- ASEAN + 3 trade has annually increased by 10%-14%, and is likely to follow a downward trend. The trend to slow down trade growth rate in 2013 and 2014 has occured not only in Vietnam-ASEAN +3 trade but also Vietnam's total trade with the whole world. World economy and international trade activities have recently tended to grow but still at low rates (WTO, 2015). Continuous fluctuations in world petrol and oil price are the main reason considerably affecting world trade in general and ASEAN +3 trade in particular.

During the period of 2000-2014, Vietnam consistently had trade deficit with ASEAN +3. The level of trade deficit climbed rapidly over time. In 2000, trade deficit of Vietnam with ASEAN +3 was 2.82 billion US dollars but this figure amounted to 45.49 billion US dollars in 2014. The reason was that Vietnam mainly exports raw and low value added products such as electronic components, machinery components, equipment and parts, crude oil, rice, textile and fisheries,... to the ASEAN + 3. Besides, that ASEAN countries and Vietnam exported the similar labor-intensive products to ASEAN+3 such as rice and textiles also resulted in low export values of Vietnam. Meanwhile, Vietnam primarily imported high-value commodities such as petroleum, computers, electronic products, machinery, wood and input materials ... from ASEAN + 3.

2.2. Trade structure of Vietnam – ASEAN+3 by market

It is clearly seen that ASEAN + 3 countries are important partners of Vietnam, accounting for over 50% of Vietnam's trade in 2013 and 2014. In addition, Vietnam's trade with countries outside ASEAN + 3 increased by 1.17% as compared with 2013 (Statistics from UNComtrades).

In ASEAN + 3, Vietnam's trade with ASEAN countries accounted for the highest proportion from 2000 to 2009 (Figure 2). However, from 2010 up to now, China has outweighed ASEAN to become the largest trading partner of Vietnam in ASEAN + 3. By 2014, the proportion of Vietnam's trade with ASEAN, Vietnam, Korea, and Japan in Vietnam’s total trade values with ASEAN +3 decreased. By contrast, the proportion of Vietnam-China trade increased by 2.13% compared with 2013. The reason was that Vietnam-China trade increased significantly in 2014 (nearly 8.6 billion US dollars). However, trade between China and Vietnam increased mainly due to a rapid increase in Vietnam's imports from China. Hence, China was also the partner that Vietnam had the largest trade deficit in the ASEAN + 3. Regarding to exports, ASEAN and Japan were the largest partners of Vietnam in the region. While Vietnam had trade deficit with ASEAN trade, Vietnam consistently had trade surplus with Japan. In 2013 and 2014, the trade balance of Vietnam -Japan was nearly 2 billion US dollars in surplus.

Intra-ASEAN trade plays an important role in Vietnam's trade (Nguyen Hong Son et al, 2015). In ASEAN, Singapore, Thailand, Malaysia, and Indonesia are the main partners of Vietnam. In the years of 2000-2001, Singapore was the largest partner of Vietnam in ASEAN (over 50%). However, trade growth of Vietnam-Singapore then decreased. From 2010 to 2014, Thailand became the largest partner of Vietnam in ASEAN.

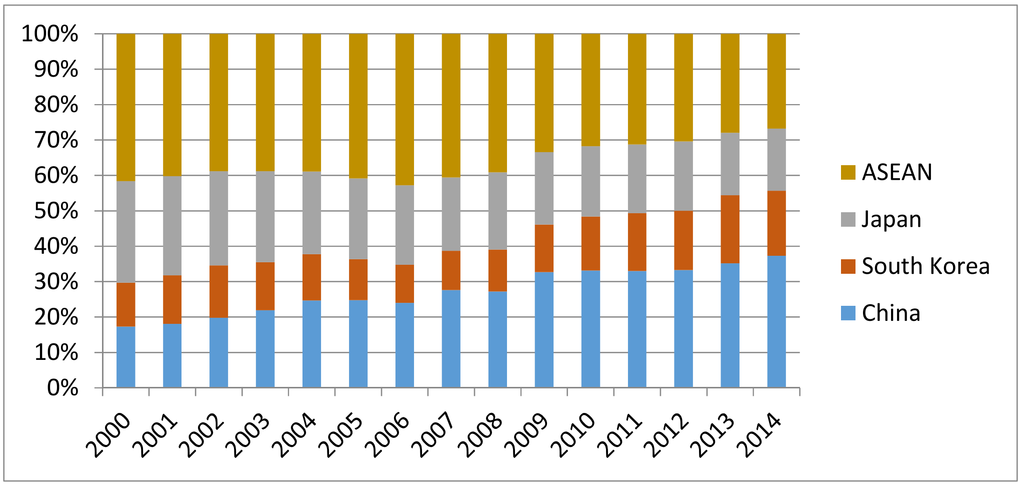


Figure **2: Structure of Vietnam's trade with ASEAN + 3**

Source: Authors' calculations based on data from UN Comtrade and Vietnam General Department of Customs

2.3. Trade structure of Vietnam - ASEAN + 3 by commodity

In terms of trade by commodity, trade between Vietnam-ASEAN + 3 is mainly in machinery and transport equipment (S7), accounting for 38.64% of Vietnam-ASEAN+3 trade in 2013. Next is the manufactured goods classified by material (S6), constituting 20.81% (Statistics from UNComtrades).

To be more specific, *the export structure* of Vietnam to ASEAN + 3 changed markedly over the period 2000-2013. Before 2006, raw and preliminarily processed products accounted for a high proportion of total exports of Vietnam to ASEAN + 3 (56%-60%). Since 2007, the proportion of preliminarily processed products decreased whereas the share of processed products increased rapidly, accounting for over 60% of Vietnam's exports to the ASEAN + 3. According to statistical data from UN Comtrade, agricultural products, textiles, fisheries, electronics, and crude oil are the main export products of Vietnam to ASEAN + 3. Table 1 below shows that the export values of these commodities increased significantly during the period 2000-2013. In particular, electronic products exported to ASEAN + 3 witnessed a rapid growth from 444.9 million USD in 2000 to 10433.8 million USD in 2013, an increase of 23.5 times. This is also the sector accounting for over 20% of Vietnam's exports to ASEAN + 3 in 2013. Exports of high-tech commodities to ASEAN + 3 also increased over time, making up of 17.78% of total export to ASEAN + 3 in 2013. Groups of traditional products such as agricultural products, textiles and fisheries have remained a key role in Vietnam's exports to ASEAN + 3 but tended to gradually decrease (Nguyen Anh Thu et al, 2014; Nguyen Hong Son et al, 2015). The shift is consistent with the trend of economic restructuring of Vietnam.

Regarding to imports, from 2000 to now, Vietnam's imports from the ASEAN + 3 have seen no major changes. Processed products are mainly imported items of Vietnam from the ASEAN + 3. Preliminarily processed products account for only a small share in the import structure due to

Vietnam's advantage of producing these products. Electronics are important import products of Vietnam. Imports of electronic goods of Vietnam from the ASEAN + 3 increased rapidly, from 861.5 million USD in 2001 to 27545.4 million USD in 2013 (nearly 32 times). Also, according to data from Vietnam's General Department of Customs, commodities such as petroleum, machinery, tools & parts, computers, etc. are the leading import items of Vietnam from the ASEAN + 3.

Table 1: Share of exports and imports of some commodities between Vietnam and ASEAN + 3

Unit: %

		2000	2003	2006	2009	2011	2012	2013
Export	*Agricultural products*	26.19	26.92	25.82	24.82	24.88	22.90	21.33
	Garments and Textiles	12.44	9.72	8.06	9.97	11.50	11.01	13.30
	Resources intensive products	6.88	9.16	9.95	10.99	12.63	11.58	10.85
	High-tech commodities	9.04	7.91	7.93	9.94	10.80	14.70	17.78
	Fisheries	12.23	11.43	8.21	6.22	5.02	4.56	4.65
	Electronic products	6.28	8.66	8.49	10.78	12.14	16.52	20.07
Import	*Agricultural products*	6.13	8.15	7.09	6.32	6.79	6.13	5.57
	Garments and Textiles	10.72	11.62	9.80	9.32	10.18	9.86	9.98
	Resources intensive products	25.47	23.78	26.57	20.01	19.51	17.07	13.21
	High-tech commodities	13.10	10.24	11.02	16.05	17.39	23.81	29.14
	Electronic products	10.91	9.73	9.73	14.20	17.53	25.32	30.47

Source: Authors' calculations based on data from UN Comtrade

3. Merchandise trade integration between Vietnam and ASEAN+3: Trade indicators approach

3.1 Revealed comparative advantage (RCA)

Following the International Trade Commission, revealed comparative advantage is measured by formula:

$$RCA = \frac{\frac{Xij}{Xit}}{\frac{Xwj}{Xwt}}$$

Where:

- X_{ij} and X_{wj} are export values of good j of country i and the world.
- X_{it} and X_{wt} are total export turnover of country i and the world.

If RCA is greater than 1, country i has comparative advantage in good j, otherwise country I does not have comparative advantage in good j..

Industries Vietnam has comparative advantage in

Some main export commodities of Vietnam to ASEAN + 3 such as agricultural products, textiles and fisheries are those that Vietnam has comparative advantages in (Table 2). However, RCAs of these traditional export commodities tend to decrease. It is because the proportion of these commodities in Vietnam's total exports decreased over the years. Indeed, competition in exporting of these goods is increasing. In addition, Vietnam is pushing up exports of non-traditional items such as electronics and furniture, which provide high-value exports.

Results also indicated that Vietnam, China and some ASEAN countries such as Thailand, Malaysia and Indonesia have comparative advantages in the exports of traditional commodities while these items are not advantage of Japan, South Korea, and Singapore. Therefore, trade integration will significantly and positively influence on Vietnam's exports of these commodities to Japan, South Korea, and Singapore. In fact, they are also main export partner of Vietnam in fisheries, textile and agriculture products.

Table 2: RCA in Vietnam's comparative advantage industries[1]

Industry	Country	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Agriculture products	**Vietnam**	2.81	2.71	2.88	3.00	2.88	2.79	2.49	2.62	2.53	2.43	1.82
	Singapore	0.25	0.25	0.24	0.24	0.25	0.26	0.25	0.25	0.27	0.27	0.28
	Thailand	2.08	2.09	1.98	2.13	2.01	2.14	1.95	2.04	2.36	2.03	2.01
	Indonesia	1.65	2.02	1.99	2.22	2.49	2.83	2.24	2.55	2.65	2.65	2.66
	Malaysia	1.22	1.23	1.17	1.24	1.44	1.67	1.41	1.63	1.88	1.66	1.64
	Japan	0.11	0.11	0.12	0.13	0.13	0.13	0.14	0.14	0.14	0.14	0.16
	China	0.55	0.47	0.45	0.42	0.38	0.35	0.35	0.36	0.36	0.34	0.33
	Korea	0.02	0.22	0.22	0.21	0.21	0.21	0.21	0.22	0.24	0.24	0.22
Garments and Textiles	**Vietnam**	3.40	3.46	3.34	3.59	3.97	4.02	4.07	4.31	4.04	3.85	3.77
	Singapore	0.26	0.23	0.21	0.19	0.19	0.17	0.16	0.14	0.13	0.13	0.15
	Thailand	1.18	1.26	1.29	1.23	1.19	1.17	1.17	1.18	1.14	1.23	1.5
	Indonesia	2	1.99	2	1.94	1.91	1.7	1.59	1.59	1.48	1.55	1.67
	Malaysia	0.43	0.46	0.5	0.5	0.49	0.5	0.51	0.51	0.55	0.51	0.52
	Japan	0.29	0.29	0.28	0.28	0.27	0.28	0.29	0.27	0.29	0.30	0.29
	China	3.15	3.03	3.05	3.20	3.12	3.19	3.07	3.04	3.04	3.01	2.95
	Korea	1.37	1.13	0.99	0.87	0.80	0.77	0.70	0.68	0.66	0.68	0.65
Fisheries	**Vietnam**	13.75	12.51	12.14	12.66	12.41	12.22	10.27	10.19	9.36	6.39	6.94
	Singapore	0.29	0.29	0.25	0.21	0.19	0.20	0.16	0.15	0.14	0.12	0.11
	Thailand	6.80	5.89	5.80	6.02	5.82	6.28	5.68	5.13	5.11	5.01	4.16
	Indonesia	N/A	N/A	N/A	N/A	N/A	N/A	N/A	2.33	2.26	2.70	2.89
	Malaysia	0.56	0.63	0.63	0.59	0.66	0.66	0.56	0.58	0.56	0.51	0.46
	Japan	0.27	0.26	0.30	0.33	0.37	0.35	0.38	0.36	0.32	0.32	0.38
	China	1.68	1.58	1.42	1.40	1.21	1.21	1.19	1.20	1.29	1.26	1.21
	Korea	0.71	0.62	0.52	0.43	0.46	0.51	0.51	0.48	0.52	0.51	0.43

Source: Authors' calculations based on data from UN Comrade

[1] Countries in bold have comparative advantage (RCA>1)

Industries Vietnam does not have comparative advantage in

Table 3 illustrates RCA of industries in which Vietnam does not have comparative advantage, including electronics, steel, machinery & transport equipment that are all high-value commodities. RCA of these items are low but have increased over the years, which shows a positive signal in the process of restructuring production and export of these commodities in Vietnam. In addition, RCA of electronics is larger than 1 from 2011. This is consistent with the fact that electronics exports have increased rapidly over time, becoming one of the major export products of Vietnam in recent years.

Table 3: RCA of industries Vietnam does not have comparative advantage in

Industry	Country	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Electronics	Vietnam	N/A	0.39	0.38	0.41	0.56	0.53	0.63	0.83	**1.22**	**1.76**	**2.14**
	Singapore	3.16	3.06	2.98	3.06	3.03	2.92	2.80	2.83	2.68	2.60	2.64
	Thailand	1.79	1.65	1.49	1.41	1.39	1.31	1.25	1.24	1.22	1.14	1.13
	Indonesia	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.55	0.50	0.51	0.50
	Malaysia	2.44	2.74	2.70	2.47	2.45	2.33	2.44	2.35	2.48	2.35	2.32
	Japan	1.85	1.71	1.63	1.57	1.57	1.60	1.58	1.43	1.44	1.42	1.32
	China	1.70	1.71	1.80	1.86	1.93	2.06	2.08	2.02	2.12	2.12	2.21
	Korea	2.38	2.26	2.25	2.09	2.05	2.03	2.04	1.97	1.94	1.94	2.11
Steel	Vietnam	0.16	0.21	0.23	0.24	0.29	0.80	0.34	0.62	0.74	0.72	0.83
	Singapore	0.24	0.24	0.27	0.28	0.30	0.32	0.36	0.27	0.27	0.30	0.31
	Thailand	0.50	0.51	0.46	0.43	0.68	0.42	0.36	0.34	0.28	0.48	0.43
	Indonesia	0.31	0.35	0.33	0.49	0.38	0.41	0.40	0.37	0.34	0.31	0.33
	Malaysia	0.45	0.48	0.40	0.48	0.47	0.40	0.57	0.44	0.47	0.48	0.39
	Japan	1.48	1.32	1.42	1.41	1.31	1.45	1.92	1.83	1.81	1.88	2.05
	China	0.43	0.75	0.78	1.02	1.15	1.27	0.71	0.84	0.94	0.90	0.94
	Korea	1.57	1.47	1.55	1.48	1.38	1.52	1.72	1.76	1.84	1.90	1.80
Machinery, transport equipment	Vietnam	0.21	0.24	0.24	0.27	0.30	0.33	0.36	0.44	0.57	0.78	0.68
	Singapore	1.49	1.49	1.48	1.50	1.44	1.43	1.44	1.43	1.35	1.31	1.34
	Thailand	1.06	1.09	1.13	1.17	1.18	1.19	1.13	1.18	1.11	1.17	1.21
	Indonesia	0.39	0.39	0.39	0.37	0.35	0.36	0.38	0.35	0.32	0.35	0.35
	Malaysia	1.38	1.34	1.37	1.37	1.28	1.22	1.29	1.23	1.14	1.10	1.10
	Japan	1.62	1.61	1.62	1.66	1.66	1.75	1.61	1.66	1.72	1.73	1.68
	China	1.04	1.11	1.17	1.23	1.24	1.33	1.37	1.38	1.40	1.36	1.36
	Korea	1.52	1.55	1.54	1.54	1.53	1.56	1.58	1.58	1.59	1.52	1.58

Source: Authors' calculations based on data from UN Comtrade and WTO

3.2 The trade complementary index (TC)

Index: $TC_{kj} = 100 - \sum abs(m_{ik} - x_{ij})/2$

Where: m_{ik} is the proportion (%) of goods i in total imports of country k

x_{ij} is the proportion (%) of goods i in total exports of country j

TC shows intra-regional trade perspectives by pointing out the complementary in the export structure of a country with imports of another country. There is a need to calculate this index for potential FTAs, compare this with that of other FTAs and their efficiency. If the result is 0, no goods exported by a country yet to be imported by its partner country and the value of 100 means the exports and imports of two partners complement each other. The higher value is, the better FTA will be.

The results show that Vietnam's export structure is largely complementary with import structure of Japan, Malaysia, Philippines, Singapore, South Korea and lowest complementary with those of Cambodia and China. The opposite direction shows that the exports of Singapore, Malaysia, Korea, Japan, and the Philippines are largest complementary with the imports of Vietnam. Thus, in terms of trade in both directions, in ASEAN, the export and import structure of Vietnam and Singapore, Malaysia, the Philippines has a high degree of complementary. Besides ASEAN, Japan and South Korea have large degree of complementary to the import and export activities of Vietnam because Vietnam has an advantage in exporting agricultural products, textiles, and fisheries while Japan and South Korea have the advantages in exporting manufactured and high-tech items. Thus, trade integration will create favorable conditions for Vietnam to strongly enhance trade with these countries. A comparison of TC index between Vietnam and Japan, South Korea, China and ASEAN in 2013 with those in 2007 and 2008 calculated by MUTRAP III (2013) shows the TC index increased over the years. This is consistent with the actual increase in importing and exporting from Vietnam to ASEAN + 3 partners.

Table 4. Trade Complementary index between Vietnam and ASEAN + 3 in 2013

Unit: %

	Partners										
	Brunei	Cambodia	Indonesia	Malaysia	Philippines	Singapore	Thailand	ASEAN	Japan	Korea	China
Vietnam: Exporter	51.43	38.5	48.72	58.19	56.23	53.07	52.91	50.12	59.15	51.14	42.35
Vietnam: Importer	14.75	8.84	42.87	66.31	54.46	65.67	60.54	55.33	56.72	57.83	45.37

Source: Authors' calculations based on data from UN Comtrade

3.3. Intra-industry trade index (IIT)

The intra-industry trade index (IIT), also known as Grubel-Lloyd index, was used by Grubel and Lloyd (1975) to calculate the structure of intra-industry trade in total trade value and defined by the formula:

$$\mathbf{IIT_i = 1 - \frac{|X_i - M_i|}{(X_i + M_i)}}$$

Where: IIT_i is intra-industry trade index for group of products i

Xi is the total export values of group of products i

Mi is the total import value of group of products i

Similarly, the total IIT index for total trade for each economy and region is calculated by the formula

$$\mathbf{AIIT_j = 1 - \frac{\sum_{i=1}^{n}|X_i - M_i|}{\sum_{i=1}^{n}(X_i + M_i)}}$$

Where AIITj is intra-industry trade index of country j

The value of IIT index is from 0 to 1. The closer to 1 IIT is, the higher intra-industry trade level is, while the closer to 0 IIT shows the higher level of inter-industry trade.

Intra-industry trade takes an important role, accounting for a quarter of world trade (Koçyiğit & Şen 2007). The results in Table 5 also showed that intra-industry trade achieves the high proportion in total trade between Vietnam and the ASEAN + 3 with AIIT index over 0.53 throughout the period. AIIT index showed intra-industry trade between Vietnam and ASEAN + 3 increased sharply from 2006 to now, the period when Vietnam has signed a great deal of regional FTAs. By sector, IIT index in raw and semi-processed commodities were generally higher than that in processed (or refined) items, reflecting the economies of scale in the production of these commodities hasn't been fully exploited yet (Dao Ngoc Tien, 2012). In detail, the IIT index of crude materials, inedible, except fuels (S2) was 0.953 in 2000 and 0.788 in 2013. The IIT index of beverages and tobacco (S1) was 0.978 in 2006 and fell to 0.528 in 2013. More than 96% of trade in mineral fuels, lubricants and related materials (S3) was intra-industry trade, reflecting export and import activities in this commodity were almost equal. The reason is that Vietnam has the potential to export raw materials and crude oil but doesn't have advantages in refined items. Therefore, Vietnam should invest in developing high technologies and constructing refining factories for raw materials to serve production and export activities. Intra-industry trade of beverage and tobacco products (S1) tended to decrease because Vietnam gradually masters in production and export and thus decrease to import these items. This is also a group of commodity with high import duties and many of them are on the list of sensitive products in the regional FTAs that Vietnam has signed, leading to declined in imports over the years.

Table 5: Intra-industry trade index between Vietnam and ASEAN+3

Year	AIIT index	IIT index according to industry classification code SITC									
		S0	**S1**	**S2**	**S3**	**S4**	**S5**	**S6**	**S7**	**S8**	**S9**
2000	0.538	0.250	0.198	0.953	0.839	0.545	0.101	0.292	0.467	0.727	0.949
2001	0.538	0.240	0.548	0.924	0.874	0.225	0.162	0.319	0.462	0.766	0.675
2002	0.531	0.364	0.613	0.895	0.921	0.118	0.169	0.269	0.402	0.831	0.663
2003	0.549	0.451	0.906	0.868	0.916	0.120	0.196	0.274	0.436	0.882	0.714
2004	0.563	0.433	0.940	0.845	0.872	0.090	0.177	0.281	0.510	0.917	0.823
2005	0.574	0.431	0.959	0.986	0.873	0.134	0.203	0.273	0.505	0.857	0.926

2006	0.588	0.466	0.978	0.888	0.974	0.118	0.238	0.284	0.506	0.875	0.309
2007	0.548	0.504	0.969	0.863	0.948	0.183	0.222	0.282	0.427	0.927	0.991
2008	0.567	0.475	0.895	0.880	0.913	0.259	0.262	0.374	0.422	0.905	0.858
2009	0.553	0.502	0.959	0.906	0.993	0.284	0.274	0.378	0.388	0.858	0.861
2010	0.568	0.543	0.849	0.801	0.927	0.249	0.320	0.453	0.466	0.859	0.827
2011	0.590	0.468	0.692	0.773	0.973	0.344	0.377	0.480	0.488	0.732	0.762
2012	0.614	0.461	0.568	0.802	0.976	0.563	0.472	0.516	0.552	0.695	0.984
2013	0.598	0.508	0.528	0.788	0.968	0.533	0.433	0.495	0.523	0.684	0.135

Source: Authors' calculations based on data from UN Comtrade

In the period 2000-2013, the IIT index of processed items is lower than the IIT index of primary items. In 2000, the IIT indices of chemicals and related products (S5), manufactured goods classified by materials (S6), machinery, vehicles and spare parts (S7) are low because of high imported value. Over the years, the IIT indices of these items increased gradually since the import and export of processed items between Vietnam and ASEAN + 3 increased significantly, while the import turnover of Vietnam exceeded the export turnover throughout the period. In fact, Vietnam doesn't have comparative advantage in producing machinery products and means of transport, thus it imports large value of these items. However, over the years, countries having comparative advantages in producing high-tech products, such as Japan, South Korea tends to expand production network, shift to ASEAN countries including Vietnam to take advantage of costs of production and preferential commitments in the FTA. At the same time, Vietnam also boost FDI inflows for domestic production. Therefore, the export of these items from Vietnam increased, though it is still significantly lower than the import of these items, which leads to increase IIT index.

In detail, analysis of intra-industry trade index between Vietnam and ASEAN, Japan, Korea, China through Table 6 shows a significant difference compared to the IIT index in Vietnam and ASEAN + 3. With ASEAN and Japan, the IIT index of Vietnam in S3 is very low, respectively 0.01 in 2000 and 0.08 in 2013, in contrast with the high IIT index of S3 in Vietnam - ASEAN +3 and Vietnam - China, Vietnam - Korea trade. This shows that the export and import of fuel, lubricants between Vietnam, South Korea and China are fairly balanced. With the processed items such as machinery, transport equipment (S7), the IIT index between Vietnam and other ASEAN countries is high, which is the opposites of the IIT index between Vietnam and Japan, South Korea, China. Because the three Northeast Asian countries have the comparative advantage in manufacturing high – tech machinery products so Vietnam imports large products from these countries. However, the IIT index of S7 between Vietnam and Japan, Korean, China is ascending. Specifically 80% of trade between Vietnam and these countries in S7 items in 2013 is intra-industry trade. This reflects the investment in producing machinery and equipment, high-tech products in Vietnam has been increasing efficiently.

Table 6: The IIT index between Vietnam and ASEAN, Japan, South Korea, China

		S0	S1	S2	S3	S4	S5	S6	S7	S8	S9
ASEAN	2000	0.43	0.13	0.58	0.01	0.09	0.07	0.37	0.75	0.99	0.44
	2013	0.90	0.51	0.66	0.08	0.35	0.35	0.82	0.99	0.94	0.25
Japan	2000	0.06	0.62	0.88	0.07	0.11	0.18	0.47	0.39	0.41	0.94
	2013	0.11	0.11	0.89	0.06	0.17	0.63	0.49	0.80	0.37	0.28
Korea	2000	0.25	N/A	0.45	0.04	N/A	0.04	0.14	0.14	0.71	0.70
	2013	0.29	0.71	0.95	0.88	0.14	0.11	0.29	0.22	0.63	0.00
China	2000	0.25	0.10	0.37	0.28	0.03	0.20	0.14	0.03	0.24	0.96
	2013	0.30	0.58	0.35	0.79	0.18	0.44	0.23	0.30	0.66	0.00

Source: Authors' calculations based on data from UN Comtrade

Table 7 shows intra-industry trade index of some major export items of Vietnam including agricultural products, textiles and electronics. The results shows that over 90% of trade in agricultural products, textiles between Vietnam and ASEAN are intra - industry trade, since Vietnam and ASEAN countries have similar comparative advantages of these items. The IIT index in agricultural products between Vietnam-Japan is lowest. With textiles, the IIT index between Vietnam and Japan, China is lowest. The reason for that is Japan is one of the partners leading textile imports from Vietnam while Vietnam imports large volume of textiles from China, not only materials but also textile and garments.

Table 7: The ITT index in some commodities between Vietnam and ASEAN+3

Country	Year	Agricultural products	Textiles	Electronics
ASEAN	2000	0.86	0.84	0.77
	2013	0.94	0.95	0.94
Japan	2000	0.11	0.64	0.51
	2013	0.24	0.46	0.99
Korea	2000	0.70	0.31	0.46
	2013	0.61	0.95	0.18
China	2000	0.27	0.23	0.12
	2013	0.29	0.41	0.33
ASEAN+3	2000	0.49	0.91	0.58
	2013	0.62	0.87	0.55

Source: Authors' calculations based on data from UN Comtrade

4. Conclusion:

Following the trend of regional economic integration , every country tries to promote its comparative advantages, utilizing opportunities of incentives from the process of economic integration. Vietnam and ASEAN + 3 are also not exceptions. Trade between Vietnam and ASEAN + 3 increased rapidly during the period 2000 - 2013. However, Vietnam witnessed trade deficit with ASEAN + 3 throughout the period. Because Vietnam mainly imported high-value added items such as machinery, equipment and exported primary products, raw materials that Vietnam has comparative advantage. The proportion of export in processed products to ASEAN + 3 has increased, which reflects Vietnam focus on investing in production of these commodities. The traditional export items that Vietnam has comparative advantage like textiles, fisheries, agricultural products, mainly exported to the supplementary trade partners such as Japan, South Korea. The process of trade integration and also the implementation of commitments under the ASEAN + 3 FTAs boost intra-regional trade of Vietnam in both traditional commodities and non-traditional.

The results of the analysis of intra-industry trade (IIT) index showed that intra-industry trade between Vietnam and ASEAN + 3 increased between 2000 and 2013. In general, the index of IIT's primary sectors of Vietnam is relatively high, reflecting the economies of scale in the production of these items have not been fully exploited. Vietnam still has to import a large volumes of fuel, raw materials. Calculation results also illustrated that the IIT index of processed goods between Vietnam-ASEAN + 3 tends to increase. Specially, IIT index of machineries, equipment of Vietnam-Japan reached 0.8 in 2013. It reflects trade integration has boosted investment in production, expanding the production network and the production scale of developed economics in the region to potential markets such as Vietnam.

Preferences

1. Dao Ngoc Tien (2012). Evaluating export activities of Vietnam after joining WTO. *Journal of Foreign Economics*, No. 54/2012.
2. Grubel, H.G. and P.J. Lloyd (1975). *Intra-Industry Trade: The theory and Measurement of International Trade with Differentiated Products*. Macmillan, London.
3. Koçyiğit, A., & Şen, A. (2007). The extent of intra-industry trade between Turkey and the European Union: the impact of Customs Union. *Journal of Economic and Social Research*, *9*(2), 61-84.
4. MUTRAP III (2013). Impacts Assessment of Free Trade Agreements on Vietnam's Economy. *FTA HOR Final Report, Vietnam – EU MUTRAP III*.
5. Nguyen Anh Thu (2012). Assessing the Impact of Vietnam's Integration under AFTA and VJEPA on Vietnam's Trade Flows, Gravity Model Approach. *Yokohama Journal of Social Science*, 17(2), 137-148.

6. Nguyen Hong Son, Nguyen Anh Thu, Vu Thanh Huong and Nguyen Thi Minh Phuong (2015). The integration of Vietnam in AEC: Opportunities and challenges for development. *Journal of Economics and Developments.* No. 212, p. 13-24.
7. Nguyen Anh Thu, Vu Van Trung and Le Thi Thanh Xuan (2015). Assessing the Impact of ASEAN+3 Free Trade Agreements on ASEAN's Trade Flows: A Gravity Model Approach. *Mediterranean Journal of Social Sciences*. Vole. 6, no. 6, pp. 394-401.
8. Nguyen Anh Thu, Vu Van Trung and Le Thi Thanh Xuan (2014). Impacts of ASEAN+3 trade integration on Vietnam's trade flows in fishery sector. In *proceedings of International Conference on Emerging Challenges: Innovation Management for SMEs* (ICECH 2014) Hanoi, Vietnam.
9. WTO (2015). *Annual Report 2015*. World Trade Organization.
10. Urata, S., & Okabe, M. (2013). *The Impact of AFTA on Intra-AFTA Trade* (No. DP-2013-05).

Growth Performance of ICT in India under Trade Liberalization and Integration with ASEAN

K J Joseph and Kiran Kumar Kakarlapudi

1. Introduction

Advances in Information Communication Technology (ICT) could be considered as the foremost contribution by the previous century to the current century and beyond. The revolutionary changes in the ICT, hardware and software, have made profound influence in all the spheres of human activity. While the genesis of such revolutionary changes could be traced to the technological changes in microelectronics, it has been sustained by the developments in software. Thus viewed the cumulative effect has been emergence of ICT as the General Purpose Technology (GPT) of the new millennium that is instrumental in enhancing efficiency, competitiveness and growth in all sectors of the economy regardless of their stage of development. If the available evidence is any indication, there is hardly any developing country that has not recognized the potential of ICT and not undertaken institutional interventions to develop ICT capabilities as a short cut to prosperity.

Being a general-purpose technology, it has been argued that effective harnessing of this technology for development calls for building capabilities in the production and use of both hardware and software (Ernst 2002). Studies have also shown that a lop sided approach in terms of promoting ICT use with the neglect of ICT production capabilities has the potential danger of perpetuating technological dependence (Mytelka and Ohiorhenuan 2000) on the one hand and forgoing opportunities for income and employment generation on the other. This is especially relevant in case of large economies like India. It is worth reminiscing that the green revolution, which has been an indisputable success story so far as agricultural productivity and economic growth in the developing world are concerned, would not have been possible had the strategy been simply one of passive adoption of western technologies. Hence a strategy towards ICT, as a general-purpose technology, needs to be one wherein there is a concomitant focus on production and use of both hardware and software. The often-advocated strategy for harnessing ICT for development has been an open trade and investment regime.

India is one among the developing countries that systematically undertaken institutional interventions aimed at developing a vibrant ICT sector. It is also worth noting that India's success in ICT software has attracted the world attention mainly on account of her remarkable performance in the export of software services, which has been inspirational for other developing countries. However, the key issue is how India has fared in terms of the production and use of hardware and software – an issue of paramount importance while considering ICT as a general-purpose technology. Much has been written about the growth performance of the software sector (Arora et al 2001, Joseph 2002; 2009; Kumar and Joseph 2007; D' Costa 2003). But our understanding on the performance of ICT hardware (read as electronics) and the bearing of trade liberalization in general and integration with ASEAN and Asia in particular on the observed performance is at best modest. This article is an attempt at filing this gap in our understanding of ICT as a general-purpose technology.

The remainder of the paper is organized as follows. The second section presents an analytical framework for approaching the issue at hand. Third section presents an analysis of the growth performance of ICT sector with focus on electronics. Section four analyses the implications of trade liberalization in general and integration with ASEAN in particular on the observed trend in electronics followed by the last section wherein the concluding observations are presented

2. Analytical Framework

Given the generality of purpose and innovational complementarities, ICT qualifies itself as yet another GPT[1]. Comparing ICT with earlier GPTs, David (1990, 1991) found remarkable parallels in terms of their contribution towards augmenting economic growth and human welfare. In general, it has been argued that ICTs are key inputs for competitiveness, economic growth and development. Further, it offers opportunity for global integration, increasing economic and social well-being of the poor and enhances the effectiveness, efficiency and transparency of the public sector, including the delivery of public services (World Bank, 2002). Thus viewed, there is hardly any field of human activity wherein ICT could not have its profound influence *inter alia* by revolutionizing the process of information exchange and thereby reducing the transaction cost (Joseph 2007). The contribution of a general-purpose technology like ICT towards development could be understood in terms of its *production - both ICT goods and ICT hardware and software- and its use.* While the former refers to ICT diffusion induced development through enhanced productivity, competitiveness, growth and human welfare the latter is on account of its contribution in output, employment, export earnings from the production of ICT related goods and services (Kraemer and Dedrick 2001).

Production of ICT Goods and services

Studies have shown that ICT production significantly contributes to output growth value addition, employment and productivity growth in developed countries like US and Japan (US Department of Commerce 2000; Bryjolfsson and Adam Saunders 2010; Ezel 2012).

[1]For a detailed discussion on General Purpose Technology, see Bresnahan and Trajtenberg (1995) who coined this term.

However, it has been argued that production of IT goods need not necessarily be an easy proposition for the developing countries because industrial structure of IT goods is highly concentrated with high entry barriers. Industry segments like microprocessors are almost closed because standards are set by the leading US based IT players like Intel. Most of the segments of IT industry are highly capital intensive and scale intensive and require specialized skills that only a few countries can hope to achieve (Kraemer and Dedrick 2001). Moreover, early entrants such as Singapore, Hong Kong, South Korea, Taiwan, Ireland and Israel have preempted many of these opportunities to a great extent.

While there is some merit in the above argument, a closer look at the characteristics of ICT industry would reveal that the doors are not that firmly closed for the new comers. ICT industry is a multi-product industry and the products may be broadly divided into two categories; ICT goods and ICT services[2]. In each of these broad categories there are a large number of products that vary in terms of technological intensity, dynamism, investment and skill requirements (Joseph 1997). This has made possible the segmentation of the industry into separate, yet closely interacting horizontal layers with greater opportunities for outsourcing and thus transforming a vertically integrated industry into horizontally disintegrated but closely interacting market segments. Moreover, as argued by Ernst (2002) under global production network that characterize IT goods production toady, geographical dispersion becomes more concentrated in case of high precision design intensive goods where as in case of lower end products there is high regional dispersion. Therefore, it is possible that the new comers in developing world could enter profitably into some of these product lines depending on their technological capability, human capital availability and the ability to mobilize capital.

Going by the past evidence, production of ICT goods has been a major source of economic output, exports and job creation in countries like South Korea and Singapore during their early stage of development and in todays developing countries like Thailand, Malaysia and more recently in China. This has been facilitated by their participation in global production network of IT goods, which has a longer history.

When it comes to IT services, economists have long since noted that the services in general are cheaper in developing countries as compared to the developed countries[3]. Yet, these countries have been unable to take benefit of this advantage mainly because the export of most of the services called for the cross border movement of labour. But the movement of labour, unlike capital, was subjected

[2] See Joseph (1997) for a detailed analysis of the product structure of electronics industry and the implication of product structure for the growth performance.

[3]This has been attributed mainly to the fact that labour is the major input in the production of services and the abundant supply of labour in less developed countries translate into low wages. Since the technology of producing services does not differ significantly across counties, lower wages results in low cost of production of services in less developed countries (Bhagwati 1984).

to series of restrictions. Though the process of globalization, which *inter alia* implied the free movement of products and factors, achieved momentum during the last two decades, there have been hardly any relaxations in the restrictions on labour mobility. However, the advances in ICT has made possible, to a great extent, the "splintering off" of many of the services from its providers which in turn led to what is often called global division of labour and the outsourcing of services. No wonder, as noted by number studies (Schware 1987, 1992; Arora, et. Al 2001; D'Costa 2003; Joseph 2002; Kumar and Joseph 2007, 2005) India, with its large pool of skilled manpower along with supporting policy environment and proactive private sector, has emerged as a preferred location in the international division of labor in knowledge intensive industries as well as in Business Process Outsourcing (BPO) and a leading player in the export of software services. India is not the only country being benefited from opportunities offered by BPOs. Countries like China, Philippines and others are also emerging as providers of BPO services to the developed countries.

ICT Use

While there were apprehensions about the return to productivity enhancement on account of ICT use, the evidence from the recent cross-country studies shows that the returns to investments in ICT in terms of productivity and growth are substantial[4]. Pohjola (2001) found the output elasticity of ICT capital as high as 0.31 for the full sample of 39 countries and 0.23 in the OECD sub sample. Country specific studies like the one for Singapore (Wong 2001) finds that the net return to ICT capital (37.9 per cent) is about two and a half times higher than that for non-ICT capital (14.6 per cent). These studies also show that that ICT induced productivity and growth still remains a phenomenon of developed OECD countries and that the developing countries are yet to catch up. Yet, there are also numerous cases to show that developing countries could benefit from increased access to ICT as much as their counterparts in the developed world to address various development issues like empowering people, improving social service provision and poverty alleviation.

In the literature on IT and development, however, the focus of attention has been essentially on IT use and only limited attempts have been made towards integrating the policy towards electronics production and diffusion of IT. As argued by Mytelka and Ohiorhenuan (2000) the often suggested strategies place the developing countries in a situation of perpetual *attente* – waiting for the transfers of technology from the North and focusing their attention on the need to attract transnational corporations to their shore. The studies on technology diffusion, however, have shown that along with demand side factors, supply side factors are also important determinants of diffusion. Hence, greater domestic availability of electronics goods acts as a catalyst in the process of diffusion. To the extent

[4] For a review of studies the readers are referred to Indjikian and Siegel (2005).

that the present levels of income are important determinants of IT use, there is no reason why the developing countries should forgo the income earning opportunities offered by the production of electronics goods which could also be instrumental in their industrial transformation. If the available empirical evidence on technological capability in the developing world is any indication, the lopsided approach in terms of promoting ICT use while neglecting ICT production capabilities, has the potential danger of perpetuating technological dependence on the one hand and foregoing opportunities for income and employment generation on the other (UNCTAD 2012; Joseph and Parayil 2008).

ICT production and use: the prerequisites

The key issue of relevance here pertains to the factors that help developing countries to leapfrog in the field of information technology by promoting its production and use?

Trade, Investment and innovation system

The virtues of trade liberalization through the removal of tariff and non-tariff barriers have been well articulated in the literature (Dornbusch 1992, Kruger 1997, Srinivasan and Bhagwati 1999). Grossman and Helpman (1991) argues that that national productivity depends in part on a country's stock of knowledge capital, which could be accumulated in two ways: through local research and development and through learning from international exchanges. The authors hypothesize that knowledge spillover effects are neither automatic nor instantaneous, but rather correlated to the number of contacts with the international research and business communities. Because interactions are supposed to intensify with increased trade, it follows that the benefits from international knowledge spillover increase with trade openness of an economy.

Coe and Helpman (1995) argued that the creation of new knowledge through innovation and the stock of knowledge are linked through a continuous feedback loop, where the existing knowledge nurtures innovation, which in turn increases the stock of knowledge. In their model cumulative R&D expenditures serve as a proxy for the stock of knowledge. Based on the data from OECD countries, they highlighted the importance of foreign R&D expenditures for domestic productivity. Thus viewed, TFP performance of country depends not only on its own R&D capital stock, but also on the R&D capital stocks of its primary trading partners. For smaller countries, foreign R&D capital stocks prove to be even more important in determining TFP than domestic R&D capital stocks. The effects of foreign R&D capital stocks are greater the larger is the share of domestic imports to GDP.

In case of a developing country the following generalizations may be in order. The decline in domestic prices is likely to make the goods and services more affordable and therefore could act as a catalyst in the process of diffusion/use of ICT into other sectors of the economy. The resultant higher output growth could lead to higher income and employment generation in the domestic economy as a whole. Second effect refers to the impact on domestic ICT producing sector on account of increased competition and greater access to needed inputs for production that in turn underscore the link between trade and investment. Trade induced competition, apart from inducing firms to cut cost of production, leads to the exit of inefficient firms and the absorption of their market share by more efficient ones leading to economies of scale and industry level efficiency. Thirdly, trade could lead to enhanced domestic productivity through the knowledge spillovers. Finally liberalized trade regime, could act as a catalyst for investment.

The link between trade and investment, however, is conditioned by the product characteristics and organization of production. This link is likely to be stronger in assembly-oriented industries as compared to process industries. In an assembly-oriented industry like ICT goods, production essentially involves assembling a number of components and sub-assemblies based on a design. The production of needed components and subassemblies may be highly skill, capital and/or scale intensive that no country could afford to have the capacity to produce all the needed components and other accessories. Hence there is the need for rationalizing their production across different locations. This is what led to the global production networks (Ernst and Kim 2002) and the international division of labour in ICT production. Thus in the global production network, production of each of the component or sub assembly is made across different countries according to their comparative advantage such that the overall cost of production is minimized. This essentially means that the production in any country will call for significant imports and bulk of the output will have to be exported to other countries rather than sold in the domestic market. Hence if the production, and therefore investment, in ICT is to take place in any country the trade regime needs to be the one wherein the free flow of inputs into and outputs out of the economy is ensured. Thus viewed, there is an inexorable link between trade and investment, which is apparently much stronger in IT goods as compared to most other industries.

Limits to Trade liberalization

While the theoretical case for trade and investment liberalization is elegant, when it comes to the experience of developing countries that resorted to trade liberalization under globalization as a short cut to prosperity we have a mixed picture. Here it may be apt to quote Stiglitz

> *"Globalization itself is neither good nor bad. It has the power to do enormous good, and for the countries of East Asia who have embraced globalization under their own terms, at their own pace, it has been an enormous benefit…..But in much of the world it has not brought*

> *comparable benefits. For many it seems closer to an unmitigated disaster" (Stiglitz 2002 p.20).*

After analyzing the trade reform policies in developing countries Rodrik (1992) convincingly concludes that

> *"trade policy plays a rather asymmetric role in development: an abysmal trade regime can perhaps drive a country into economic ruin; but good trade policy alone cannot make a poor country rich" (p 103).*

Trade policy, at best, provides an enabling environment for development. Perhaps most emphatic was Arthur Lewis who stated as early as in 1978. To quote

> *"the engine of growth should be technological change with international trade serving as lubricating oil and not as fuel". He continued "….international trade cannot substitute for technological change, so those who depend on it as their major hope are doomed to frustration" (Lewis 1978; p 74).*

In case of ICT production, the link between trade and investment notwithstanding, it has been shown that local capabilities are critical for attracting investment and promoting production and trade. In a context wherein low labour cost is taken for granted by the MNCs, the ability of the developing countries to participate in global production network is governed by their ability to provide certain specialized capabilities that the MNCs need in order to complement their own core competence (Lall 2001, Ernst and Lundvall 2000). Countries that cannot provide such capabilities are kept out of the circuit of international production network despite their liberal trade regime. Also as argued by Cantwell (1995), Dunning (1996), Makino et al (2002) and Pearce (1999) the MNCs have been following the knowledge-based asset-seeking strategies along with natural resource-seeking, market-seeking and efficiency-seeking strategies to reinforce their competitive strengths. More importantly to get rid of the risk of getting locked up at the low end of the value chain and to facilitate movement along the continuum of Original Equipment Manufacturer (OEM) to Original Brand Manufacturer (OBM) and finally to Original Design Manufacturer (ODM) (Hobday 1994) there is the need for building learning, innovation and competence building systems while resorting to a liberal trade and investment regime. In a similar vein, along with numerous studies, a survey by Saggi (2002) concludes that the absorptive capacity of the host country is crucial for obtaining significant benefits from FDI. Without adequate human capital or investment in R&D, spillovers from FDI are infeasible.

When it comes to ICT use, lower prices resulting from trade liberalization need not necessarily promote ICT demand and its diffusion unless the developing countries have the capability to use it. Hence trade liberalization has to be accompanied by capacity building such that needed local content is developed and capabilities are created to make its effective use. This calls for complementing the liberalized trade and FDI policies with appropriate policy measures and institutional interventions with respect to education, R&D and human capital such that learning capabilities are enhanced in all parts of the economy – the central concern of studies on innovation system.

In the similar vein, The World Bank (2000) underlined the role of following factors; an educated and skilled population that can create and use knowledge, a dynamic national Information Infrastructure (NII) that consists of telecommunication networks, strategic information systems and the policy and legal frameworks affecting their deployment, an interlinked system of research centers, universities, firms and other organizations that can tap into the growing stock of global knowledge, assimilate and adapt it to local needs and create new knowledge. All these can be grouped into what is now referred to in the literature as an innovation system.

Drawing from the above discussion it may be inferred the liberalized trade could at best be construed as a necessary condition for promoting ICT production and use and the sufficient condition being a vibrant innovation system at the national, regional and the sectoral level.

3. Performance of ICT Sector

In this section we shall analyze the performance of ICT sector in India with due attention to ICT software ICT hardware and ICT use. The analysis is based on data gathered from different sources. The data on software production, employment and exports is accessed from Electronics and Software Export Promotion Council, Statistical Year book and Economic Survey, Government of India. The data on hardware read as electronics is obtained from Department of Electronics and the Annual Survey of Industries published by Central Statistical Organisation. The data on exports and imports of electronic products is availed from UN COMTRADE using World Integrated Trade Systems (WITS). We have used ISIC Revision 3 and HS 1988/92. The data on R&D, import of capital goods and royalties is taken from Prowess provided by Centre for Monitoring Indian Economy.

Performance of Software Sector

In what follows, we shall make use of the data provided by the Electronics and Software Export Promotion Council for the trend analysis. Here, total software exports and production include software services, Business Process Outsourcing (BPO) and software products along with engineering research and design (mostly embedded software) –hereafter referred to as software products. Data presented in the table 1 clearly reinforces the findings of earlier studies which indicated that the performance of software sector during the last two decades has been remarkable by any standard. During the decade of 1990s the total production of software sector increased by 26 fold; from a little over $200 million in 1990-91 to US $5.5 billion in 1999-00, recording an annual average growth rate of over 44 per cent. With a total production of about $75 billion in 2010-11, the observed high rate of growth during 1990s was sustained since 2000 recording an annual average rate of growth of over 35 per cent.

More remarkable has been the performance with respect to exports. Total exports increased from $ 110 million 1990-91 to nearly $ 4 Billion in 1999-00 recording an annual average growth rate of about 50 percent. Going by the available evidence, with a total export of $ 57.6 billion in 2010-11 the observed rate of growth was as high as 38 per cent since 2000 (see table 1) Thus viewed, in a context wherein India has been severely constrained by the availability of foreign exchange, software sector contributed significantly towards improving the external health of the economy.

Table 1: Trend in software production and export (including BPO) from India

Year	Software production ($ Million)	Annual growth rate (%)	Exports ($ Million)	Annual growth rate (%)
1990-91	209		110	
1991-92	289	38.3	166	50.9
1992-93	382	32.2	221	33.1
1993-94	545	42.7	325	47.1
1994-95	803	47.3	473	45.5
1995-96	1182	47.2	711	50.3
1996-97	1798	52.1	1159	63
1997-98	2929	62.9	1813	56.4
1998-99	4009	36.9	2599	43.4
1999-00	5538	38.1	3962	52.4
Average growth 1991-99		**44.2**		**49.1**
2000-01	8021	44.8	5978	50.9
2001-02	9931	23.8	7653	28
2002-03	12376	24.6	9607	25.5
2003-04	16141	30.4	12608	31.2
2004-05	21587	33.7	17216	36.5
2005-06	30404	40.8	23718	37.8
2006-07	42312	39.2	33757	42.3
2007-08	55144	30.3	43467	28.8
2008-09	61984	12.4	49540	14
2009-10	64956	4.8	51001	2.9
2010-11	74890	15.3	57616	13
Average growth 2000-10		**35.3**		**38.2**

Source: Electronics and Software Export Promotion Council, Statistical Year book, different years. Note: Software includes the software services, software products and BPOs

Table 1 also indicates that with global financial crisis that affected initially the US - the leading market for India - and later spread to Europe, has had its adverse effect. This is evident from the drastic decline in the rate of growth in export from over 36 per cent in 2007-08 to 6.6 percent in 2008-09. However as these economies are reviving from crisis, the adverse effect appears to have been short lived because the rate of growth in export also picked up as is evident from the higher export growth of nearly 24 per cent recorded in 2010-11.

Software in India's GDP and employment

Being one of the fastest growing sectors in the Indian economy software industry has also contributed towards the turnaround in India's GDP growth observed since 1991. Share of software production, which includes software services, software products and BPO, in GDP increased from 1.85% in 2000-01 to the highest level of 5.37% in 2008-09. Thereafter it has shown a marginal decline to reach 4.7% in 2010-11(Table 2). It is also evident that in the service sector driven growth of the Indian economy recorded during the recent years, software sector played a significant role as its share in service sector GDP increased by threefold since 2000. Equally remarkable has been its contribution in total exports which nearly doubled from 7.7 per cent in 2000-01 to 14.8 per cent in 2009-10 (see table 2)

Table 2: Contribution of software sector to India's GDP and exports

Year	% of GDP	% of Service GDP	% of total exports	% of Service exports
2000-01	1.85	6.48	7.73	18.61
2006-07	4.63	16.76	13.27	28.23
2007-08	4.85	17.55	13.82	29.26
2008-09	5.37	18.40	13.99	29.57
2009-10	5.06	16.68	14.77	31.24
2010-11	4.77	15.57	12.86	29.09

Source: Data on GDP: Government of India, Economic Survey 2012-13
Data on software production and export: Electronics and Software Export Promotion Council, Statistical yearbook different issues; Software includes the software services, software products and BPOs

According to NASSCOM Strategic Review (2012), the direct employment generated by the software industry (software services, products, BPO and hardware) is estimated at 2.54 million in 2011 as compared to 160,000 in 1996. It is also estimated that the indirect employment is about four times the direct employment. The industry is creating job opportunities for highly qualified (majority with an engineering degree) young graduates with a relatively short experience.

The observed performance of software sector in employment generation appears highly impressive when considered against the fact that employment generation by the organized manufacturing sector has been on the decline during 1990s (Nagaraj 2004) and according to NSS statistics during 1999-00 to 2004-05 growth in employment in the rural and urban areas has been only of the order of 1.97 per cent and 3.22 per cent respectively (Chandrsekhar et al 2006). While contributing significantly to GDP, export earnings and employment the industry has been undergoing major transformation within.

Changing direction of exports

There is also evidence to suggest that the export market is becoming more diversified. Table 3 indicates that the share of North America, traditionally the leading destination of India's software exports has declined by more than six per centage points since 2005 while that of EU countries increased.

Table 3: Changes in the direction of software exports (including BPO)

Destination	Software			
	2005-06		2010-11	
	Value ($Million)	Share (%)	Value ($ Million)	Share (%)
North America	14727.81	62.10	32265.14	56.0
Europe (EU countries)	6098.94	25.71	17954.35	31.16
Singapore, Hongkong & Other south Asian Countries	632.48	2.67	1843.72	3.2
Japan Korea & Other Far east counties	722.84	3.05	749.12	1.3
Middle East Countries	564.72	2.38	1728.49	3
Europe(Non EU counties)	496.95	2.1	633.89	1.1
Australia & Other Oceanic counties	293.65	1.24	979.59	1.7
African Countries	96	0.4	691.4	1.2
Latin America	79.06	0.33	576.16	1
Russia & C.I.S Counties	5.65	0.02	194.47	0.34
Total	**23718.09**	**100**	**57616.33**	**100**

Source: Electronics and Software Export Promotion Council, Statistical Year book, different years

There are also evidence to suggest in the shares of Africa and Latin America have increased, though remaining at a very low level, which in turn cannot be delinked from India's regional trading arrangements and initiatives for greater integration with these countries under the auspices of IBSA and BRICS. Asian countries are yet to occupy a significant position in in India's software export. In case of Japan Korea & Other Far east counties, their share almost halved. When it comes to Singapore, Hongkong & Other south Asian Countries though their share increased, the observed increase was marginal.

Trend in domestic sales

Given that the domestic use of software could be instrumental in enhancing competitiveness of all the sectors of the economy and the welfare of all sections of the society, the social marginal benefit of a dollar worth of ICT consumed domestically could be much higher than that of a dollar worth of software exported (Joseph 2002). In the current context where international competitiveness is the key to survival for all the sectors of the economy and that the major export markets are in the grip of crisis and growing opposition to offshoring of jobs, it is of relevance to examine if there has been an increased focus on domestic market by the Indian software industry.

However, there are again serious data limitations to address this issue. The reported data on domestic sales is likely to involve gross underestimation of domestic consumption because it will not include those software services rendered by the software personnel employed by the users. In India the common practice with larger organization with legacy systems have been to employ in-house software professionals for software development. The software development and maintenance undertaken by such professionals will not get reported as domestic sales where as such services, if rendered by a software company will be recorded in domestic sales. Just like the man who married his housemaid would reduce GDP, the commonly prevalent practice of appointing in-house software personnel is likely to reduce the value of domestic consumption of software. As per NASSCOM (2011) even today the common practice is to undertake most of the software development work in-house supported by a software firm. Even in 2010, the extent of software development outsourcing ranged between only 20 to 70 per cent across different sectors with telecom at the highest with 70 percent.

Table 4: Trend in Domestic sale of Software and share of domestic market in total production

Year	Domestic Sale ($ Mill)	Annual growth rate (%)	Domestic market share in production (%)
1990-91	99		47.37
1991-92	123	24.2	42.56
1992-93	161	30.9	42.15
1993-94	222	37.9	40.73
1994-95	330	48.6	41.1
1995-96	471	42.7	39.85
1996-97	724	53.7	40.27
1997-98	1150	58.8	39.26
1998-99	1379	19.9	34.4
1999-00	1537	11.5	27.75
Decadal growth		36.5	
2000-01	2043	32.9	25.47
2001-02	2278	11.5	22.94
2002-03	2769	21.6	22.37

2003-04	3533	27.6	21.89
2004-05	4371	23.7	20.25
2005-06	6686	53	21.99
2006-07	8555	28	20.22
2007-08	11677	36.5	21.17
2008-09	12444	6.6	20.08
2009-10	13955	12.1	21.48
2010-11	17274	23.8	23.07
Average growth 2000-10		30.6	

Source: Same as table 2; Total exports include software services, BPO and Software products including embedded software.

Nonetheless, table 4 indicates that the domestic sales of software have also been highly vibrant and it is more so in the recent years. The observed rate of growth in the sale of software in the domestic market recorded an annual average rate of growth of over 36 per cent during 1990s, albeit from a lower base and over 30 per cent since 2000. Here it is worth noting that while the rate of growth in exports declined by 11 per cent (see table 1) as we move from the first period (1990s) to the second period (since 2000), the recorded rate of decline in domestic sale was only at much lower pace of about six per cent. More importantly, until 2005-06 the recorded annual rate of growth in the export of software in all the years was consistently higher than that of domestic sales. However, since 2005-06 there has been a reversal wherein the rate of growth in domestic sales exceeded that of exports in all the six years, the exception being only two years wherein export growth was marginally higher.

Table 4 also indicates that the share of domestic sales in total production has been showing a steady decline until 2004-05 to reach the lowest level of 20 per cent. However, after 2004-05, despite a vibrant export market, the decline in the share of domestic market observed up to 2004-05 got arrested. If the empirical evidence for the last three years is any indication, a turnaround towards domestic market has already set in because; it is for the first time since 1991 that the share of domestic market has shown an upward trend consecutively for three years from 20.08 per cent in 2008-09 to 23.07 per cent in 2010-11.

On the whole India's performance in the IT software sector appears to be impressive and is considered inspirational for other developing countries (Joseph 2002 2007). Scholars have also argued that there is much for ASEAN countries especially the new comers to learn for India's experience (Kumar and Joseph 2007).

Performance of IT Hardware (electronics)

In its broad sense the IT industries comprises of both IT hardware and IT software. The latter comprises of software products and software services that also include the IT enabled services. The former comprises not only computer hardware but also the whole lot of other electronic goods that are used in information gathering, processing and dissemination. India is one of the pioneering developing countries to make deliberate policy measures and institutional interventions as early in the mid-1960s towards developing an electronic production base in the country. The strategy during the early years was on self-reliant growth in tune with the then general industrial/technology policy framework[5]. The strategy was to build up on a deliberately derivative basis, an integrated structure so as to meet the requirements on the basis of local manufacturing (Department of Electronics 1979). Hence the Indian plans, while assigning due role for the private sector that was in its infancy, envisaged a greater role for the public sector units set up by the central government and various regional level public sector units like Kelton (in Kerala), Uptron (in UP), Meltron (in Maharashtra) and others established by the state governments. Above all the importance of technological self-reliance was upheld and given the disenchantment with FDI, the strategy envisaged limited role for foreign investment. To bring out the desired changes, the government used a variety of control instruments relating *inter alia* to investment and trade like the Industries (Development and regulation) Act, Monopolies and Restrictive Trade Practice Act, (MRTPA) Foreign Exchange Regulation Act (FERA) and other measures.

The strategy remained more or less the same in essence for a decade or so. In a general environment wherein the economy has been faced with diminishing returns to increased restrictions, the Government acted on the recommendations of the Sondhi Committee and Menon Committee (Govt of India Department of Electronics 1981). The result was a gradual, but steady, move towards a market oriented policy regime in the 1980s through a series of policy changes marking the second phase. These policy changes sought a liberal climate, both internally and externally, through dilution of the industrial licensing, relaxations of MRTPA and FERA provisions, liberalization of imports and greater access to foreign capital and technology. Moreover, considerable relaxations were effected in the fiscal regime including reduction in direct taxes and reduction in excise duties to provide a more propitious economic climate for private sector in the Indian industrial economy.

The new industrial policy of July 1991 set the beginning of the third phase marked by further liberalization in industrial licensing and greater outward orientation. In general the 1990s witnessed the removal of industrial licensing for most of the products except a few products of strategic significance, and further liberalization with respect to Foreign Direct Investment (FDI) and technology

[5] The resolution, which set up the Electronics Commission in 1971, stated "the government attached the highest importance to the development of an integrated and self-reliant electronics industry in the country. ....an intensive promotional effort relating to both production and research & development was, therefore essential to ensure a rapid growth of self-reliance" (Department of Electronics 1982 p.14).

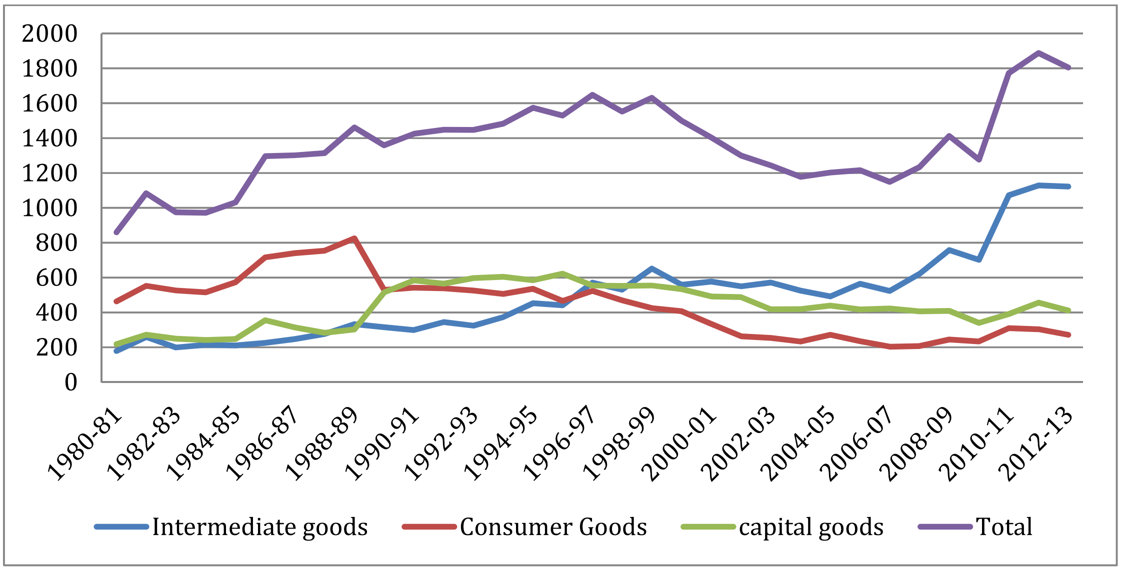
import along with series of fiscal and trade policy reforms to facilitate production and outward orientation. Further as signatory to the Information Technology Agreement of WTO, import duties on all the Information and Technology Agreement (ITA) goods have been phased out by 2005[6]. The policy reforms were based on the basic premise that there is an inexorable link between trade and investment, which is apparently much stronger in electronics as compared to most other industries. Hence the restrictive trade policies have had their adverse effect on the performance of the industry in the past. To be more specific, in the global production network, which today characterizes electronics, production of each of the component or sub assembly is made across different countries according to their comparative advantage such that the overall cost of production is minimized. This essentially means that the production in any country will call for significant imports and the output made will have to be exported to other countries rather than sold in the domestic market. Hence, if the production, and therefore investment, in IT to take place in any country, the trade regime needs to be the one wherein the free flow of inputs into and outputs out of the economy is ensured.

Over the years the ownership profile of the industry has changed and its evolution in the computer hardware industry provides a broad indication of the way in which electronics industry evolved over the years. Broadly, once could discern following phases in its evolution. The first phase was marked by foreign domination followed by a period of where the public sector controlled the commanding heights. During the third phase the private sector firms began to dominate and in the final phase which coincided with the globalization phase the foreign firms again has taken control over the industry.

Broadly, the performance of electronics industry since 1980-81 could be analyzed, based on policy changes, in two periods - with 1991 as the cut off. The post 1990s may be again divided into two sub-periods with 1997 as the cut off. This is justified by the trade liberalization measures undertaken at the instance of ITA in 1996 and number of institutional intervention and new policy initiatives since 1997 like the formation of a separate ministry for IT & electronics, reorganization and merger of DoE/DIT autonomous bodies, attempts at hardware promotion, fiscal incentives, etc. In the light of various policy changes, Figure 1 shows the number of factories in the industry from 1980-81 to 2012-13 which roughly explains the size of the Industry.

Figure 1: Number of Factories

[6] Recognizing the potential of Electronics/IT industry, the Prime Minister set up a National Task Force on Information Technology and Software Development in May, 1998. The Task Force was of the view that hardware industry and the software industry are two sides of the same coin, the success of one, whether it is export of software of $50 billion by 2008 or IT penetration drive for realizing “IT for all” by 2008, depends on the concomitant success of the other.

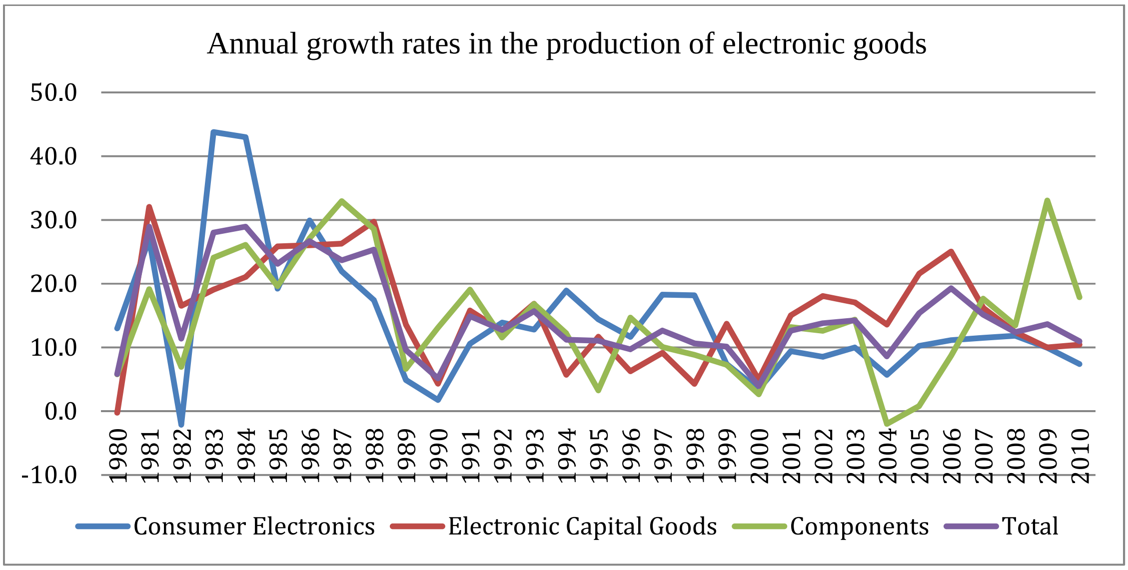


Source: Annual Survey of Industries, Various Years

From Figure.1 it could be observed that number of factories have gradually increased from just over 800 in 1980-81 to 1600 in 1998-99 and declined thereafter. Here it is important to note that post ITA period witnessed drastic decline in the number of factories, which indicates closing down of the units that could not withstand the heightened competition under trade liberalization. However, the number of factories has started increasing after 2006-07. The decline in factories after ITA is contributed mostly by consumer electronics as it shows a highest decline.

However, number of factories does not provide clear understanding on the performance of the industry over the years. Therefore, we presented simple annual growth rates in the output growth of the industry in Figure 2. As the figure depicts, the growth rate of output shows an increasing trend till 1988 and declined after thereafter. The trend is consistent with all the sub-sectors of the industry. A recent study (Joseph 2005) that covered up to 2002 found that during the first phase the recorded output growth of total electronics output was substantially higher (28.6 per cent) as compared to the second period (13.8 per cent). As we move to the period since 1997, series of institutional interventions and policy reforms not withstanding, there has not been any marked increase in the recorded rate of output growth but a marginal decline (11.2 per cent). Figure 2 tend to suggest that the trend continues even in 2006 though there has been a recent revival in the electronics capital goods driven mostly by the communication equipment.

Figure 2. Annual Growth Rates in Production of Electronic Goods



Source: Department of Electronics, Various years

It is important to note that simple annual growth rates do not really convey the industry's performance and hence, we present annual average growth rates (see Table 5). We have presented the growth rates during the last three decades and the average growth of the industry before and after the ITA agreement. The table 5 shows that electronics industry has registered an impressive growth rate of 27.4 percent during the pre-liberalization period (1980-90). However, the growth could not be sustained as we could observe a decline in growth rates during first and decades of liberalization, 16.88 percent during 1990-00 and 12.98 percent during 2000-12. The industry has grown at 23.99 percent during pre ITA period and it drastically declined to 12.08 percent during the post ITA period. These growth trends are consistent across three sub- groups of the industry. The electronics components have grown at faster rate than the consumer electronics and electronic capital goods. This trend could be attributed to global production network, which today characterizes electronics, production of each of the component or sub assembly is made across different countries according to their comparative advantage such that the overall cost of production is minimized. This essentially means that the production in any country will call for significant imports and the output made will have to be exported to other countries rather than sold in the domestic market.

Table 5: Decadal Growth in Electronics Output

Year	1980-90	1990-00	2000-12	1980-96	1996-2012
Intermediate goods	32.71	27.63	13.77	28.79	13.88
Consumer Goods	25.73	20.92	11.29	18.41	10.74
Capital goods	26.74	10.74	14.57	29.69	12.41
Total	27.38	16.88	12.98	23.99	12.08

Source: Same as Figure 1

The table 6 presents employment growth of electronics industry. As we move from the decade of 1980s to 1990s there was a drastic decline in the employment for the sector as a whole and in electronic consumer goods and electronic capital goods. However, when it comes to the decade since 2000, thanks to the electronic capital goods, there was a revival in the employment growth for the sector as a whole.

Table 6: Decadal growth in employment

Year	1980-90	1990-00	2000-12	1980-96	1996-2012
Intermediate goods	10.41	9.64	5.97	8.65	5.34
Consumer Goods	1.82	2.53	-0.90	-2.37	-2.66
Capital goods	6.40	-4.02	4.29	10.30	1.31
Total	5.34	0.60	4.08	4.29	1.92

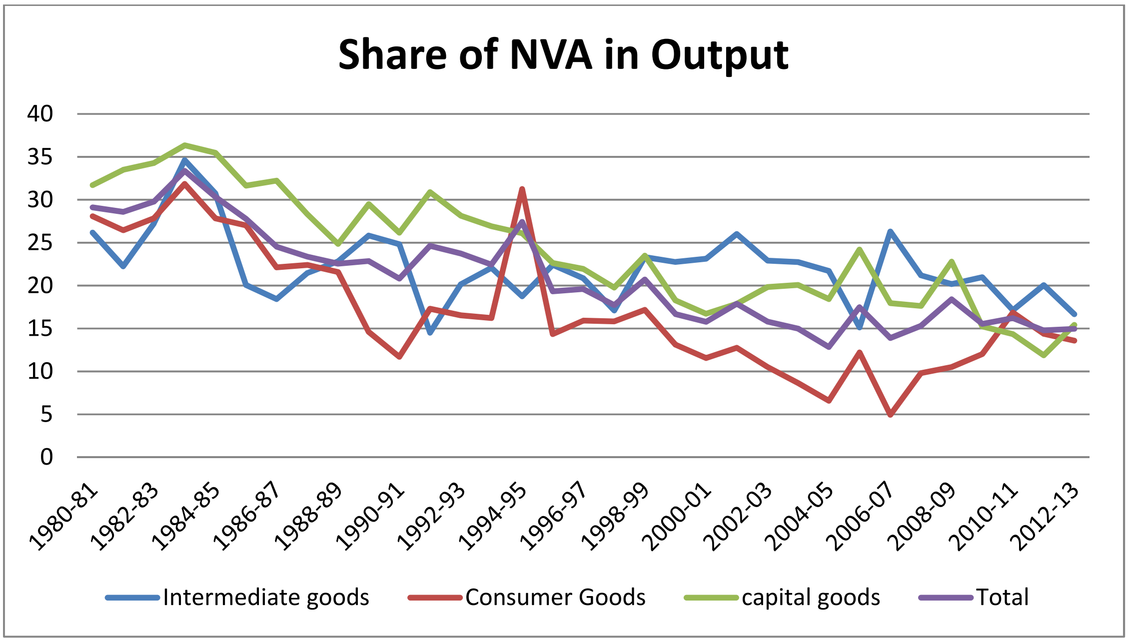
Source: Same as Figure 1

Emerging picture is highly discouraging when we compare the post ITA period with the pre ITA period. While the employment for the sector as a whole was about 4.3 per cent during the pre ITA period it declined to less than two per cent during the post ITA period. More importantly, the decline in employment was observed in the entire three product categories as well with more pronounced decline in the electronic capital goods wherein the employment growth declined from over 10 percent to a little over one per cent during the post ITA period.

Having observed broad trends in output and employment, we have analyzed the extent of value addition taking place in the industry. The figure shows that the share of value addition in output has been showing a declining trend over the last three decades. It has declined from 30 percent in 1980-81 to 15 percent in 2012-13. This trend is consistent across all the sub-groups.

On the whole, the foregoing analysis tends to suggest that while India’s performance in ICT software and services has been remarkable the electronics sector (ICT goods) presented a different picture. While the electronics in general |and the product categories therein have shown an impressive performance during 1980s in terms of growth in output and employment.it did not did not sustain during the decades that followed. In what follows we shall try to explore the bearing of trade liberalization and ASEAN integration on the observed trend in electronics.

Figure 3: Share of Net Value Added in Output



Source: Same as Figure 1

4. Trade liberalization and ASEAN Integration

During the pre-liberalization phase India aimed at developing an integrated electronics sector with greater role for the public sector (Joseph 1997). With globalization, India's strategy towards electronics also has undergone major change with greater reliance on private sector and FDI along with reducing the tariff barriers. The trade liberalization strategy gathered momentum with India, as one of the founding members of ITA, agreed to do away with tariffs on electronics goods. The Information Technology Agreement (ITA) of WTO, initiated by the private sector, aimed at liberalizing trade in IT products as a means of promoting the use and production of IT products. Since the demand for IT products is known to be price elastic, ITA has been expected to result in their enhanced access by reduced prices *inter alia* through getting rid of their tariffs (also other duties and charges) and heightened competition induced by trade liberalization. Given the link between trade and investment in assembly based industries like IT products, it was also expected to strengthen and widen the Global Production Network (GPN) in IT products with an increased participation by developing countries. ITA required elimination of tariffs on goods coming under its ambit in maximal four stages until 2000. However, developing countries could opt for extending their staging until 2005[7]. Participating countries are required to abide by the Most Favoured Nation (MFN) principle.

[7] The exact text of the ITA, including the product coverage, can be found at http://www.wto.org/english/tratop_e/inftec_e/inftec_e.htm

Hence, the benefits of zero tariffs are extended to those WTO members who did not sign the ITA without having to provide similar access to their own markets in return. Even today ITA is mainly a tariff reduction mechanism as the review of non-tariff barriers (NTBs) has not yet come to any definite conclusion.

Along with the multilateral trade liberalization under ITA, India has also been integrating intensively with ASEAN. In fact, the look east policy that coincided with its adoption of globalization, has led to a virtual transformation of India's relationship with ASEAN. Thus within a period of 10 years (1992-2002) India's position with ASEAN improved from sectoral dialogue partner to a Summit-level interaction. It scaled new heights with the signing of the Framework Agreement on Comprehensive Economic Cooperation between ASEAN and India at the Bali Summit in October 2003 and FTA in goods signed in 1999. Scholars have argued that great potential existed for India-ASEAN cooperation in information and communication technologies. While ASEAN could make use of India's strength in IT software and IT-enabled services to strengthen and complement their own emerging capability in IT hardware India could benefit from their hardware capability (Parayil and Joseph 2005). Parayil and Joseph(2005) among others, also called for greater interactive learning between these countries by linking their innovation systems. This was envisaged through facilitating frequent meetings between the IT business community in India and ASEAN and joint projects involving joint research and production by private sector firms to exploit the synergies between the hardware capabilities of ASEAN and the software capabilities of India.

Trade Performance

As mentioned earlier, India has followed self-reliant growth in tune with the then general industrial/technology policy framework in building electronics industry. The industry has remained in-ward oriented until 1991. Further, given the strong link between trade and investment in the industry, India signed ITA in order to reap the benefits of global production network, which today characterizes electronics, production of each of the component or sub assembly is made across different countries according to their comparative advantage such that the overall cost of production is minimized. The table shows that there is an increase in both exports and imports of the industry over the years. However, it should be noted that imports have always been higher than exports and imports of the electronics industry have been constantly growing. Exports of the electronics sector have increased from 0.2 billion dollars in 1990 to 0.44 billion dollars in 2000 and further increased to 6.61 billion dollars by the end of 2012. At the same time, imports increased at a much faster pace. Imports increased from 0.74 billion dollars in 1990 to 2.73 billion in 2000 and further it has increased to 24.95

billion by the end of 2012. The National Electronics policy 2012 states that if the imports of the electronics continue to increase at this rate, in value terms it will surpass crude oil imports in next 10 years. There is a massive import of electronics imports particularly after ITA. The trade balance of electronics industry indicates that since the beginning of 1990s, India has a fast growing trade deficit in electronics industry, as the imports are always higher than exports. The trade deficit was 0.53 billion dollars in 1990, which has increased to 2.19 billion dollars in 2001 and further, increased to 19.34 billion dollars in 2012. This is contributed by rapid increase in the imports after the ITA.

Table 7: Trade Performance of the Electronics Industry

Year	Total Exports (Billion US$)	Total Imports (Billion US$)	Output (Billion US$)	Trade Balance (Billion US$)	Domestic Availability Ratio
1990	0.2	0.74	5.11	-0.53	0.90
1991	0.21	0.49	3.95	-0.28	0.93
1992	0.17	0.68	3.71	-0.50	0.88
1993	0.2	0.62	4.15	-0.42	0.91
1994	0.29	0.9	4.92	-0.61	0.89
1995	0.5	1.3	5.2	-0.80	0.87
1996	0.6	1.09	5.51	-0.48	0.92
1997	0.48	1.62	5.83	-1.14	0.84
1998	0.26	1.72	5.89	-1.46	0.80
1999	0.33	2.18	6.4	-1.84	0.78
2000	0.44	2.73	6.77	-2.29	0.75
2001	0.65	2.79	6.75	-2.139	0.76
2002	0.65	3.86	7.61	-3.20	0.70
2003	0.8	5.83	9.29	-5.03	0.65
2004	1.03	7.79	11.08	-6.75	0.62
2005	1.05	10.15	12.31	-9.1	0.57
2006	1.31	13.06	14.22	-11.74	0.55
2007	1.49	15.63	20.97	-14.14	0.60
2008	1.92	13.18	20.59	-11.26	0.65
2009	5.74	19.05	23.18	-13.31	0.64
2010	4.45	20.77	27.61	-16.31	0.63
2011	6.68	25.77	29.85	-19.08	0.61
2012	5.61	24.95	32.87	-19.34	0.63

Source: UNCOMTRADE and Annual Survey of Industries

From the available evidence thus far, it is evident that there is growing demand for electronics in India. Increasingly, India depended on imports to meet the domestic demand. One could argue, given the evidence that imports substituted the domestic production which resulted in decline in rate of growth of output particularly after the ITA. The table also indicates declining domestic availability ratio. The domestic availability ratio was about 90 percent in 1990 and it steadily declined to 63 percent by the end of 2012.

In the context of our finding that India's trade in electronics industry is increasing, it is important to analyse the major trading partners and particularly India's engagement with the ASEAN and other major Asian countries as they are leaders in the industry. The table 8 presents direction of India's electronics exports. We have taken ASEAN, China, Japan Korea and rest of the world to analyze the direction of trade. Of the total electronics exports, India exported to 7.7 percent to ASEAN in 1988, which increased to nearly 40 percent in 2001. However, India's exports to ASEAN have started declining from 2001 and by the end of 2014 ASEAN position (8%) has returned to its level in 1988.

Table 8: India's Direction of Trade in Electronics

	Relative Share of Exports in Total Electronics Exports					**Relative Share of Imports in Total Imports**				
Year	ASEAN	China	Japan	Korea	Rest of the World	ASEAN	China	Japan	Korea	Rest of the World
1988	7.72	0.00	0.23	0.29	91.77	15.19	0.04	27.81	6.63	50.32
1989	10.84	0.02	0.47	0.01	88.65	14.37	0.08	31.48	4.90	49.18
1990	16.33	0.12	0.21	0.08	83.27	17.81	0.06	28.14	2.27	51.73
1991	9.78	0.01	0.09	0.03	90.09	16.25	0.06	27.21	3.67	52.81
1992	26.26	0.03	0.32	0.07	73.32	15.35	0.61	21.80	2.07	60.17
1993	28.22	0.03	0.11	0.18	71.45	20.45	2.00	20.99	2.43	54.13
1994	33.72	0.28	0.27	0.15	65.58	22.14	2.45	17.95	3.49	53.97
1995	36.04	0.36	0.52	0.32	62.76	23.84	3.36	13.37	4.36	55.07
1996	23.40	0.19	1.07	0.13	75.21	28.64	4.13	9.12	5.68	52.44
1997	21.05	0.94	0.95	0.28	76.79	28.86	5.92	8.58	4.79	51.86
1998	16.68	1.01	3.30	0.37	78.64	30.04	8.42	9.14	5.97	46.43
1999	27.65	0.87	2.88	0.99	67.60	34.77	7.22	7.03	4.48	46.50
2000	29.90	1.15	1.32	1.16	66.47	37.29	7.79	5.07	4.28	45.56
2001	39.42	0.28	1.45	0.72	58.13	34.06	9.88	5.20	8.38	42.49
2002	15.27	0.78	1.66	0.72	81.57	24.02	16.86	3.84	7.19	48.09
2003	13.96	1.61	0.56	0.30	83.58	21.24	18.45	3.64	17.84	38.83
2004	16.35	1.77	0.42	0.41	81.05	23.20	23.45	2.85	14.11	36.38
2005	9.26	1.93	0.54	0.39	87.88	21.60	27.94	3.02	16.16	31.28
2006	13.07	2.24	0.49	0.23	83.97	21.15	32.88	2.68	10.13	33.17
2007	12.69	2.93	0.26	0.56	83.57	18.46	42.80	2.79	4.23	31.71
2008	13.13	2.22	0.36	1.10	83.19	16.52	46.45	2.68	7.03	27.31
2009	20.93	2.96	0.47	0.31	75.33	15.33	48.07	3.84	5.36	27.40
2010	10.48	2.84	0.33	0.17	86.18	16.74	51.92	2.25	6.35	22.75

2011	8.86	3.59	0.16	0.29	87.10	16.96	47.87	2.62	5.45	27.10
2012	8.05	3.28	0.32	0.34	88.00	18.59	51.53	2.39	3.82	23.66
2013	8.81	3.46	0.66	0.46	86.62	19.64	56.76	1.63	4.92	17.04
2014	10.79	5.43	0.89	0.92	81.98	17.35	58.04	1.47	6.38	16.76

Source: UNCOMTRADE

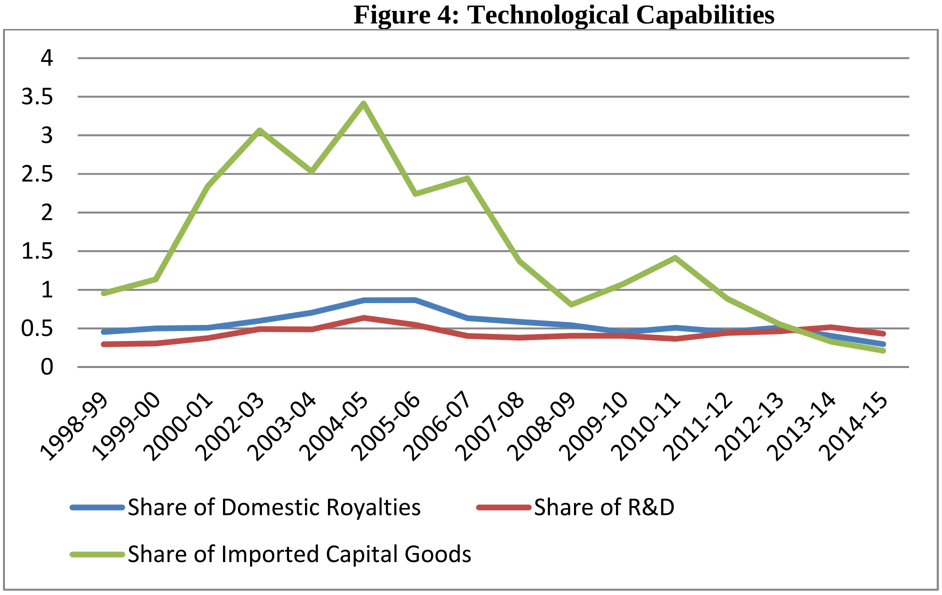
India hardly had any exports to China in 1988 but its share has gradually increased to 1.1 percent of total exports in 2001 and further increased to 5.43 percent in 2014. The relative share of Japan in total exports was about 0.23 percent in 1998 and increased up to 3.30 percent in 1998. But it declined from 1999 onwards and it is about 0.89 percent in 2014. It appears that Japan is yet to appreciate the potential that Indian economy offers and this is broadly in tune with (Esho, 2001) that considering India a poor economy, Japan's highest contribution of ODA not FDI has been to India. The relative share of Korea has been very less and largely remained less than 1 percent throughout the last two decades expect in the year 2000 and 2008. From the table it is evident that large proportion of India's electronic exports is going to non-Asian countries. Of the total India's electronic exports, 91.77 percent went to non-Asian countries in 1990. The share has gradually declined to 58 percent in 2001 and increased to 81 percent in 2014. The broad trends reveal that despite efforts to integrate India's trade with ASEAN leaders such Malaysia and Singapore, India's exports to these countries did not increase particularly after 2001.

Contrary to exports, where relative shares of partners by and large remained same, direction of imports shows a dynamic picture. Imports of from countries other than ASEAN, Japan Korea has been declining constantly. Secondly, among the Asian countries, India used to import electronic goods from Japan. However, its import share has declined from over 27 percent in 1988 to nearly 5 percent in 2000 and further decreased to 1.47 percent in 2014. The relative share of ASEAN has been increasing from 7.72 percent in 1988 to 37 percent in 2001 and started declining thereafter. Imports from ASEAN have declined to 17.35 percent in 2014. Imports from non-Asian countries have declined from 50.32 percent in 1988 to 42 percent in 2000 and further declined to 16.76 in 2014. The relative share of imports from China has shown a massive increase. Its share increased from 0.04 percent in 1988 to 9.98 percent in 2001. From 2001 to 2014 the imports from China have increased by many folds and today (2014) its share is as high as 58 percent. From the evidence, we could tentatively infer that India's electronic goods import basket consist of products from China. One could even infer that the decline in rate of electronics output in India could be attributed to excessive dependence on imports from China.

Whither innovation system

While trade and investment liberalization could at best be considered as a necessary condition for facilitating the production and use of ICT, the sufficient condition is the presence of a vibrant innovation system. The innovation system framework by now emerged as the most popular approach in innovation studies (Fagerberg and Sapprasert 2011) highlights the role of learning and innovation, facilitated inter alia through the interactions between different actors involved. In the context of globalization, wherein innovation systems have become global in nature, the role of interaction between with actors outside the country is equally important as interaction between actors within the country. In a sense, this is also broadly in line with the arguments by Coe and Helpman (1995). The issue of relevance here is to what extent learning innovation and competence building have been built up in India’s ICT sector through trade liberalization and integration with ASEAN. This however, is an issue that requires a separate enquiry. The preliminary evidence Figure 4, with respect ICT hardware, tends to suggest low level of competence building.

Figure 4: Technological Capabilities



Source: PROWESS, various years

Figure 4 provides proxies for both domestic and international interaction, which could lead to capability building. It is evident that share of import of capital goods (embodied technology), mostly undertaken by the producers has been on the decline. This tends to suggest that the increased import that the study reported earlier has been mostly for final demand, indicating interaction between producers’ abroad and traders within the country. The learning impact of such interaction is bound to be limited in the domestic economy. Similarly, the figure also shows that interaction with other knowledge generating actors has also been on the decline along with declining in house production of knowledge as evident from share of R&D expenditure in output.

5. Conclusion

ICT is often considered as a general-purpose technology of the new millennium with its profound influence on all aspects of human life. For harnessing its potential for development without perpetuation of technological dependence, studies have underlined the need for developing the capabilities in its production and use. Trade and investment liberalization has often been advocated as the means of promoting its production and use. The present paper analyzed the performance of India's ICT sector in terms of its production and use against the backdrop of India's commitment to trade liberalization under ITA and growing integration with ASEAN countries

The study reiterated the remarkable performance of software production and export which has been attributed, inter alia to the innovation system that was built up over the years. The study also highlighted the recent trend towards greater orientation towards domestic market. When it comes to IT hardware (electronics) the performance was rather unsatisfactory during the period wherein India embraced trade liberalization as a development strategy with the signing of ITA. Not only that, the output growth decelerated, employment growth became negligible, extent of value addition almost halved and finally the trade deficit boomed to threatened even to cross the deficit on account of oil imports. While Indian has been making concerned efforts under its look East policy to integrate with ASEAN and also Japan and South Korea, the available evidence tends to suggest that India is yet to graduate from 'looking East' to 'acting East'. India's export and import to ASEAN and electronics leaders like Japan and Korea declined to reach negligible level at present. Thanks to growing domestic demand, India's imports by and large is confined to final demand goods almost entirely from China. It tends to suggest that the nature of trade integration that India had with the rest of the world, seems to have not resulted in interactive learning that is expected of in a globally integrated National Innovation System. In the case of hardware, to the extent that import has been mostly of final goods, interaction has been mostly with traders within the country with hardly any learning opportunities for the domestic producers. When it comes to import of capital goods with potential for interactive leaning, the trend has been on the decline. The limited scope for interactive learning in hardware has to be contrasted with the interaction in the software industry through exports, which offered much learning opportunities. To throw further light on the issue at hand there is the need for more in depth inquiries into the nature and extent of integration of India's electronics industry with the global production network and the extent of integration between global production network and the innovation system in India. This is however an area for further enquiry.

References

Arora, A., V. S Arunachalam, J. Asundi and F. Ronald (2001) 'The Indian Software Services Industry', *Research Policy*, 30 (8): 1267-87.

Bhagwati, J. N. (1984) Why are Services Cheaper in Poor Countries? *Economic Journal*, 94: 279-285.

Bresnahan, T. and M. Trajtenberg (1995) 'General Purpose Technologies: Engines of Growth', *Journal of Econometrics*, 65 (1): 83-108.

Brynjolfsson, E., & Saunders, A. (2010). Wired for innovation: how information technology is reshaping the economy.

Cantwell, J. A. (1995) 'The Globalization of Technology: What Remains of the Product Cycle Model?' *Cambridge Journal of Economics*, 19(1): 155-174.

Coe, D. T., & Helpman, E. (1995). International R&D spillovers. *European Economic Review*, *39*(5), 859-887.

D'Costa A. P., 2003, Uneven and combined development: Understanding India's software exports, *World Development*, 31(1), 211–226.

Dunning, J. H. (1996) 'The Geographic sources of the competitiveness of firms: some results of a new survey', *Transnational Corporations*, 5: 1-29.

Ernst, D. (2002) 'Global Production Networks and the Changing Geography of Innovation Systems: Implications for Developing Co208untries', *Economics of Innovation and New Technology*, 11 (6): 497-523.

Ernst, D. and B. A. Lundvall (2000) 'Information Technology in the Learning Economy: Challenges for Developing Countries', East-West Centre working paper No. 8, (Honolulu: East-West center).

Ernst, D. and L. Kim (2002) 'Global Production Networks, Knowledge Diffusion and Local Capability Formation', *Research Policy*, 31 (8-9): 1417-1429.

Esho, Hideki (2001) The Japanese Response to India's New Economic Policy in Kesavan K V (eds) Economic Liberalisation in India: Japanese and Indian Perspective, ICSSR, New Delhi

Ezell, Stephen J., (2012) *Boosting Exports, Jobs, and Economic Growth by Expanding the ITA*, The Information Technology & Innovation Foundation, Washington DC available at http://www.itif.org/events/boosting-exports-jobs-and-economic-growth-expanding-information-technology-agreement

Fagerberg, Jan and Koson Sapprasert (2011) National Innovation Systems: The Emergence of a New Approach, Science and Public Policy, 38(9): 669-79

Grossman, G., & Helpman, E. (1991). Innovation and growth in the world economy.

Hobday, M. (1994) 'Export-led Technology Development in the Four Dragons: The Case of Electronics', *Development and Change*, 25 (2): 333–361.

Indjikian, R. and D. S. Siegel (2005) Impact of Investment in IT on Economic Performance: Implications for Developing Countries, *World Development*, 33 (5): 681-700.

Joseph K J (2007) Electronics Industry, in Kumar N. and K J Joseph (eds) *International Competitiveness & Knowledge-based industries, Oxford University Press New Delhi*

Joseph K J (2007) Sectoral Innovation System in Developing Countries: The case of ICT India in Lundvall Bebgt-Ake, Joseph, KJ, Chaminade C and Vang J (eds) Handbook of Innovation Systems and Developing Countries: Building domestic capabilities in a global setting, Edward Elgar Publishing, UK

Joseph K J and G Parayil (2008) Can Trade Liberalization Bridge Digital Divide" Assessing the Information Technology Agreement, *Economic and Political Weekly*, Vol. XLIII No.1, January 5 p 46-53.

Joseph, K. J. (1997) '*Industry under Economic Liberalization: The Case of Indian Electronics'* (New Delhi: Thousand Oaks; London: Sage Publications).

Joseph, K. J. (2002) 'Growth of ICT and ICT for Development: Realities of the Myths of Indian Experience', Discussion paper No. 2002/78, Helsinki: UNU/ WIDER.

Kraemer, K. L. and J. Dedrick (2001) 'Information Technology and Economic Development: Results and Policy Implications of Cross-Country Studies', in M. Pohjola (ed.), *Information Technology, Productivity and Economic Growth* (Oxford University Press).

Krueger, Ann O (1997) 'Trade and Economic Development: How We Learn'? *American Economic Review*, 87 (1): 1-22

Kumar, N. and K. J. Joseph (2005) 'Export of Software and Business Process Outsourcing from Developing Countries: Lessons from India', *Asia Pacific Trade and Investment Review* 1(1): 91-108.

Kumar, N and K J Joseph (2007) "National Innovation Systems and India's IT Capability: Are there any lessons for ASEAN newcomers?" in Bengt Ake Lundvall P Intarakumnerd and Jan Vang (eds) Asia's Innovation Systems in Transition, Edward Elgar, UK

Lall, S. (2001) *Competitiveness, Technology and Skills* (Cheltenham: Edward Elgar).

Lewis, Arthur (1978): '*The Evolution of the International Economic Order*' Princeton: Princeton University Press

Makino, S., C. M. Lau and R. S. Yeh (2002) 'Asset exploitation versus asset seeking: implications for location choice of foreign direct investment from Newly Industrialized Economies', *Journal of International Business Studies*, 33: 403-421.

Mytelka, L. K. and John F.E. Ohiorhenuan, (2000) Knowledge-based Industrial Development and South-South Cooperation, *Cooperation South*, No.1 2000, pp 74-82.

Nagaraj, R (2004) "Fall in organized Manufacturing Employment: A Note," *Economic and Political weekly*, July 24 pp 3387-90.

NASSCOM (2011), *The IT-BPO Sector in India; Strategic Review*, National Association of Software and Service Companies. New Delhi.

NASSCOM (2012), *The IT-BPO Sector in India; Strategic Review*, National Association of Software and Service Companies. New Delhi.

Pearce, R. D. (1999) 'The Evolution of Technology in Multinational Enterprises: The Role of Creative Subsidiaries', *International Business Review*, 8: 125-148.

Pohjola, M. (2001) 'Information Technology and Economic Growth: A Cross Country Analysis' in M. Pohjola (ed.) *Information Technology, Productivity and Economic Growth* (New York: Oxford University Press).

Rodrik, D. (1992) 'The Limits of Trade Policy Reform in Developing Countries', *Journal of Economic Perspectives*, 6 (1) 87-105.

Saggi, K. (2002) 'Trade Foreign Direct Investment and International Technology Transfer: A Survey', *The World Bank Research Observer*, 17 (2):191-235.

Schware, R., (1987) "Software Industry in the Third World: Policy Guide lines, Institutional Options and Constraints", *World Development*, Vol. 15, No 10/11, pp 1249-67.

Srinivasan, T. N. and J. N. Bhagwati (1999) 'Outward Orientation and Development: Are Revisionists Right'? Discussion Paper No. 806, Economic Growth Center, Yale University, New Haven.

Stiglitz, J. E. (2002) *Globalization and its Discontents* (New York: Allen Lane). UNCTAD (2012) *Information Technology Report 2012: The Software Industry and Developing Countries*, United Nations, New York and Geneva.

Wong, P. K. (2001) ‘The Contribution of Information Technology to the Rapid Economic Growth of Singapore’ in M. Pohjola (ed.), *Information Technology, Productivity and Economic Growth* (New York: Oxford University Press).

World Bank (2000) *Korea and the Knowledge based Economy: Making a Transition* (World Bank: OECD).

World Bank (2002) *Information Communication Technology: A World Bank Group Strategy* (Washington DC: The World Bank).

November 15, 2015
Hosei University

Business Environments to ``Make in India'' by Japanese Firms

Takahiro Sato
(Kobe University)

1

Outline

1. Introduction
2. Overview of Japanese Companies in India
3. The Results of Questionnaire Survey (2013-14)
  (1) Responding and Non-Responding Japanese Companies
  (2) Current Situation of Responding Japanese Companies
4. Concluding Remarks

2

1. Introduction

- According to Embassy of Japan in India and JETRO, # of Japanese companies: 926 in 2012→1072 in 2013 → 1209 in 2014 and # of establishments of Japanese companies: 1804 in 2012→2542 in 2013 → 3961 in 2014.
- The most successful cases: Maruti Suzuki and Honda.
- The most disappointed Cases: Daiichi Sankyo-Ranbaxy and Tata DoCoMo

- Examples of recent important events: Soft Bank, UNIQLO, Unicharm, ``Japanese Village'' by JGC Corporation and Mizuho, Western Dedicated Freight Corridor by Sojitz, US-2 by Sinmaywa, Comprehensive Economic Partnership Agreement (CEPA), ``Special'' Global Partnership, Japan-Plus and so on.
- Many think tanks and industrial associations release the reports on the Japanese companies working in India. Many scholars also do.
- To the best of my knowledge, however, there are no academically serious research on the Japanese companies working in India.

Academic Contribution of This Study

- Making of ``population list'' of Japanese companies attached with the basic corporate information.
- Based on it, a questionnaire survey was done to all companies of ``population list.'' The current situation of the 113 responding companies is investigated. The difference between responding and non-responding companies is also studied.

5

2. Overview of Japanese Companies in India

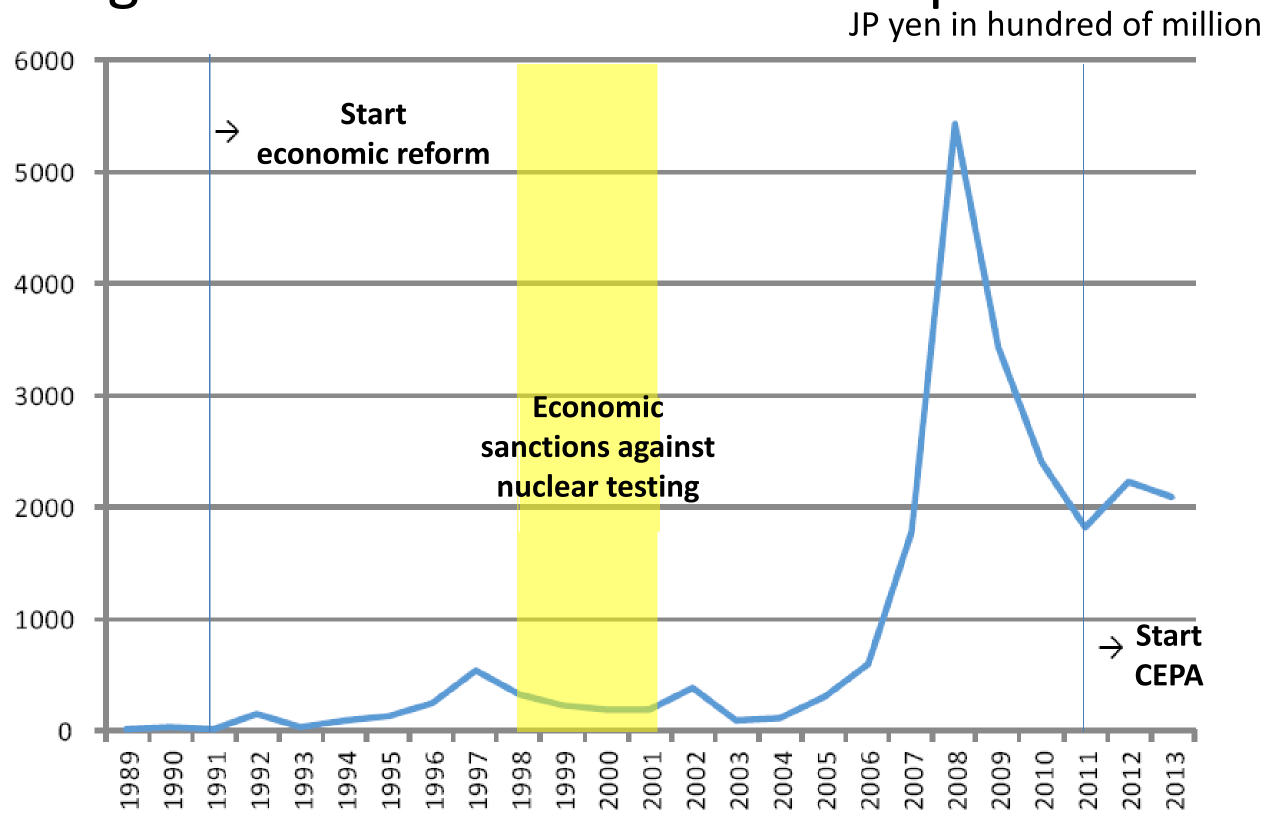
1. Ministry of Finance, *Situation of Outward and Inward Direct Investment,* and *Process of Outward/ Inward Direct Investment*.

2. Research Institute for Economics and Business Administration, Kobe University, *Multinational Corporation Database* (Toyokeizai, *Kaigai Sinsyutsu Kigyo Souran*).

3. Ministry of Economy, Trade and Industry, *Survey of Overseas Business Activities*.

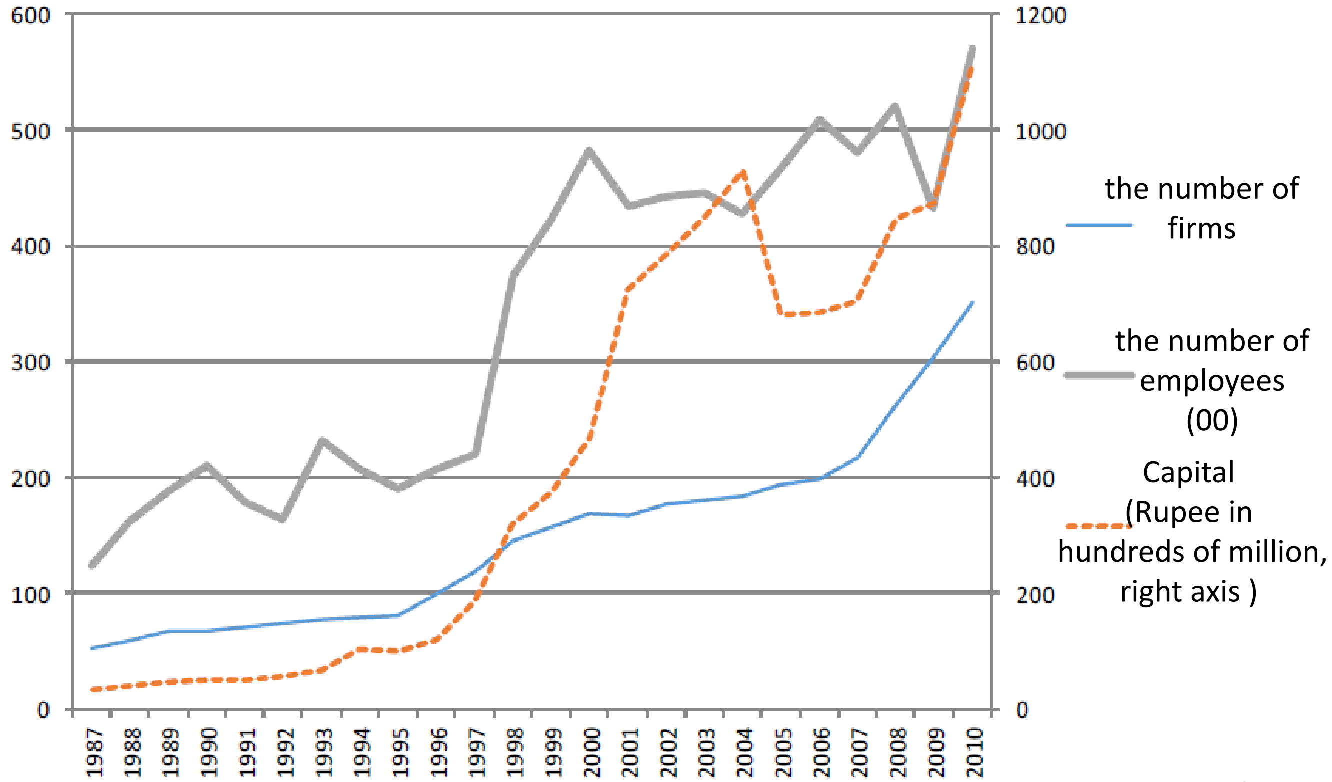
6

Foreign Direct Investments from Japan to India



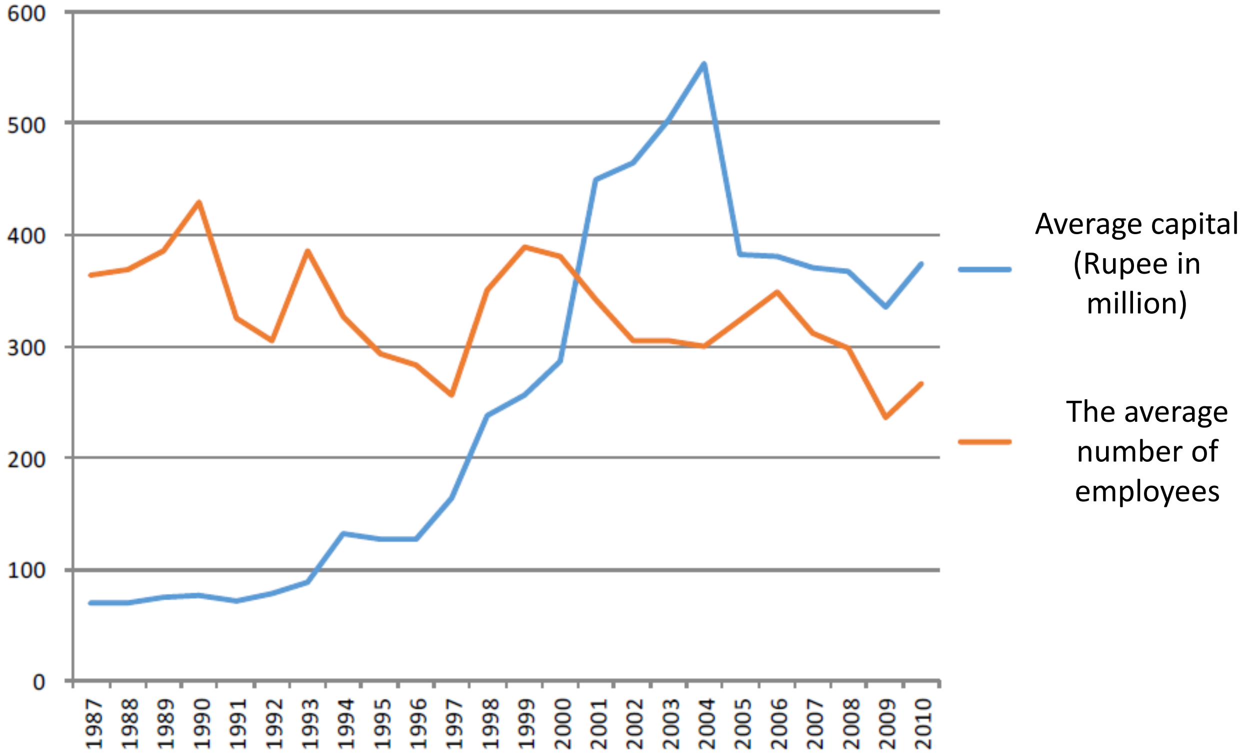
Source: Author's elaboration based on MOF "Situation of Outward and Inward Direct Investment" for 1989-2004 and "Process of Outward/Inward Direct Investment" for 2005-2013.

Number of Japanese Companies, Employees and Capital in India



Source: Author's elaboration based on RIEB "Multinational Corporation Database".

Japanese Companies' Average Capital in India



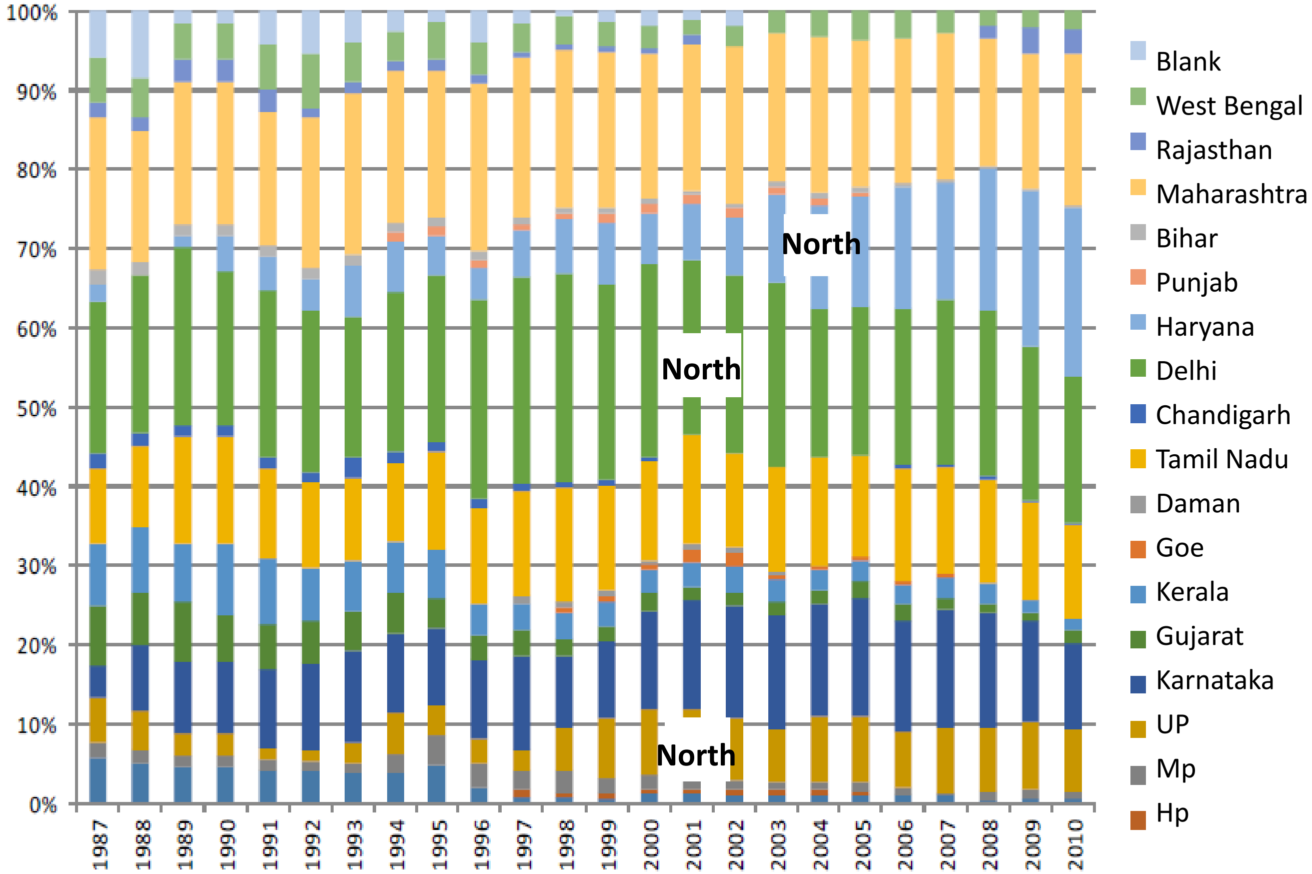
Source: Author's elaboration based on RIEB "Multinational Corporation Database".

9

The source: http://www.freemap.jp/itemDownload.php?b=asia&s=india&t=gif

10

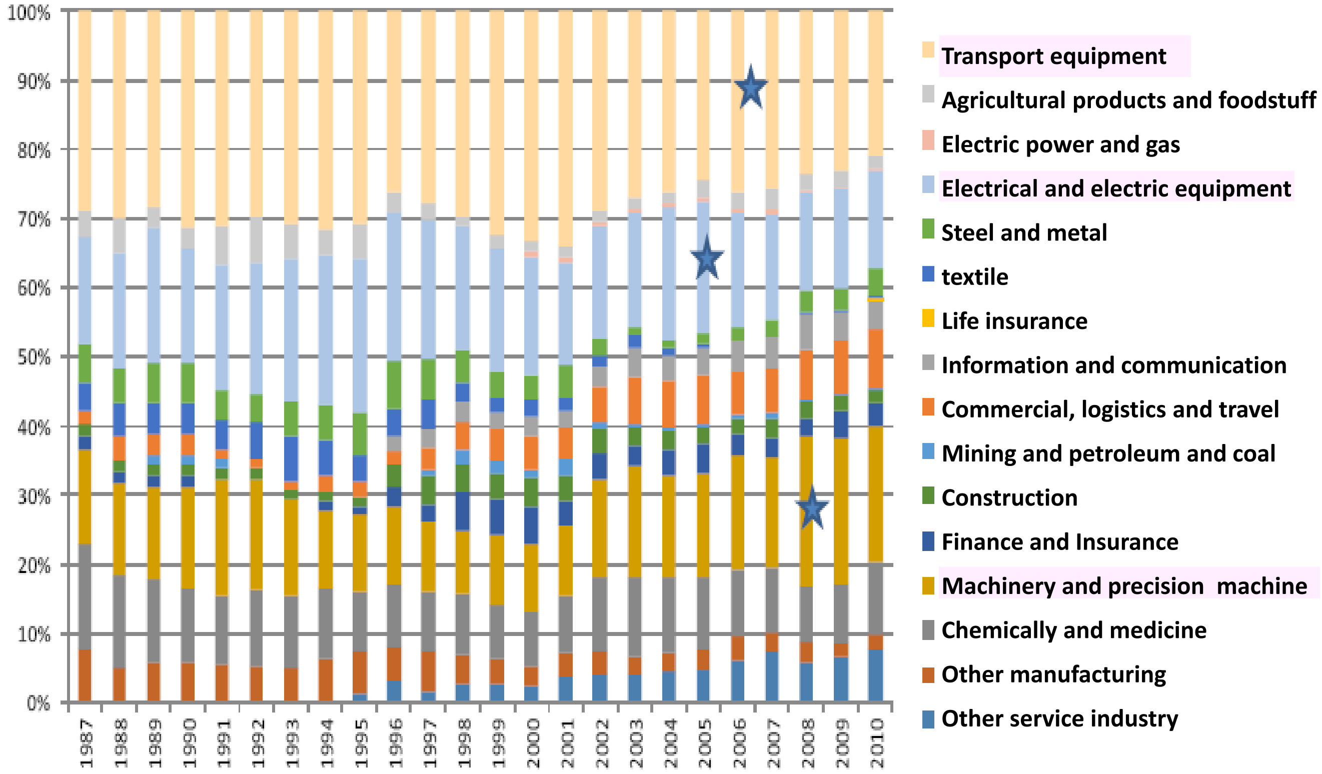
Locations of Japanese Companies



Source: Author's elaboration based on RIEB "Multinational Corporation Database".

11

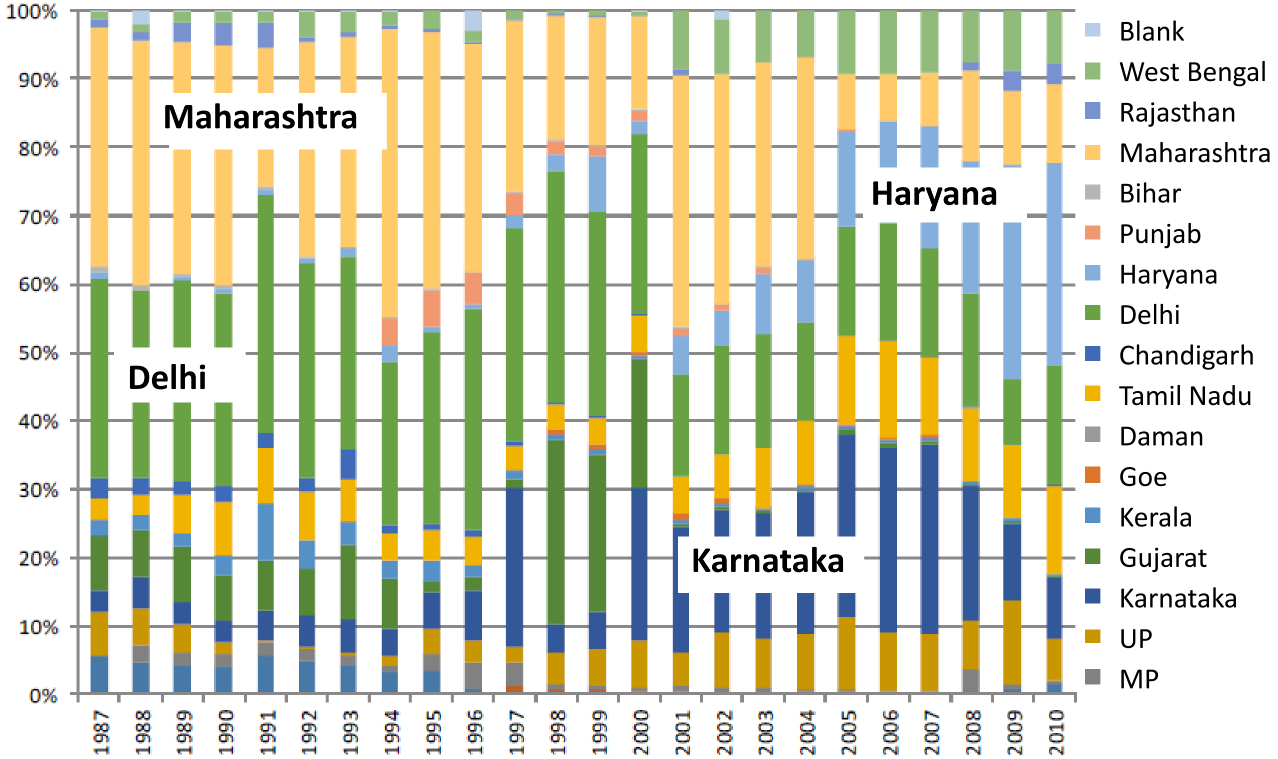
Industrial Sectors of Japanese Companies in India



Source: Author's elaboration based on RIEB "Multinational Corporation Database".

12

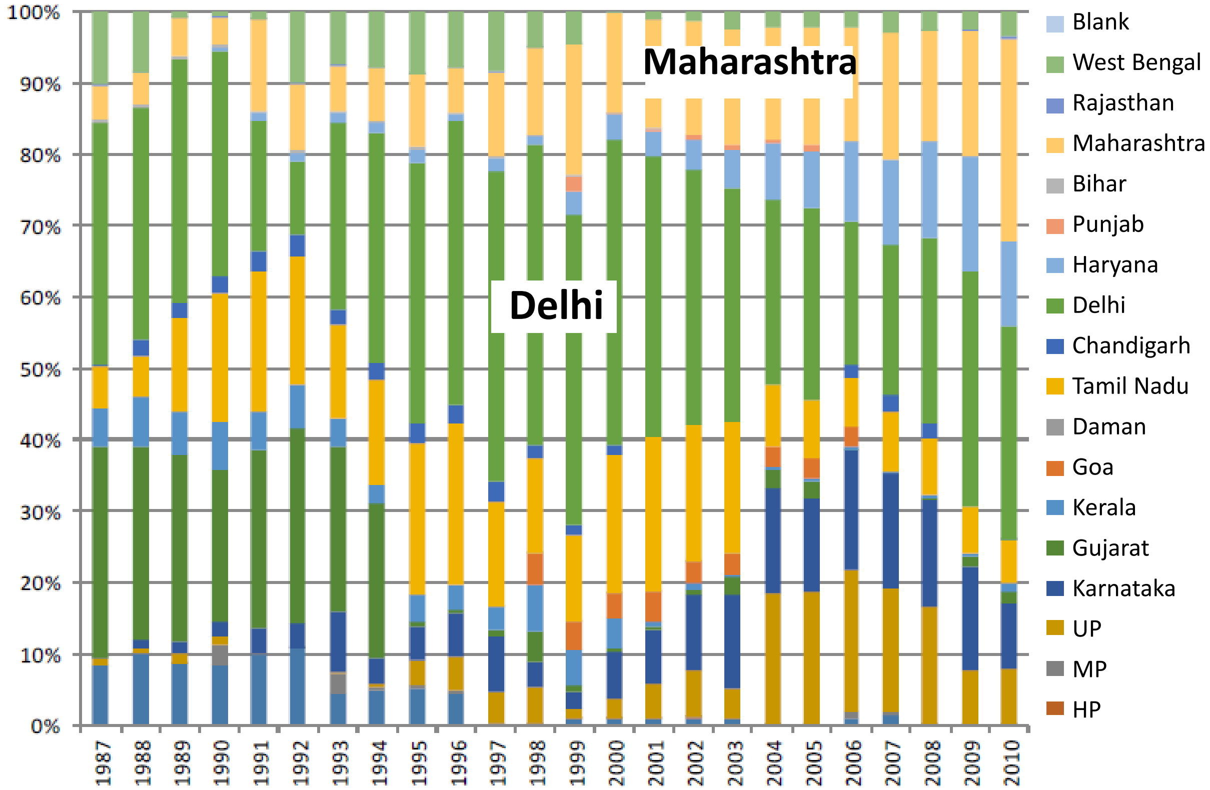
Distribution of Japanese Companies' Capital Across States



Source: Author's elaboration based on RIEB "Multinational Corporation Database".

13

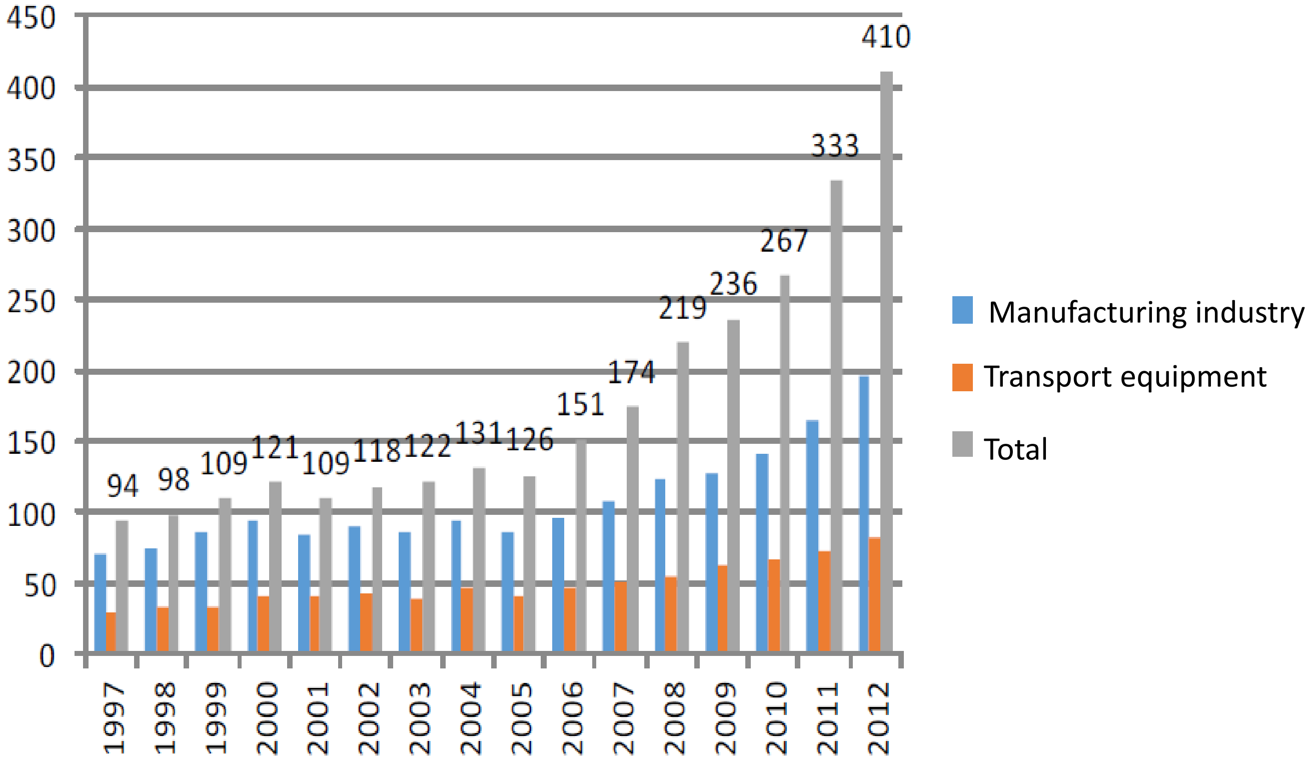
Distribution of Japanese Companies' Employees



Source: Author's elaboration based on RIEB "Multinational Corporation Database".

14

Number of Japanese Companies in India

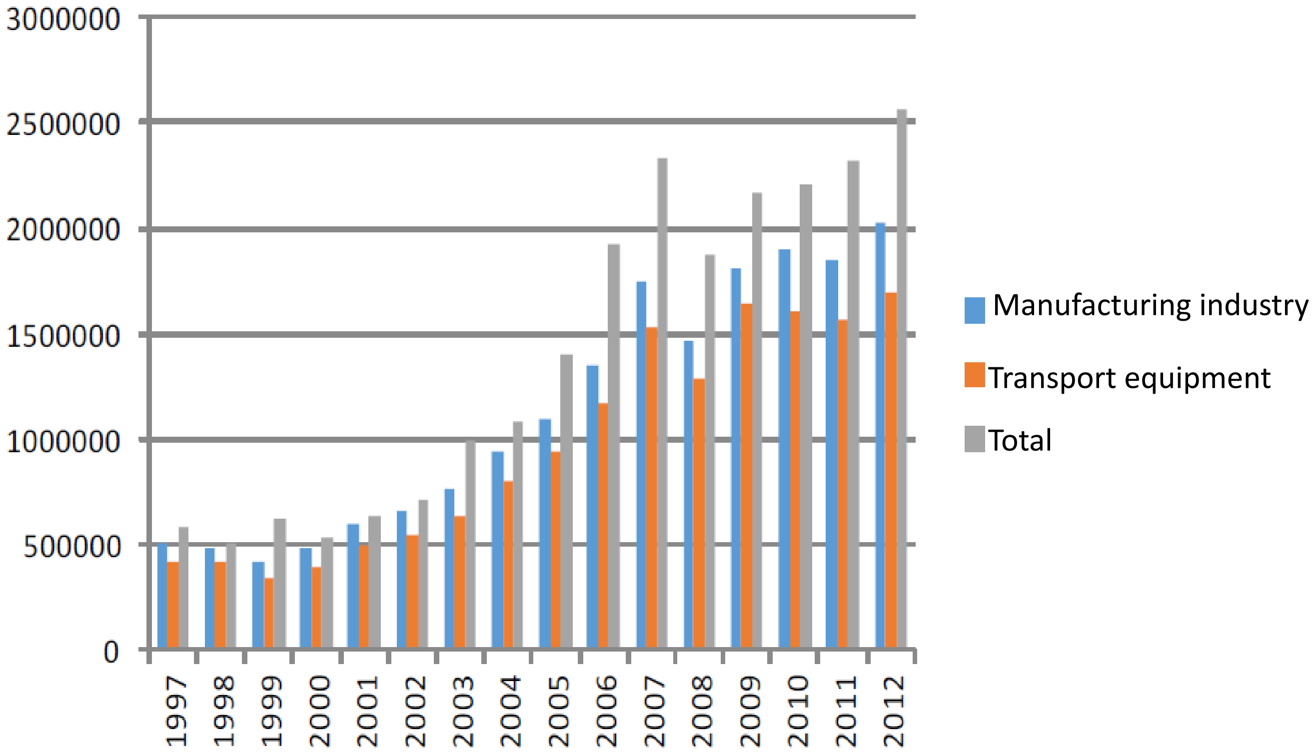


Source: Author's elaboration based on METI "Survey of Overseas Business Activities".

15

Japanese Companies' Sales in India

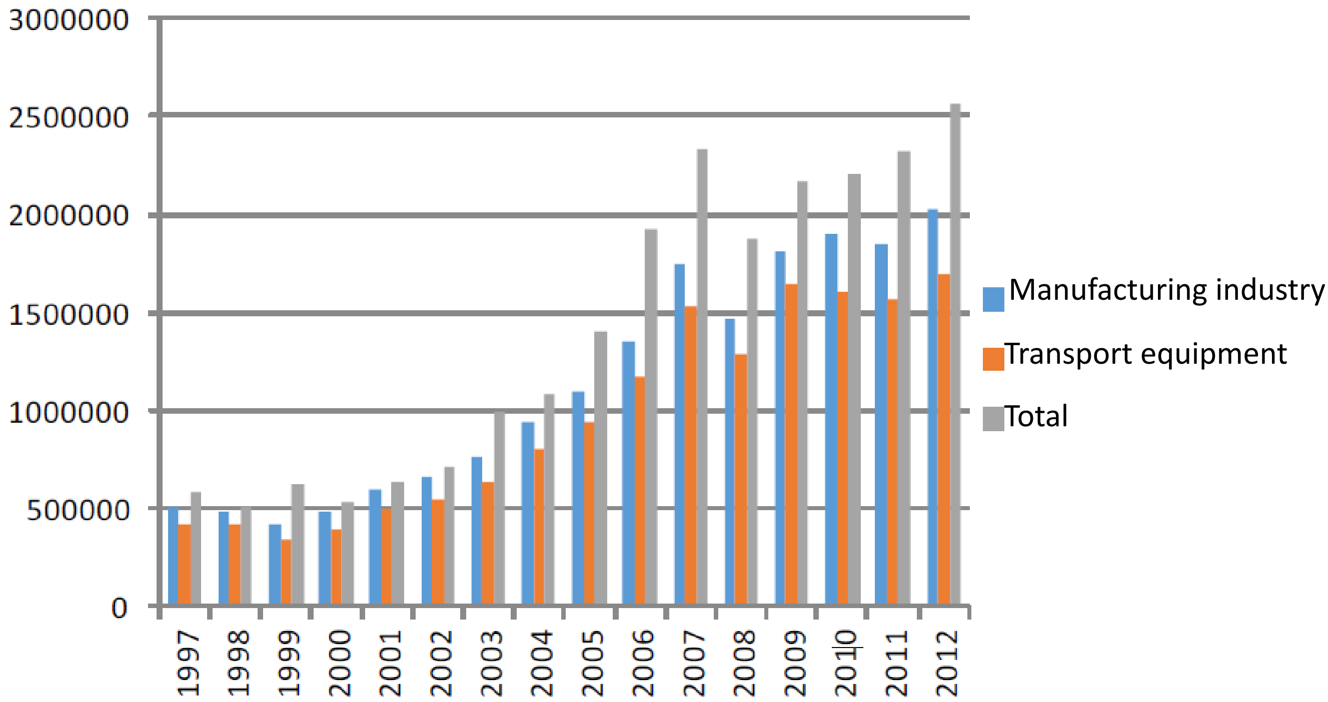
JP yen in million



Source: Author's elaboration based on METI "Survey of Overseas Business Activities".

16

Number of Japanese Companies' Employees in India



Source: Author's elaboration based on METI "Survey of Overseas Business Activities".

17

3. The Results of Questionnaire Survey (2013-14)

(1) Responding and Non-Responding Japanese Companies

18

Methodology

- Embassy of Japan in India and JETRO, *Japanese Companies List, October 2012* covering 926 Japanese Companies is set as the bench mark for making the ``population list.''
- By employing the independent sources, additional companies are added to Embassy of Japan in India and JETRO list. ``Master file'' covering 969 companies is made.
- Master file has a lot of duplicates of the companies. We drop the duplicates and finally get unique 620 companies. The list of these 620 companies is regarded as our ``population list.''
- We request all of 620 companies to make answer to our questions during the period December 2013 to February 2014. Finally we got 113 responses. 5 companies do masking their own names.
- We look for the basic corporate information on all of 620 companies by employing online query of Ministry of Corporate Affairs. We finally get the basic corporate information covering 524 companies. Then, this information is merged into ``population list.''

19

Characteristics of Responding Companies and Non-responding

	Non-responding	Responding	Total	Responding/ Total
Number of companies	512	108	620	17%
Number of identified companies	432	92	524	18%
Capital(Rupee in hundreds of million)	5763	637	6400	10%
Average capital(Rupee in hundreds of million)	13.34	6.92	12.21	87%

- 5 anonymous companies are excluded from the group of responding companies.
- Response rate: 17%.
- Share of capital of responding companies: 10%.
- Average capital of responding companies is also smaller.

20

Characteristics of Responding Companies and Non-responding Companies(2)

	Non-responding	Responding	Total
Others	3%	1%	3%
Other services	21%	19%	20%
Commerce, transportation	20%	28%	21%
Manufacturing(Others)	12%	8%	11%
Manufacturing(Chemical and medicine)	7%	10%	7%
Manufacturing(Machinary)	16%	19%	16%
Manufacturing(Metals)	3%	4%	3%
Manufacturing(Transport equipments)	19%	10%	18%
Manufacturing(Food)	0%	0%	0%
Manufacturing(Agricultural)	0%	0%	0%
Total	100%	100%	100%

- Responding companies' share of commerce/ transportation is larger and that of manufacturing (transport equipment) is less.

Characteristics of responding Companies and Non-responding Companies(3)

	Non-responding	Responding	Total
Andhra Pradesh	0%	1%	0%
Daman and Diu	0%	0%	0%
Delhi	35%	50%	37%
Gujarat	0%	1%	0%
Haryana	17%	24%	18%
Himachal Pradesh	0%	0%	0%
Jharkhand	0%	0%	0%
Karnataka	4%	5%	4%
Kerala	1%	0%	0%
Maharashtra	9%	5%	8%
Orissa	0%	0%	0%
Pondicherry	0%	0%	0%
Punjab	1%	0%	0%
Rajasthan	2%	3%	2%
Tamil Nadu	20%	7%	18%
Uttar Pradesh	1%	1%	1%
West Bengal	2%	2%	2%
Unknown	8%	2%	7%
Total	100%	100%	100%

- Location of responding companies is more in Delhi and Haryana and less in Tamil Nadu.

Characteristics of responding Companies and Non-responding Companies(4)

	Non-responding	Responding	Total
Non-governmental company	58%	48%	56%
Foreign subsidiary company	26%	35%	28%
Other company	1%	2%	1%
Non-company	16%	15%	15%
Total	100%	100%	100%

Characteristics of responding Companies and Non-responding Companies(5)

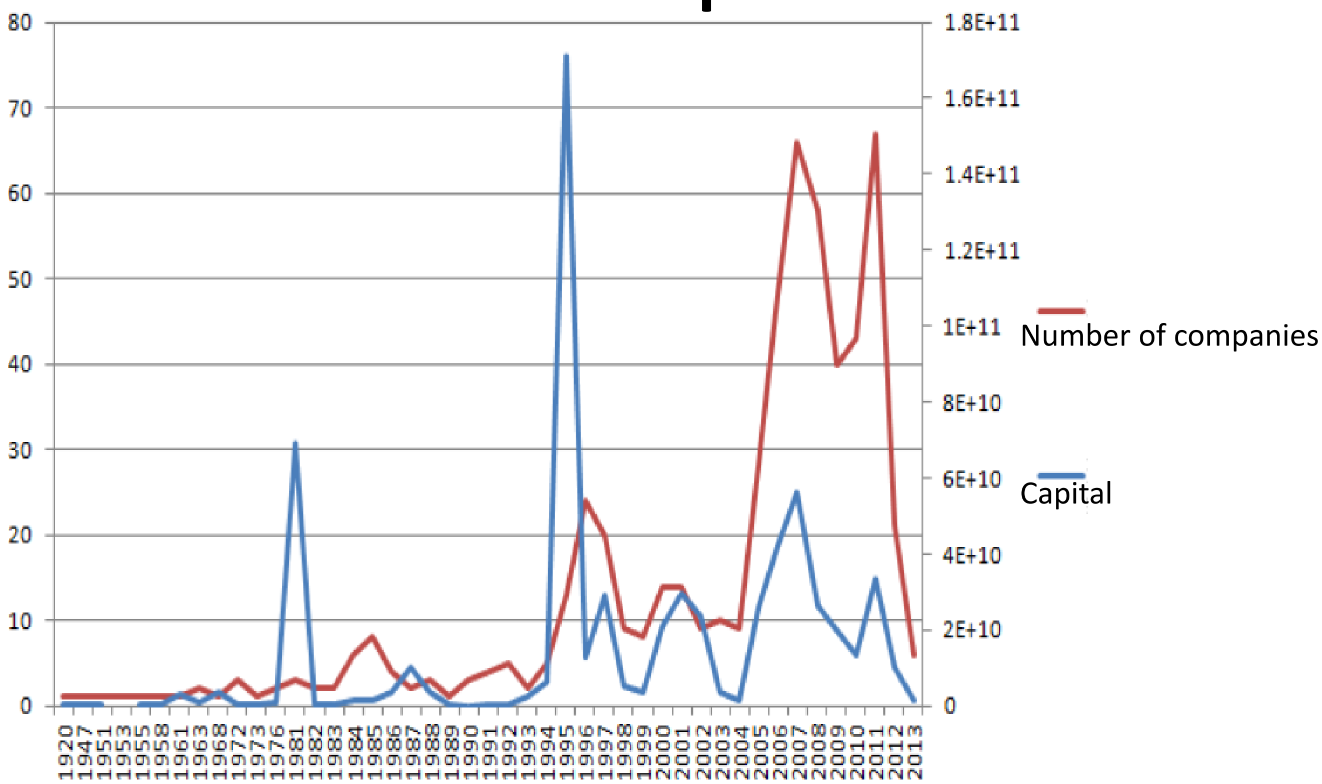
	Non-responding	Responding	Total
Private limited company	67%	77%	69%
Public limited company	18%	9%	16%
Non-company	16%	14%	15%
Total	100%	100%	100%

Characteristics of responding Companies and Non-responding Companies(6)

	Non-responding	Responding	Total
Listed company	5%	3%	5%
Unlisted company	79%	82%	80%
Non-company	16%	15%	15%
Total	100%	100%	100%

- Responding Companies' share of foreign subsidiary company and private limited company is larger.

Establishment year, Number of Companies and Capital

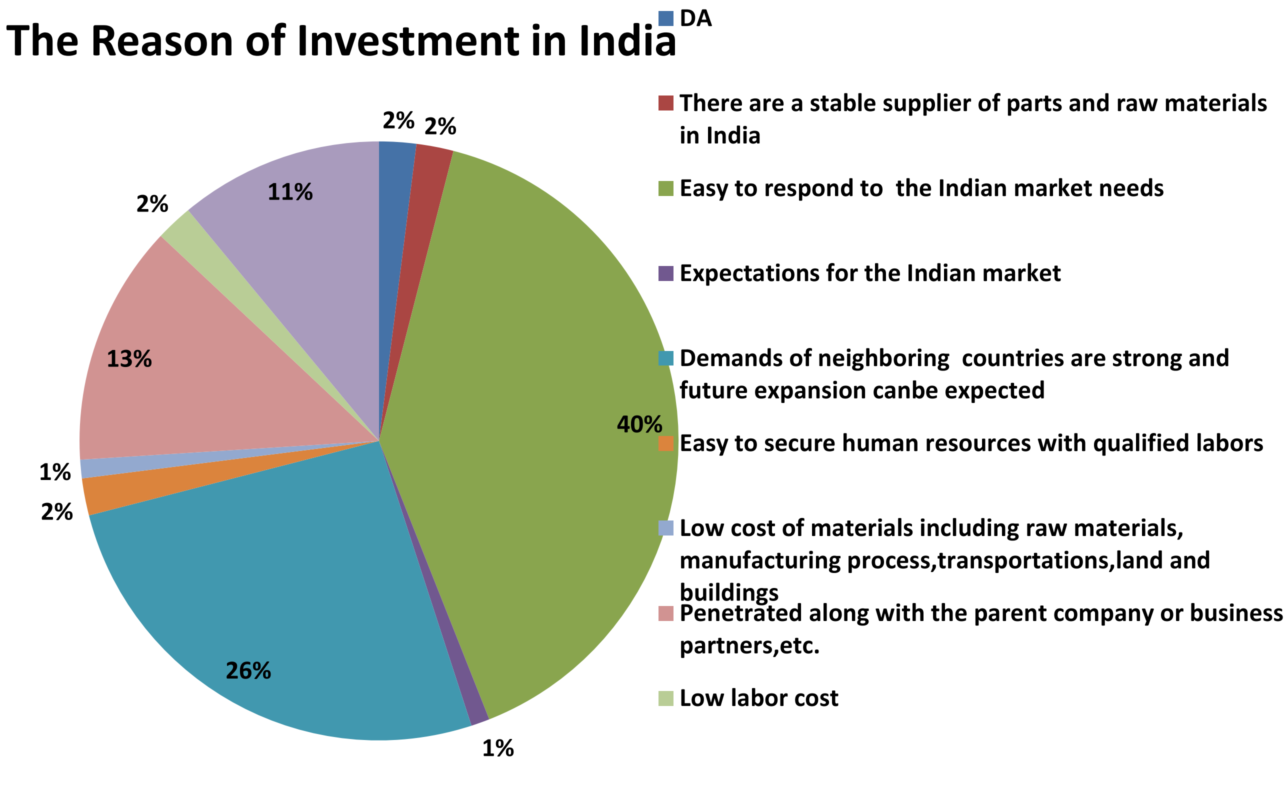


Note: 1981 is the year when Anchor Panasonic and Maruti Suzuki were established and 1995 is the year when TTSL (Tata Teleservices) was established.

3. The Results of Questionnaire Survey (2013-14)

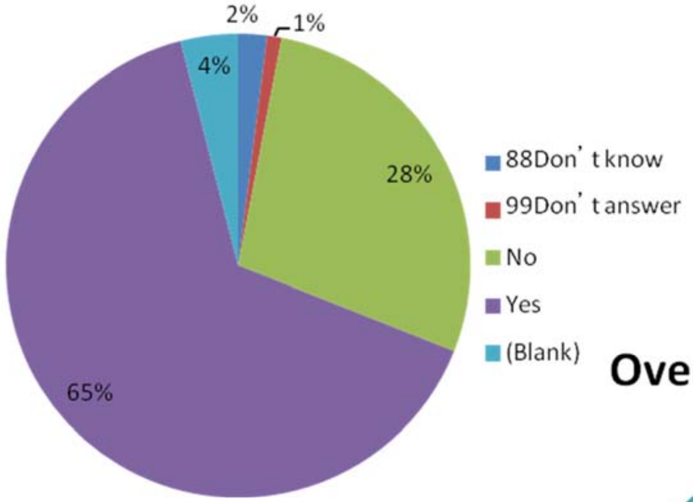
(2) Current Situation of Responding Japanese Companies

25

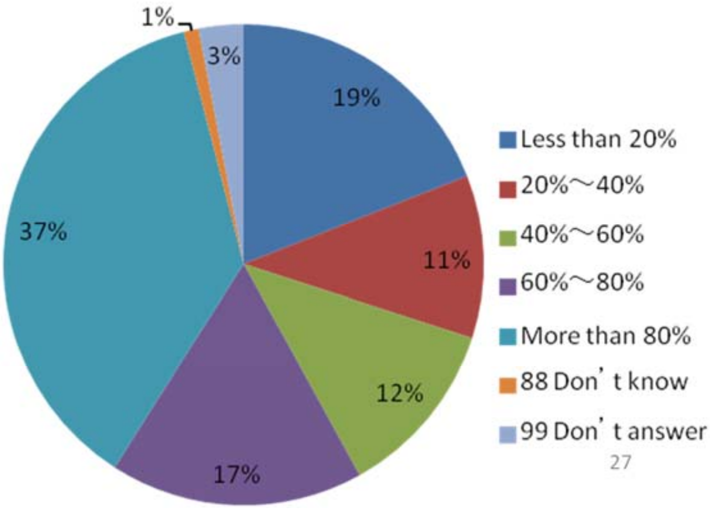


26

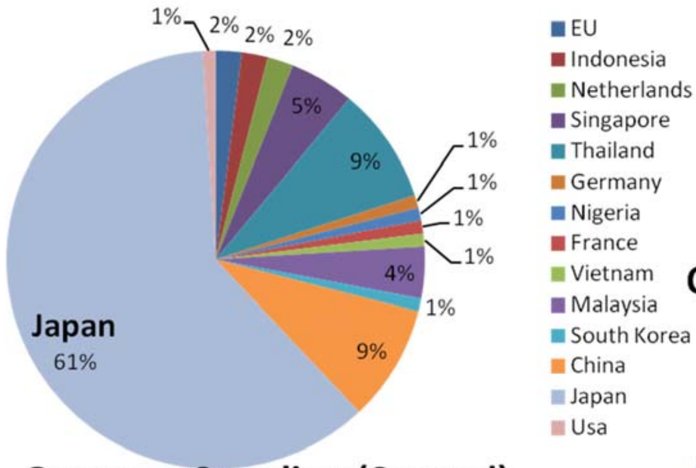
Overseas Procurement



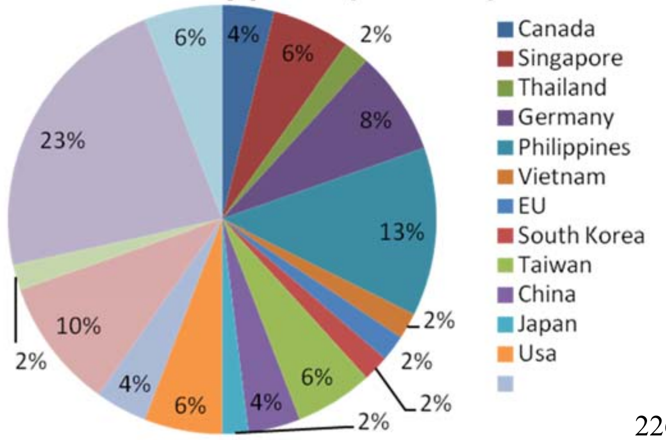
Overseas Procurement rate



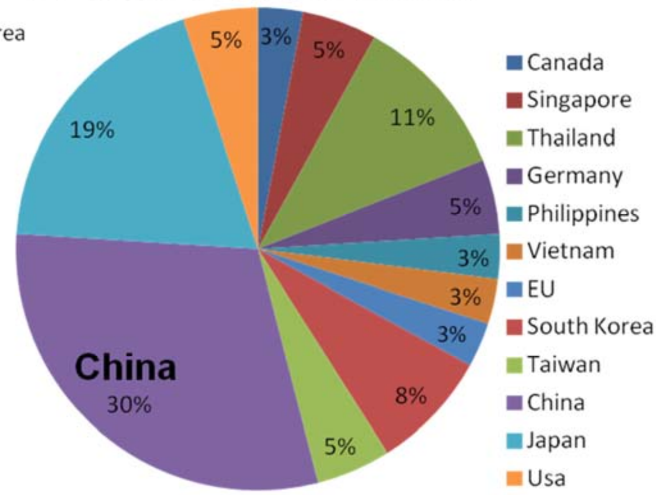
Overseas Suppliers(First)



Overseas Suppliers(Second)

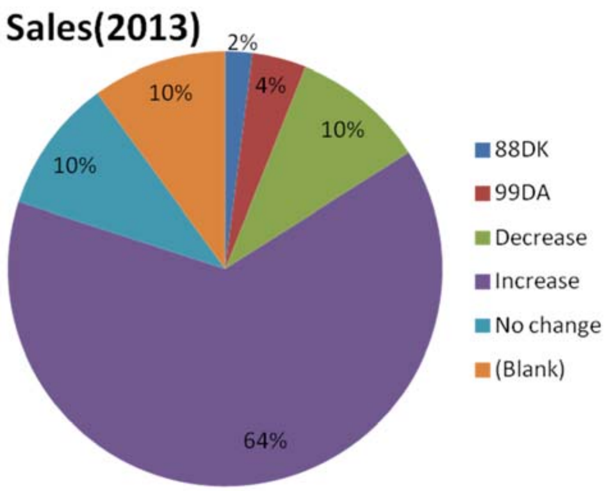


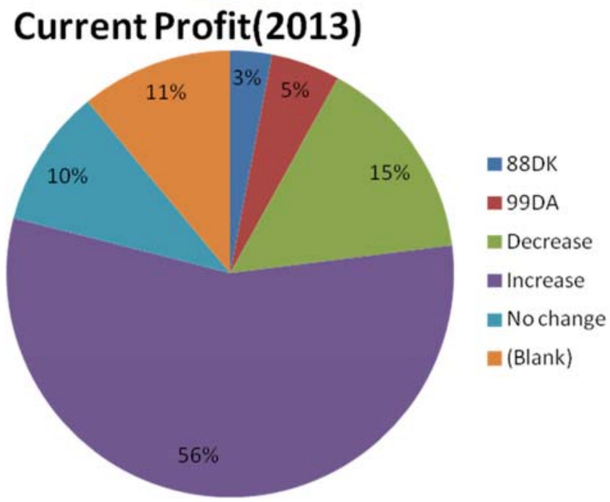
Overseas Suppliers(Third)

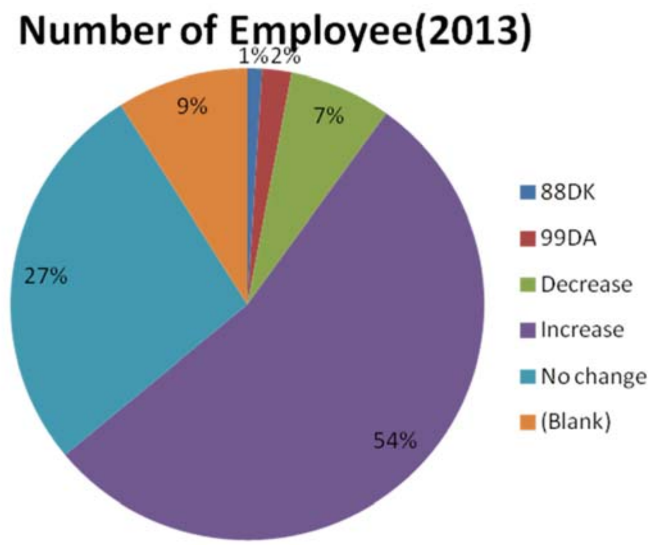


Employment Situation

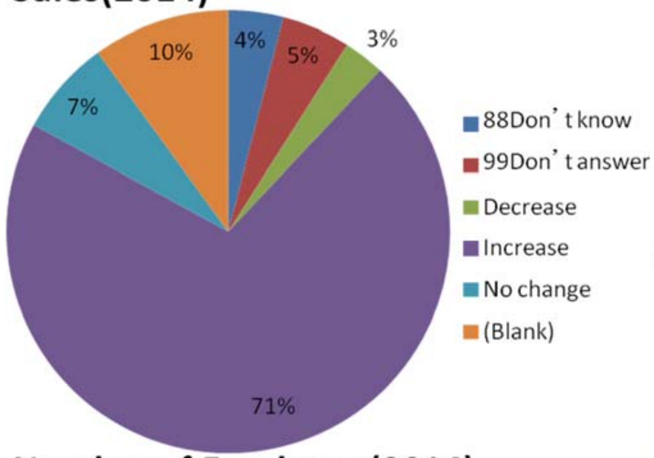
	Average	Min	Max	Total
Number of employees	212	1	3000	23579
Japanese nationality	5	1	90	580
Local Japanese employees	1	0	10	60
Temporary staff	137	0	5000	12291
Turnover	9	0	100	811



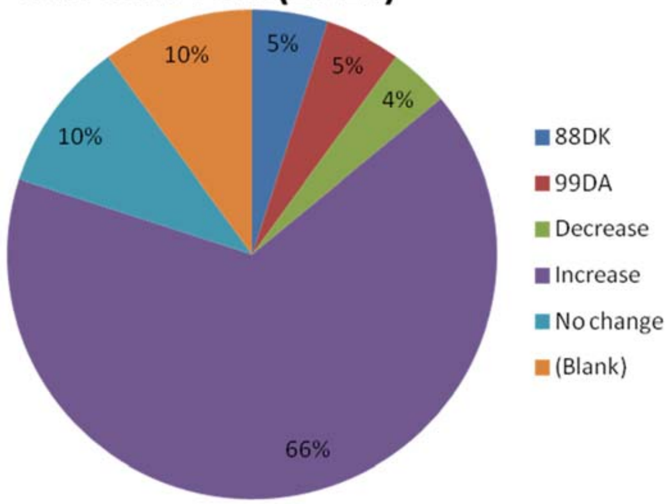




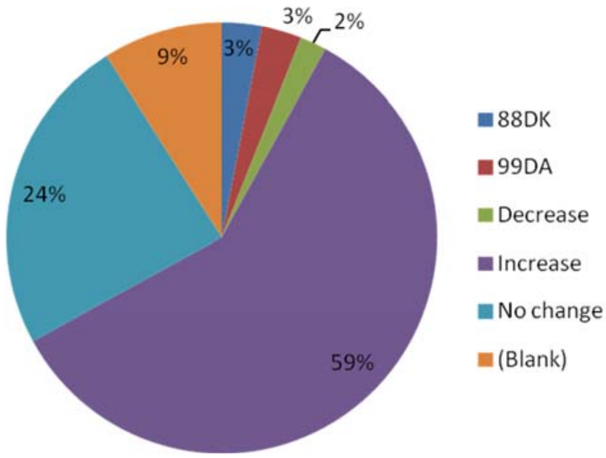
Sales(2014)



Current Profit(2014)

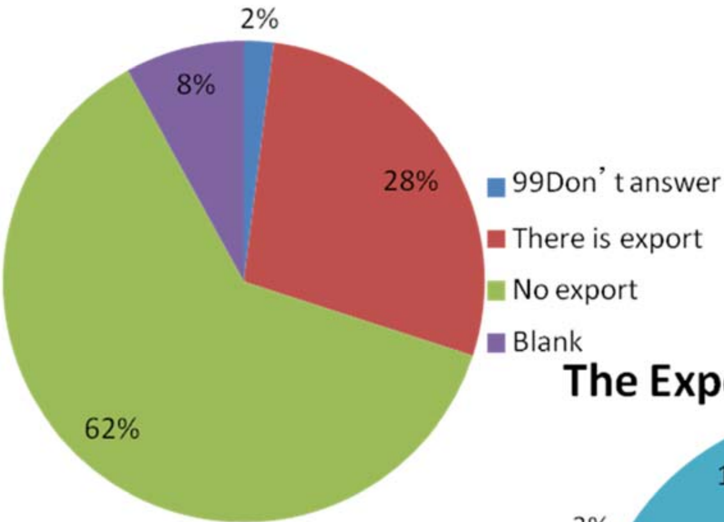


Number of Employee(2014)

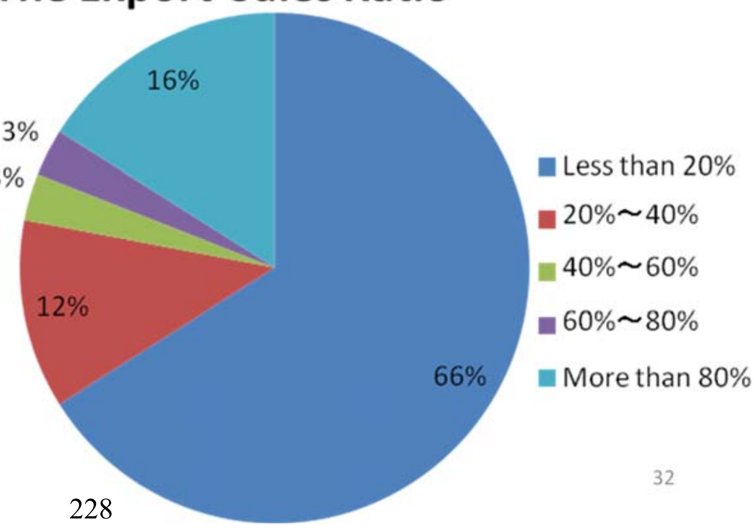


31

Export

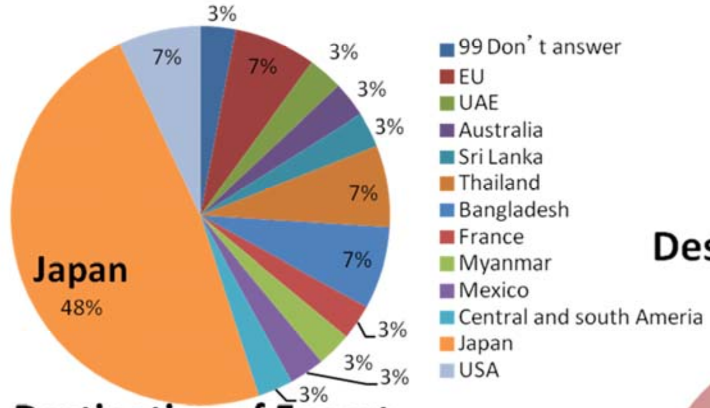


The Export-Sales Ratio

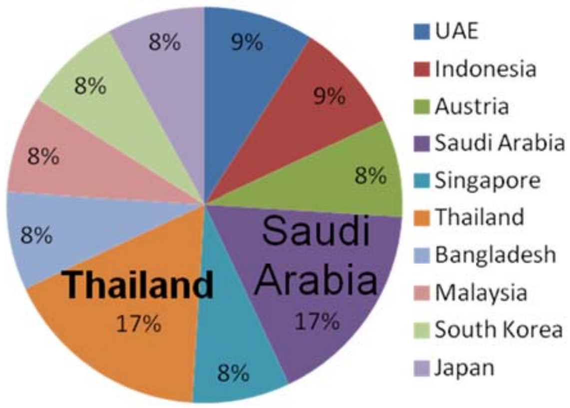


32

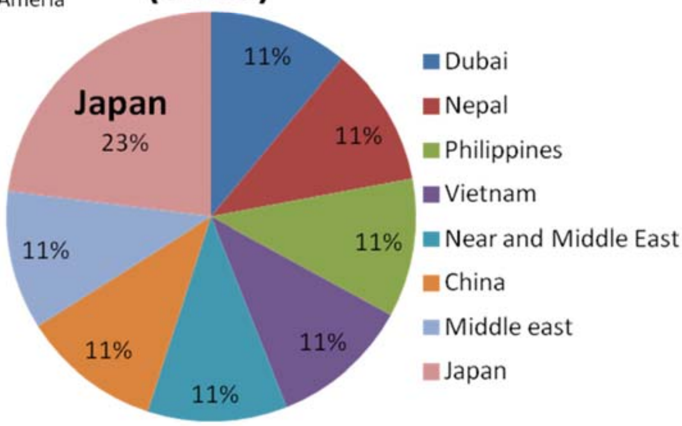
Destination of Export (First)

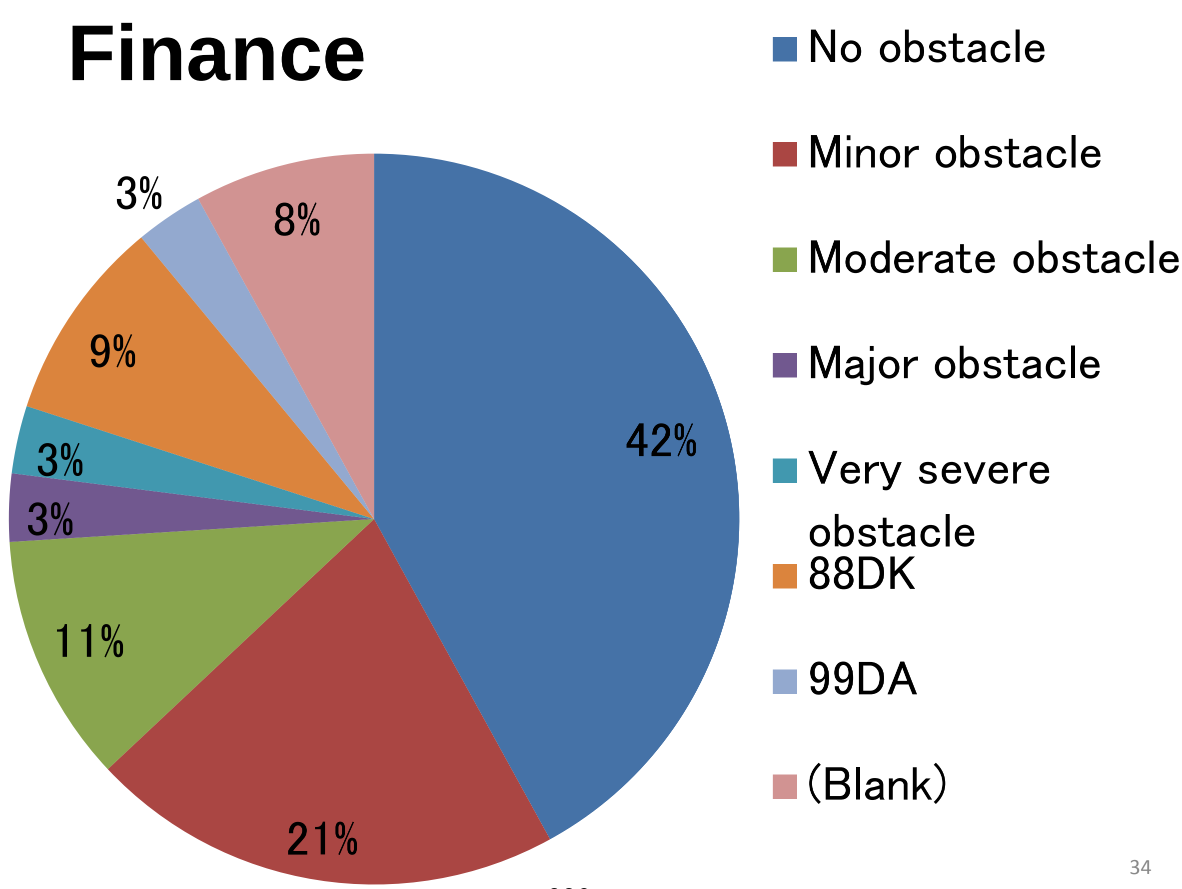


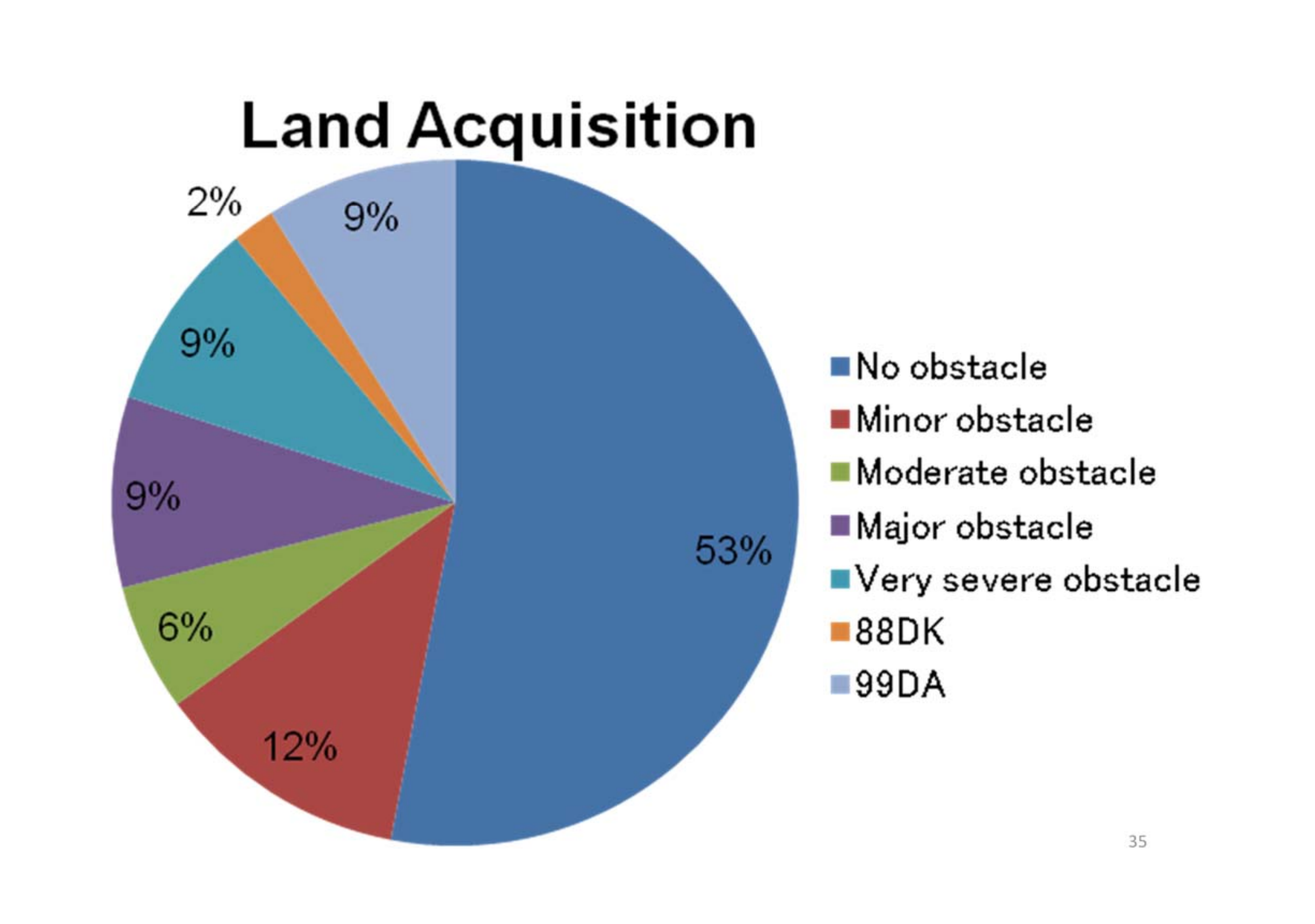
Destination of Export (Second)



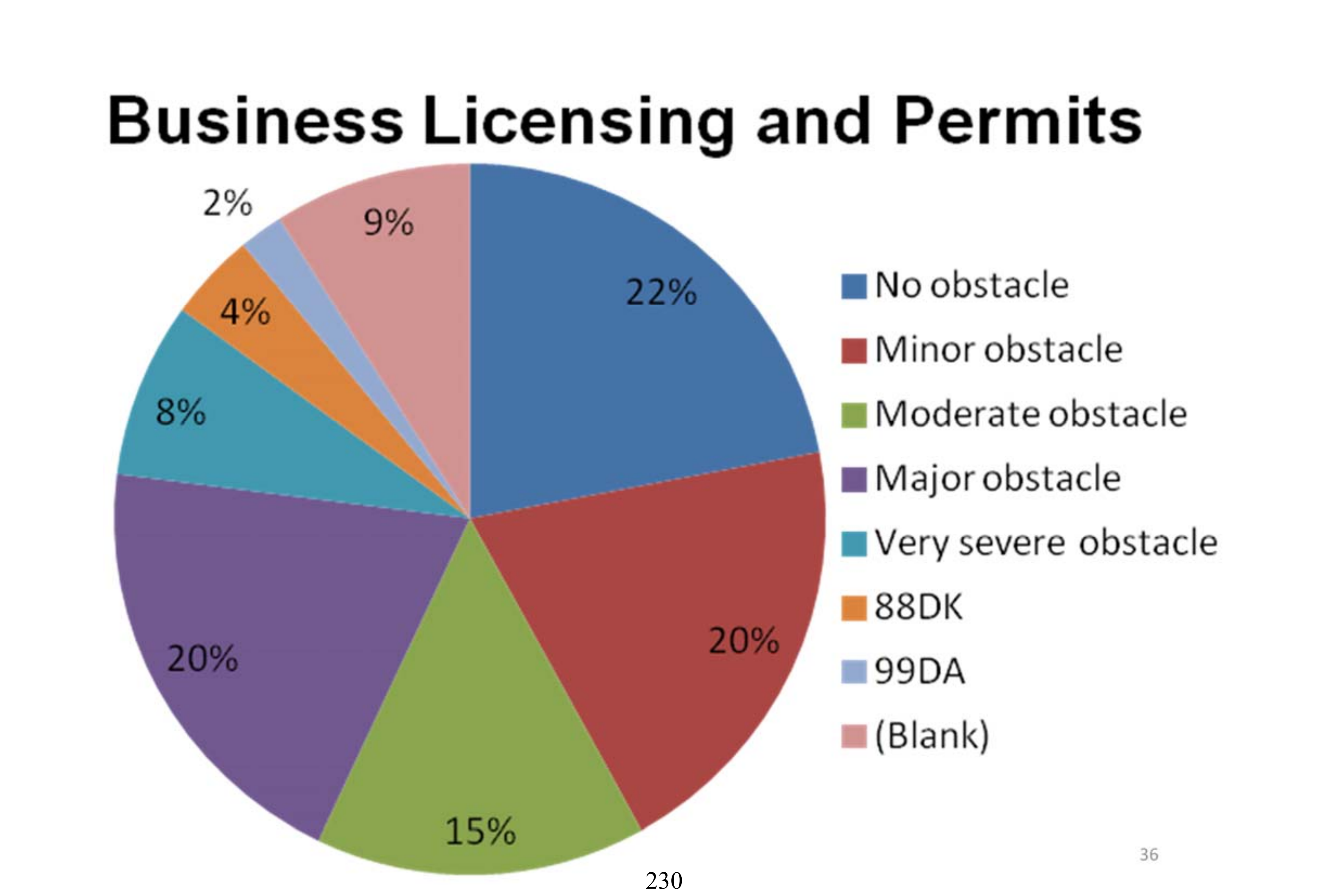
Destination of Export (Third)



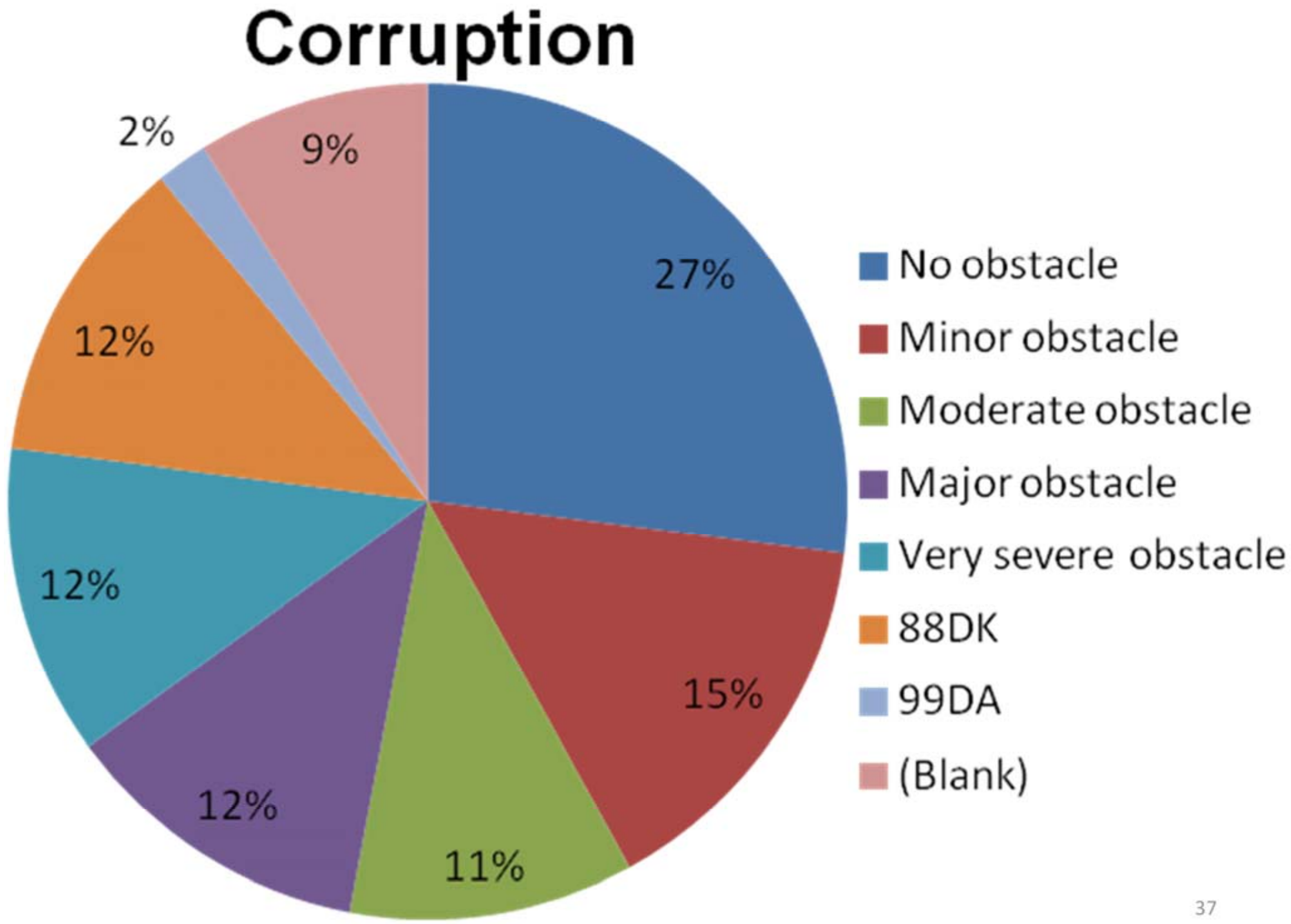




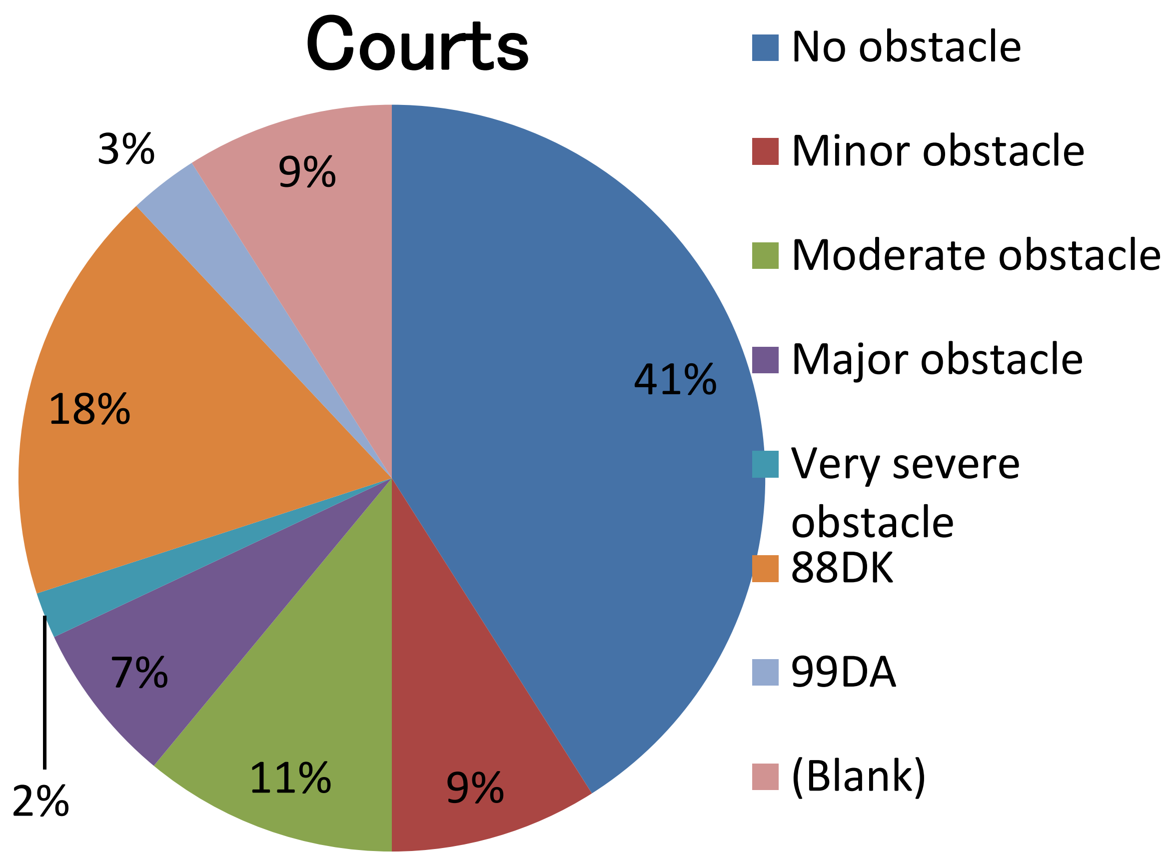
Land Acquisition
2%
9%
9%
9%
6%
12%
53%
No obstacle
Minor obstacle
Moderate obstacle
Major obstacle
Very severe obstacle
88DK
99DA
35



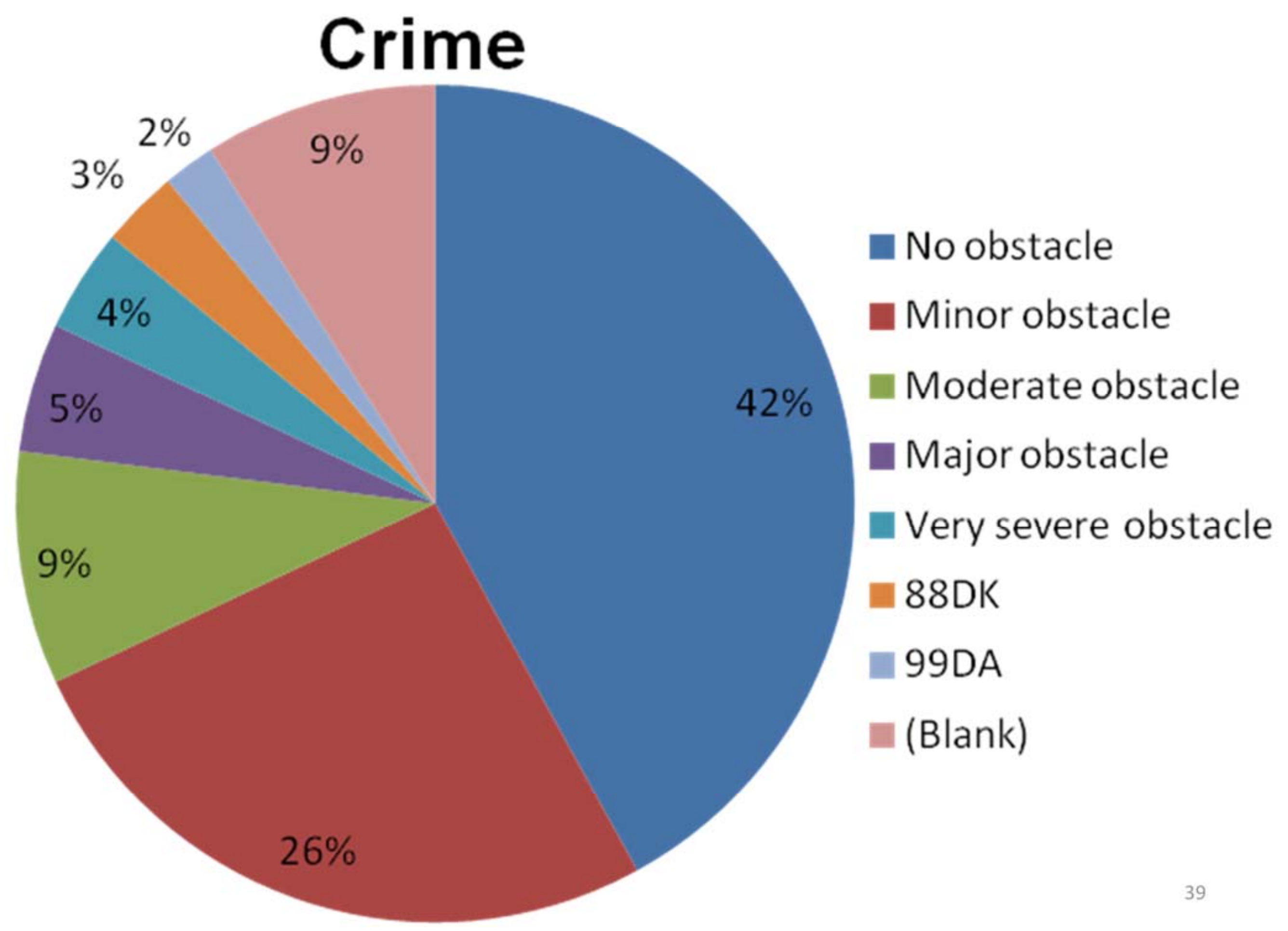
Business Licensing and Permits
2%
9%
22%
4%
8%
20%
20%
15%
No obstacle
Minor obstacle
Moderate obstacle
Major obstacle
Very severe obstacle
88DK
99DA
(Blank)
36

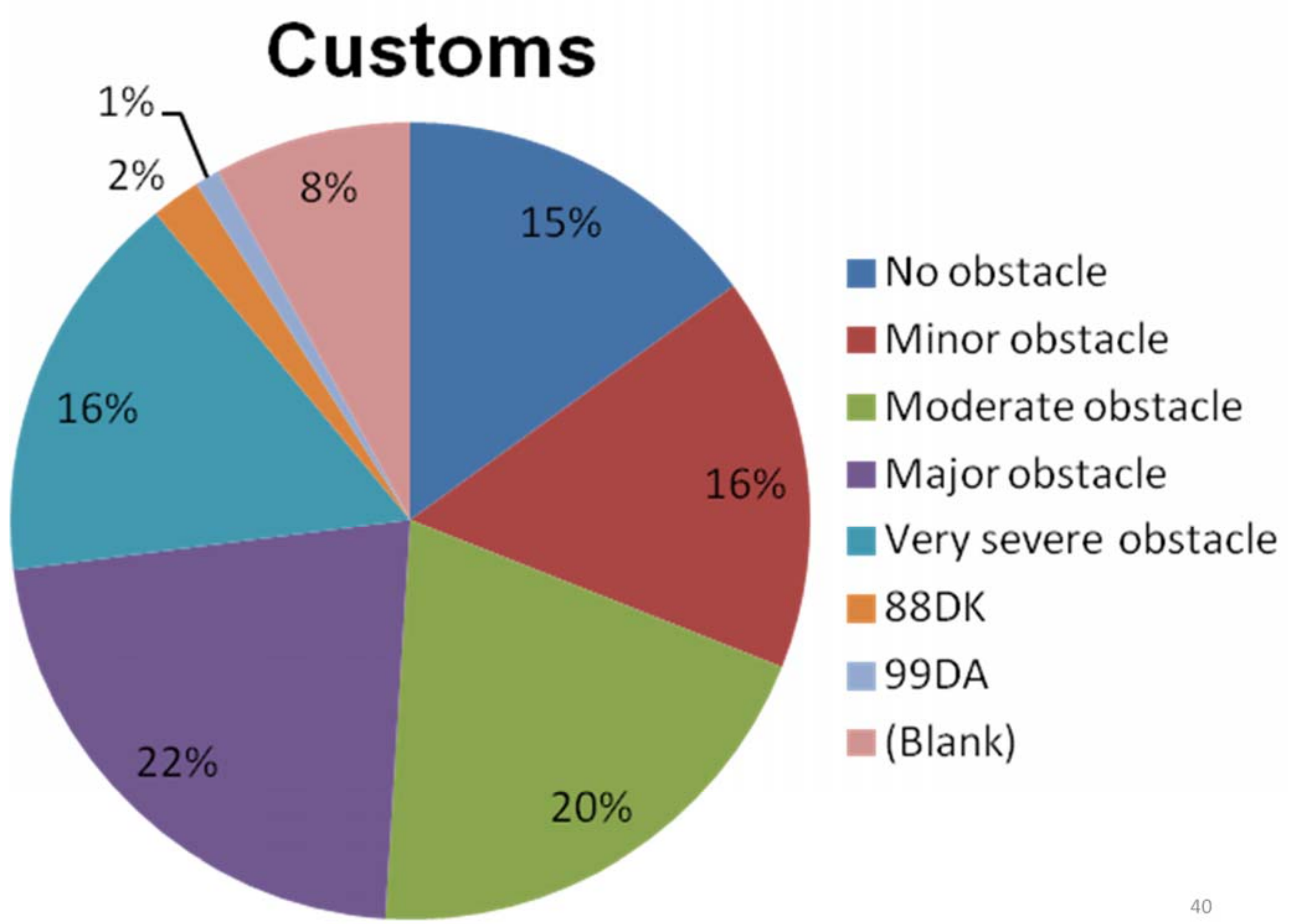

Corruption
27%
15%
11%
12%
12%
12%
2%
9%
No obstacle
Minor obstacle
Moderate obstacle
Major obstacle
Very severe obstacle
88DK
99DA
(Blank)

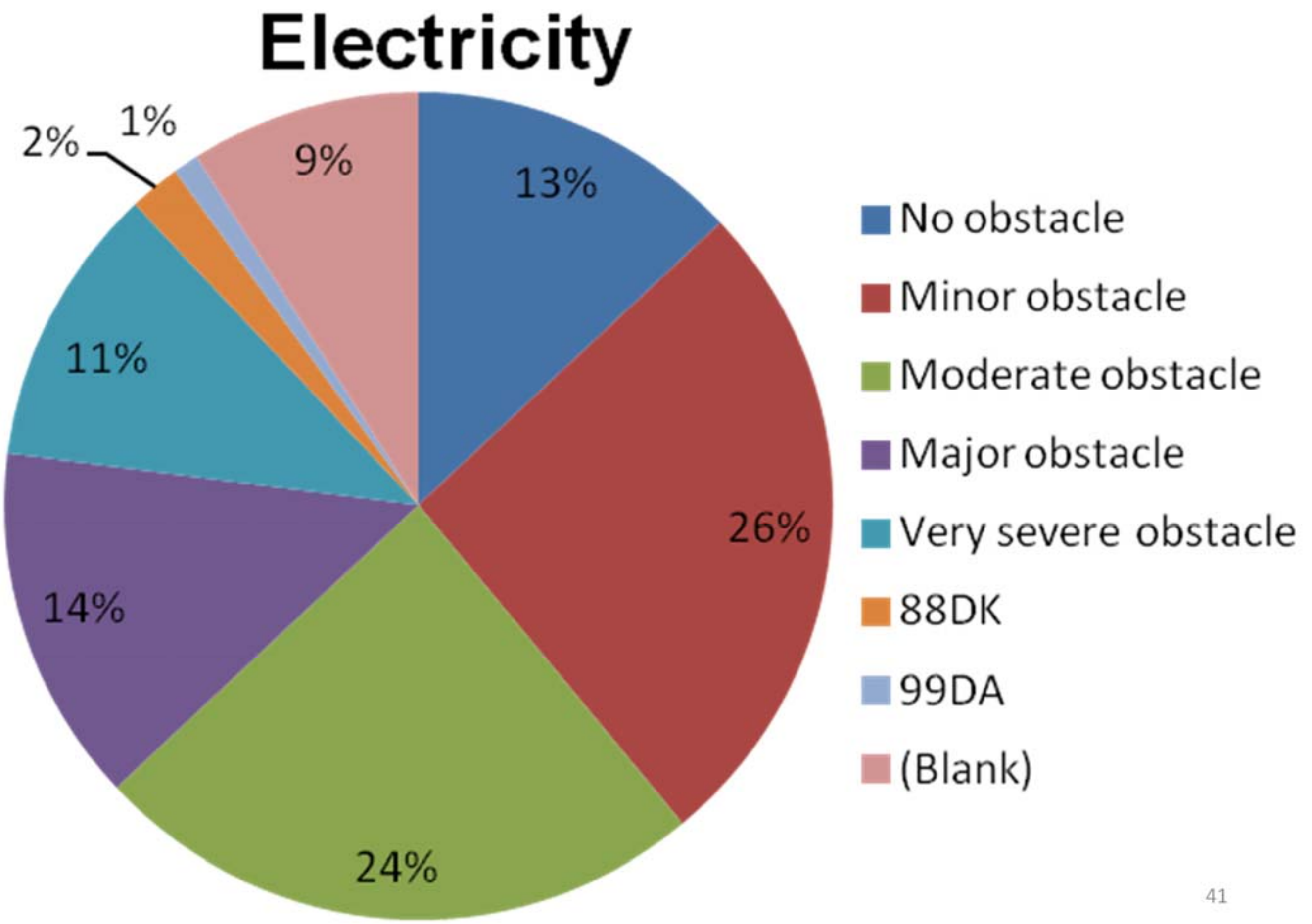
37

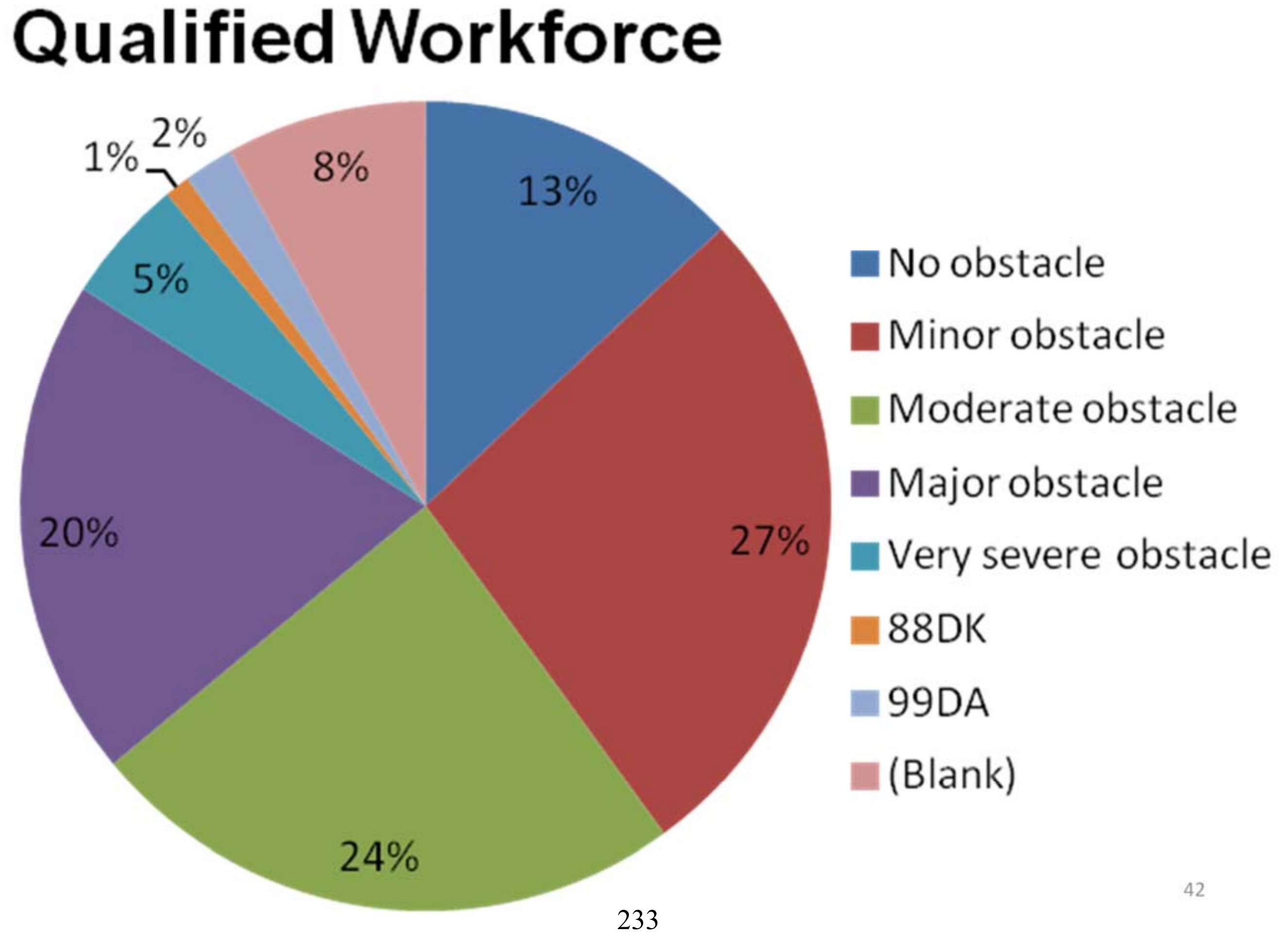

Courts
41%
9%
11%
7%
2%
18%
3%
9%
No obstacle
Minor obstacle
Moderate obstacle
Major obstacle
Very severe obstacle
88DK
99DA
(Blank)

38

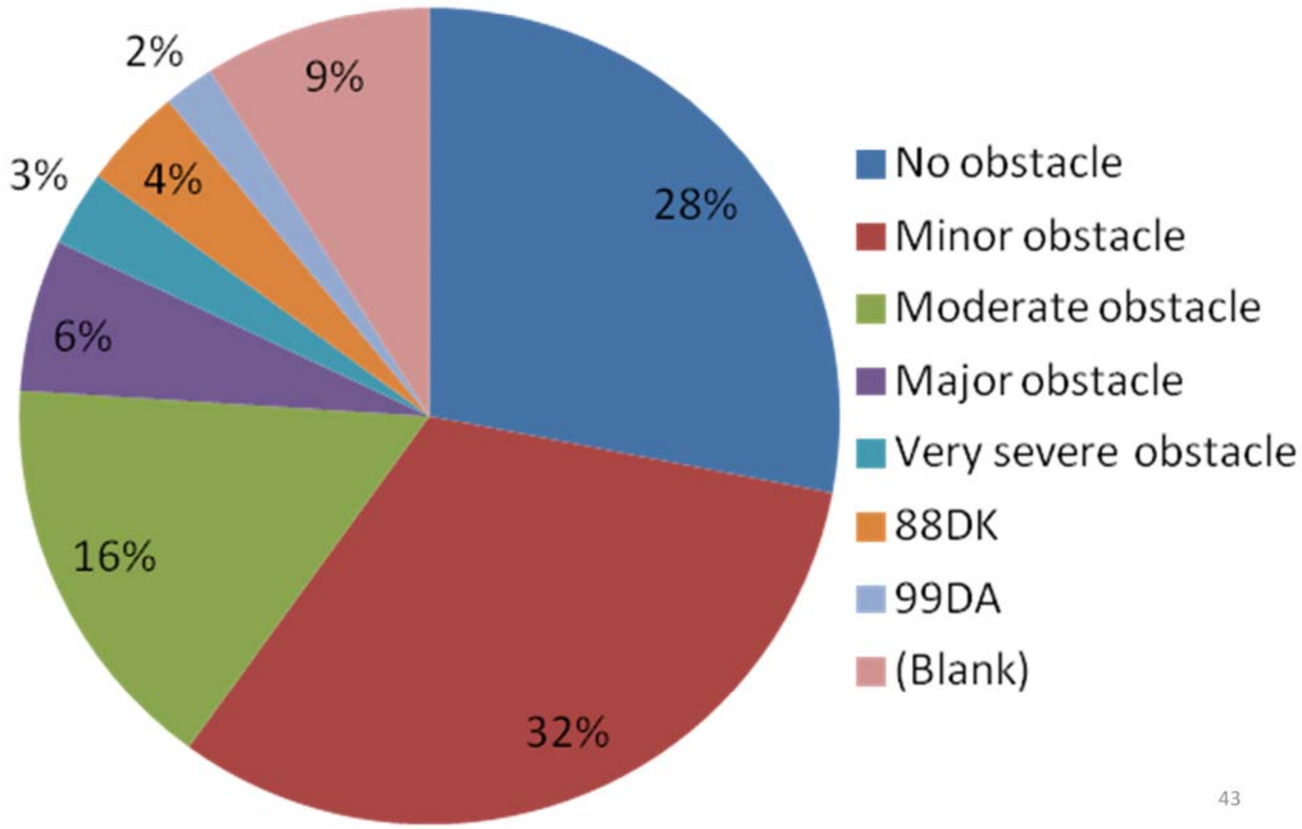

Crime
2%
9%
3%
4%
5%
9%
42%
26%
No obstacle
Minor obstacle
Moderate obstacle
Major obstacle
Very severe obstacle
88DK
99DA
(Blank)
39


Customs
1%
2%
8%
15%
16%
16%
22%
20%
No obstacle
Minor obstacle
Moderate obstacle
Major obstacle
Very severe obstacle
88DK
99DA
(Blank)
40


Electricity
1%
2%
9%
13%
11%
14%
26%
24%
No obstacle
Minor obstacle
Moderate obstacle
Major obstacle
Very severe obstacle
88DK
99DA
(Blank)
41

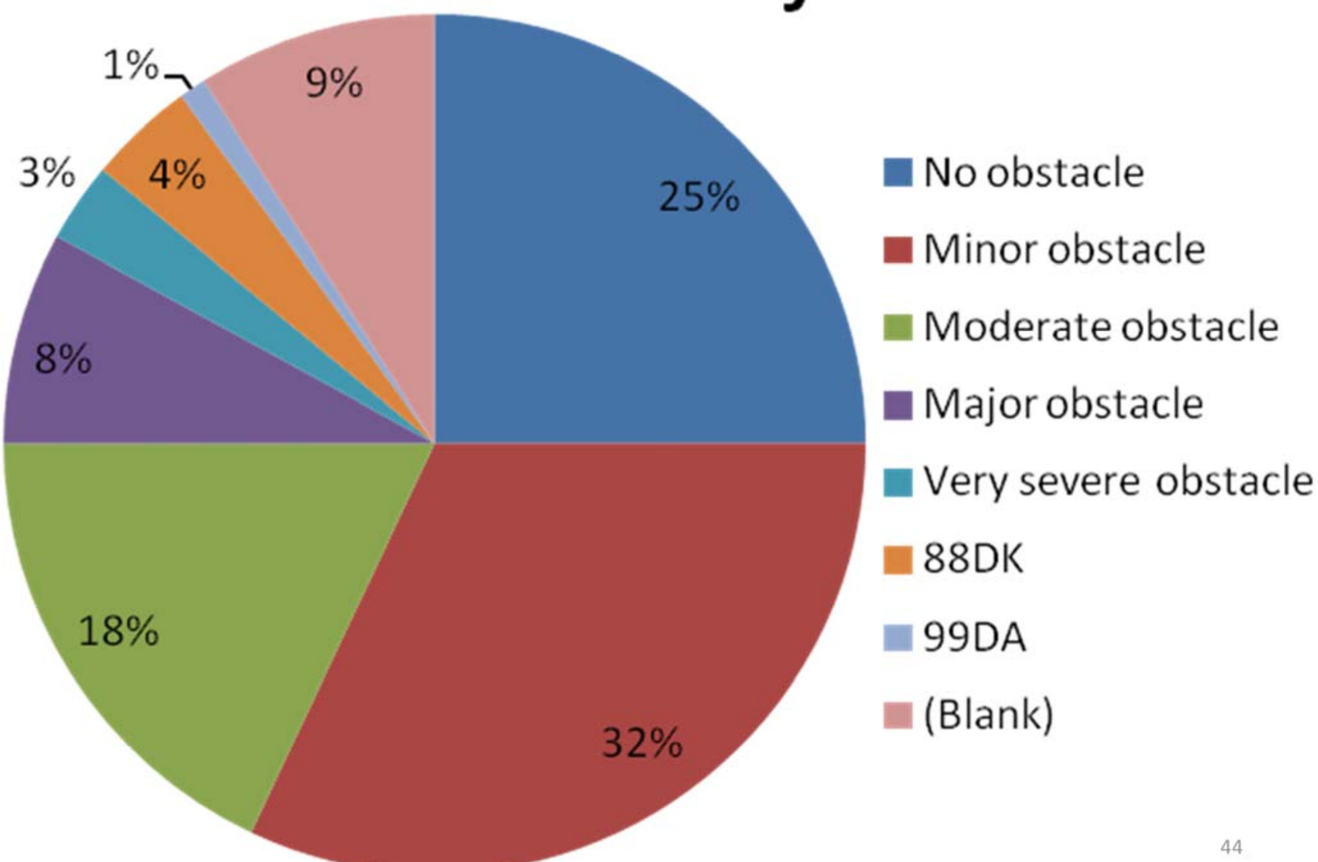

Qualified Workforce
2%
1%
8%
13%
5%
20%
27%
24%
No obstacle
Minor obstacle
Moderate obstacle
Major obstacle
Very severe obstacle
88DK
99DA
(Blank)
42

Labor Regulations



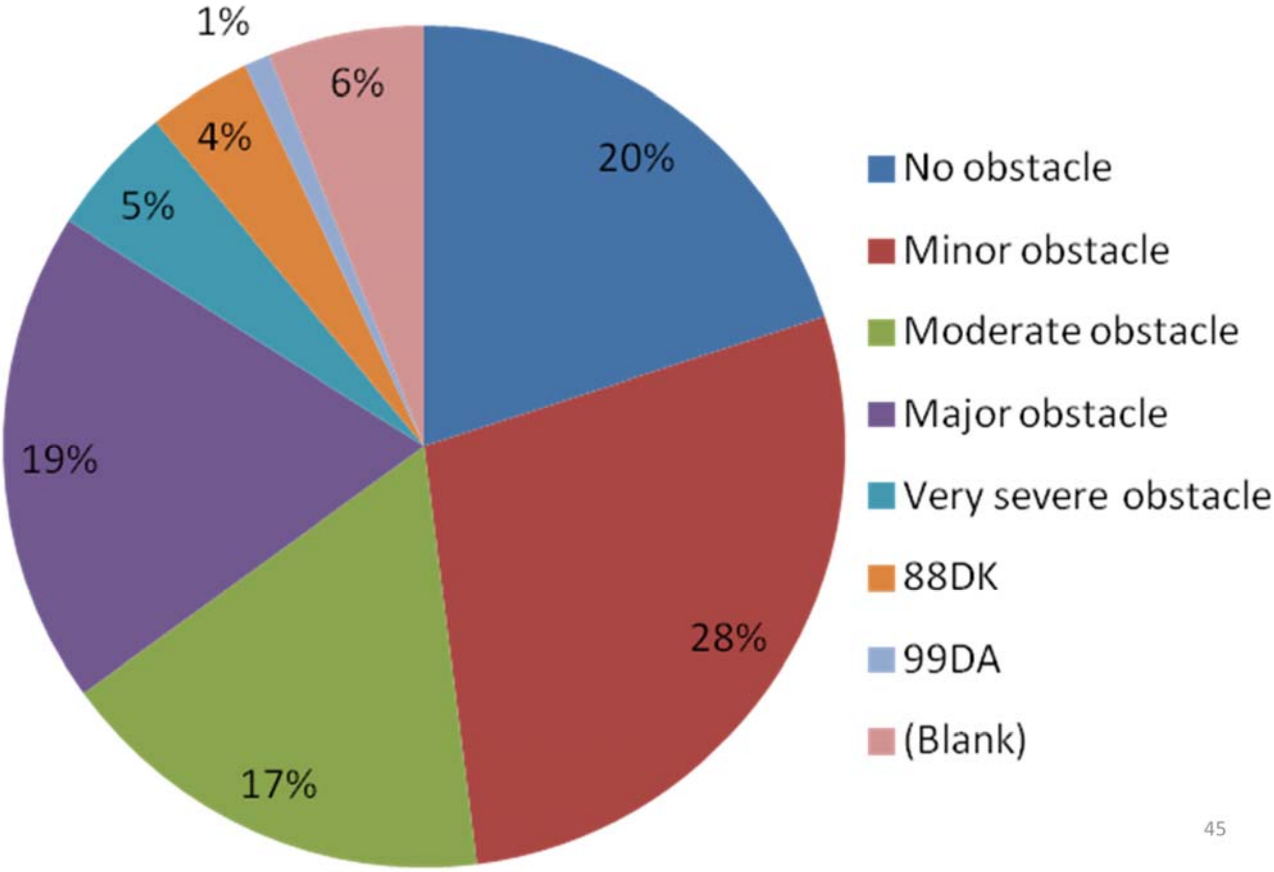
43

Political Instability



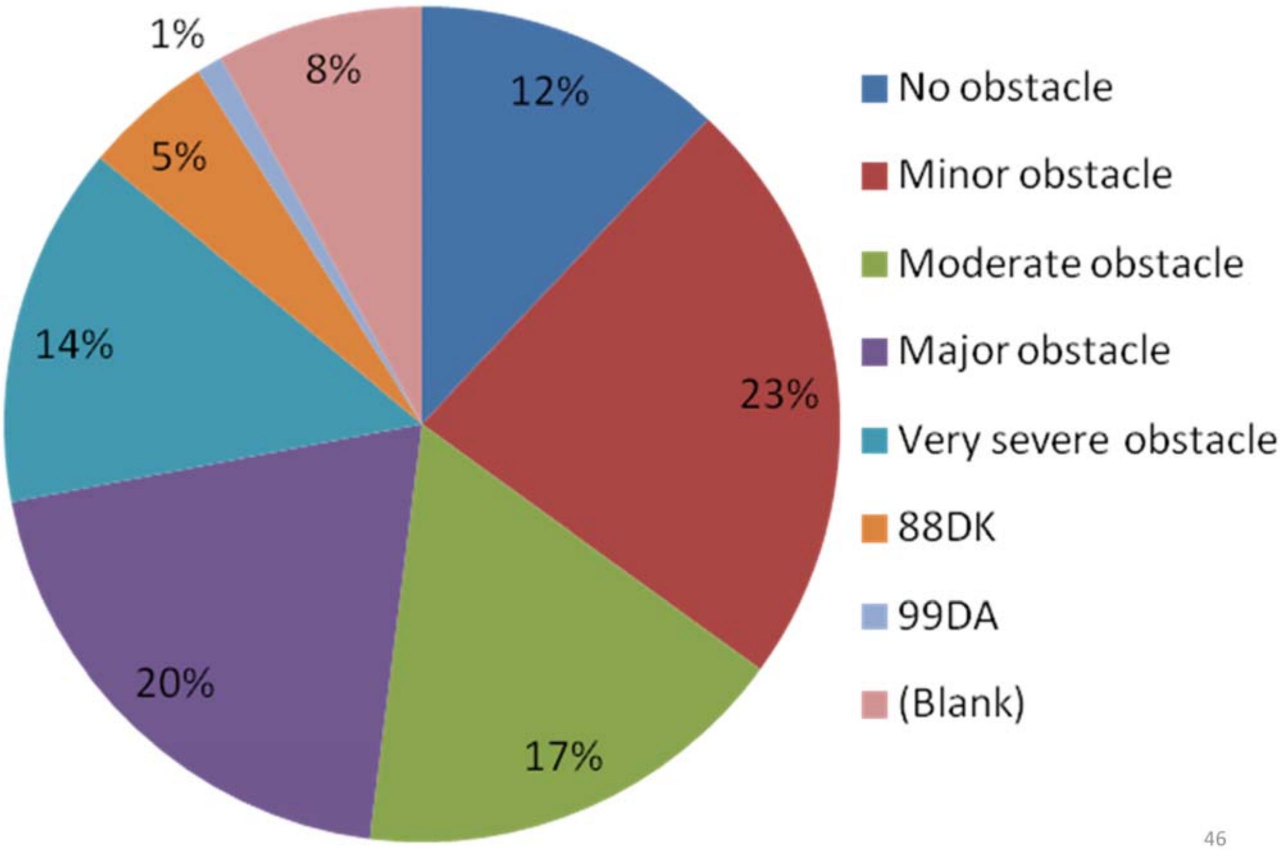
44

Practices of Competitors

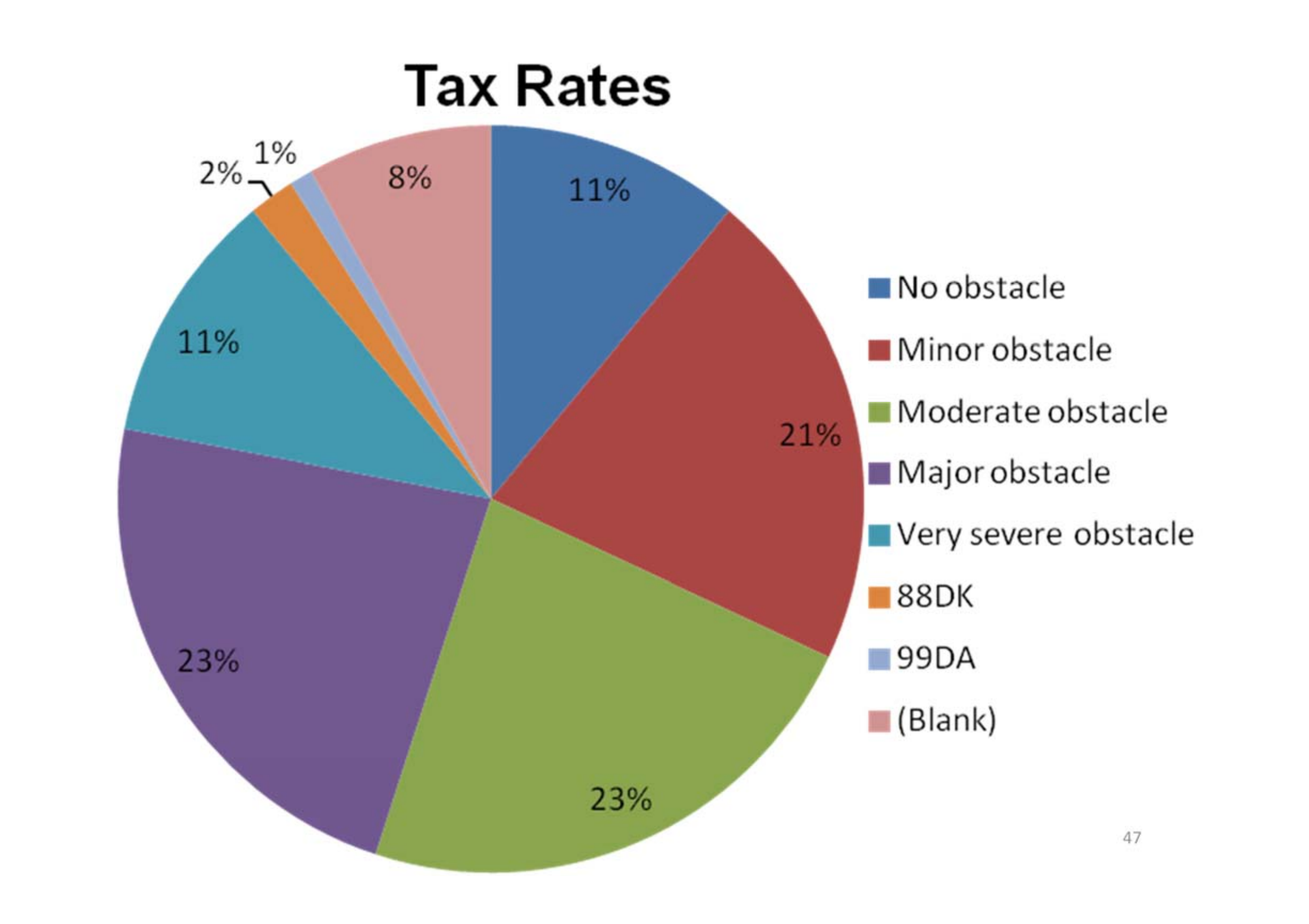


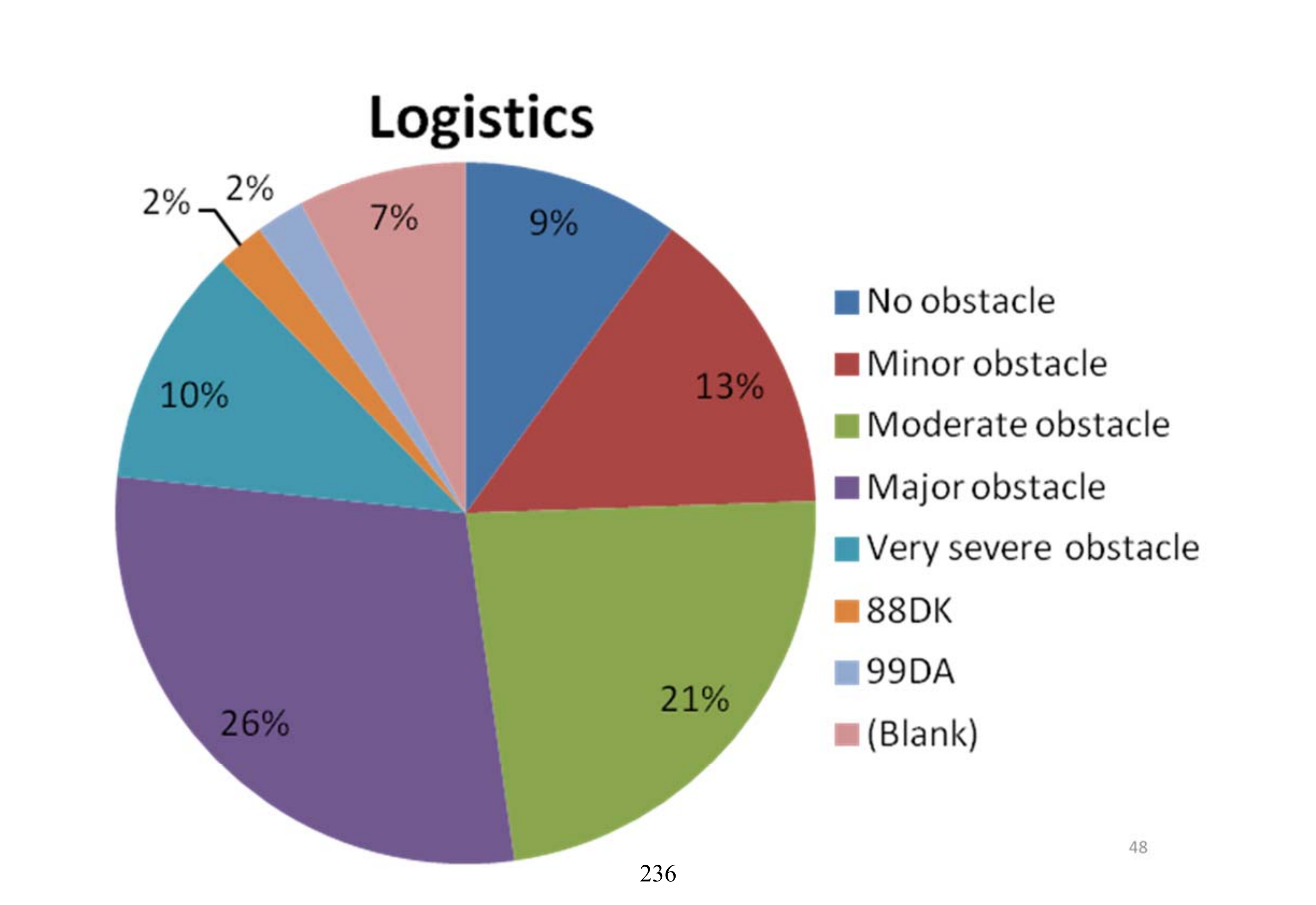
45

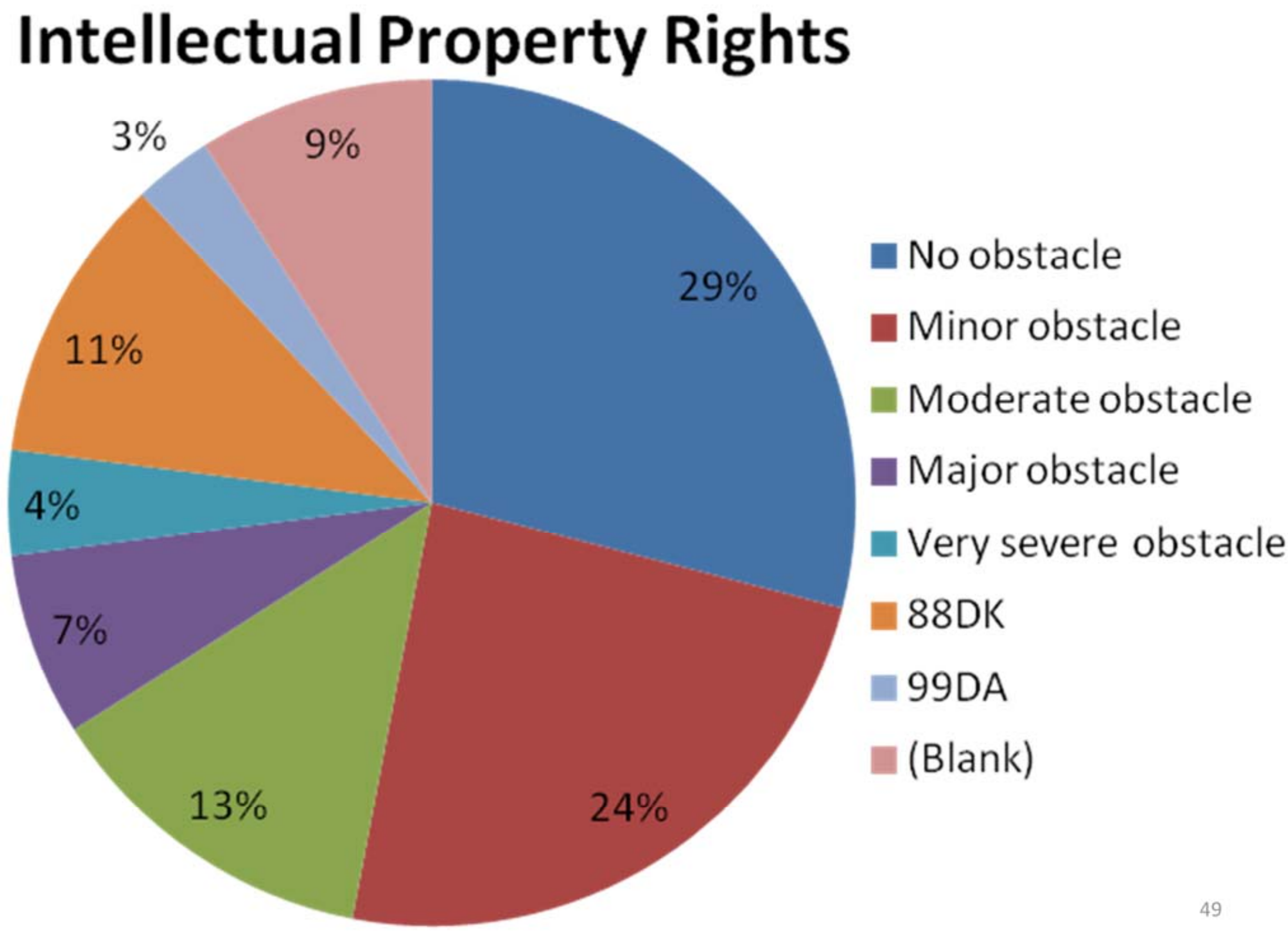
Tax Administration

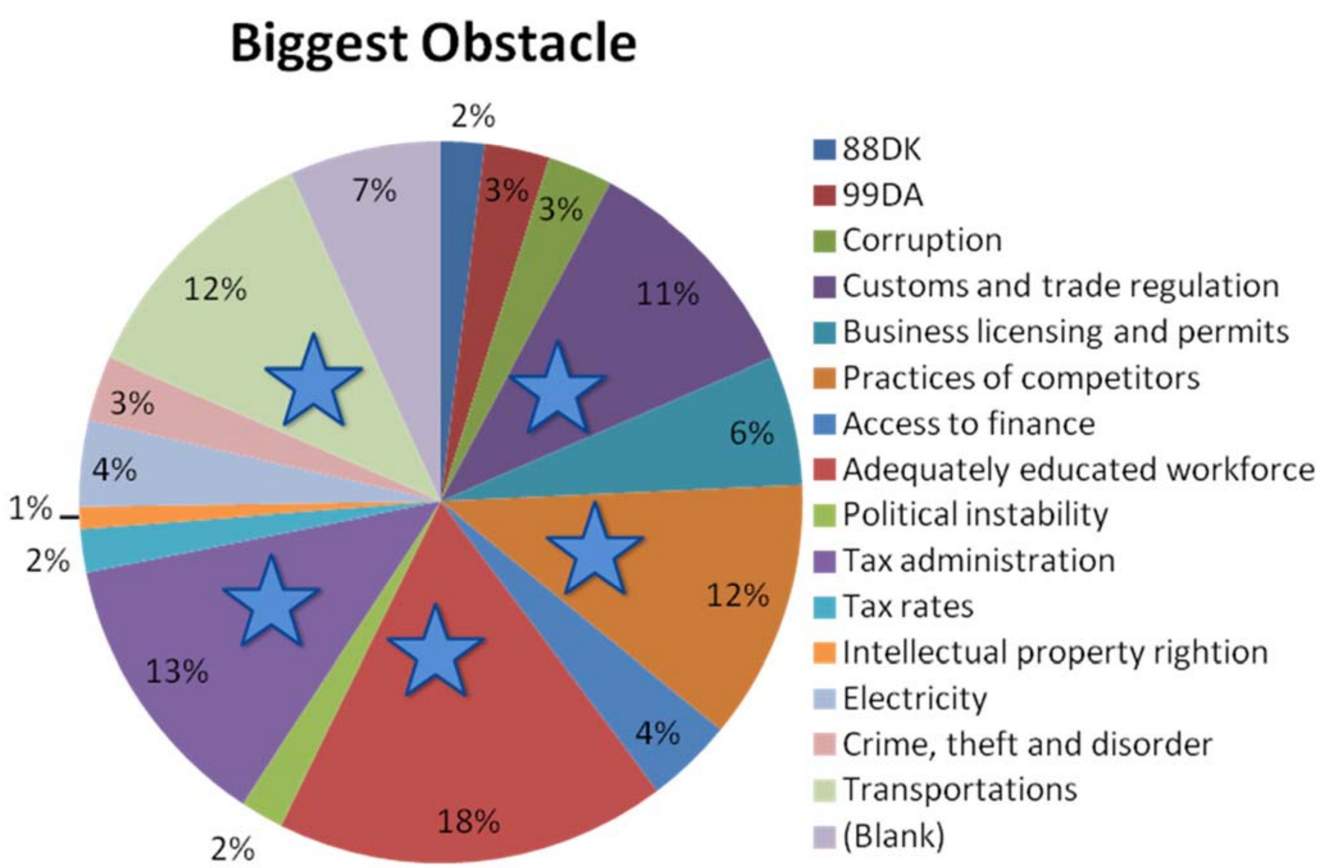


46

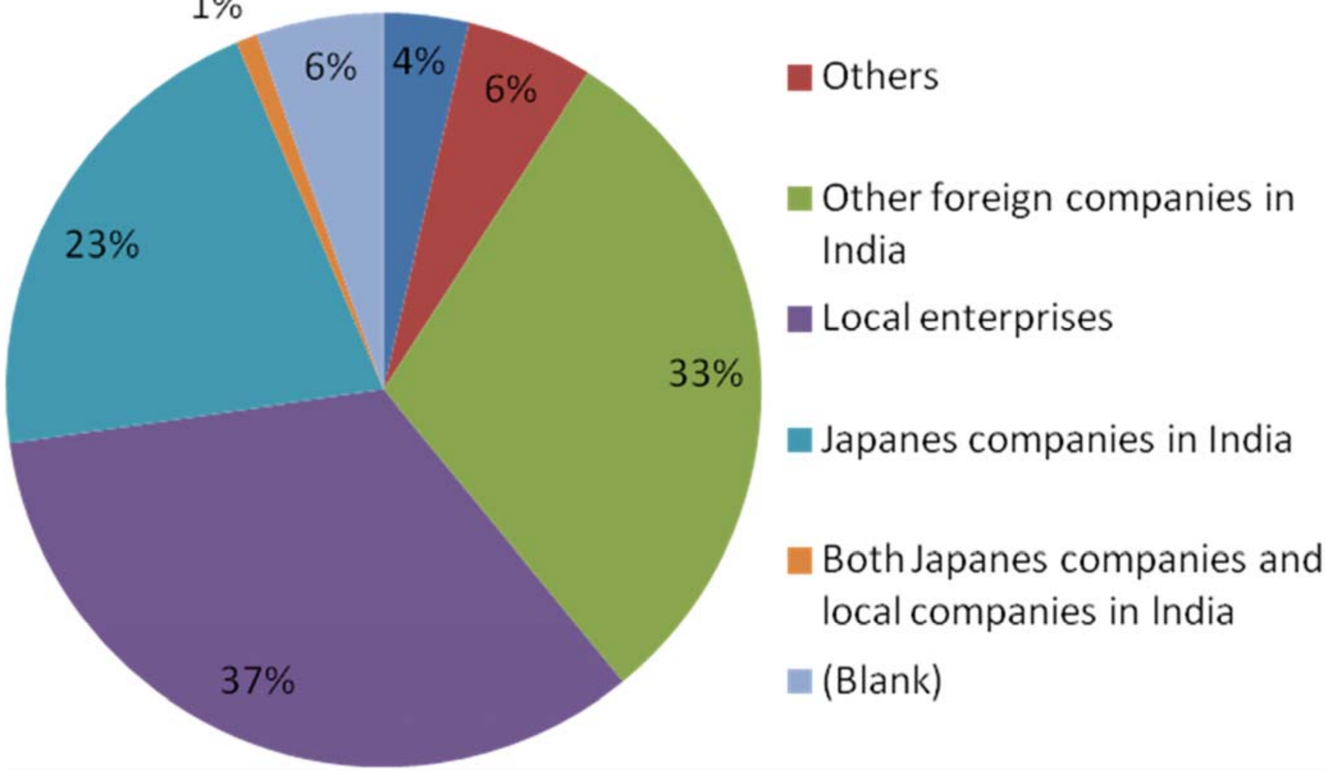

Tax Rates
11%
21%
23%
23%
11%
2%
1%
8%
No obstacle
Minor obstacle
Moderate obstacle
Major obstacle
Very severe obstacle
88DK
99DA
(Blank)
47


Logistics
9%
13%
21%
26%
10%
2%
2%
7%
No obstacle
Minor obstacle
Moderate obstacle
Major obstacle
Very severe obstacle
88DK
99DA
(Blank)
48


Intellectual Property Rights
29%
24%
13%
7%
4%
11%
3%
9%
No obstacle
Minor obstacle
Moderate obstacle
Major obstacle
Very severe obstacle
88DK
99DA
(Blank)
49

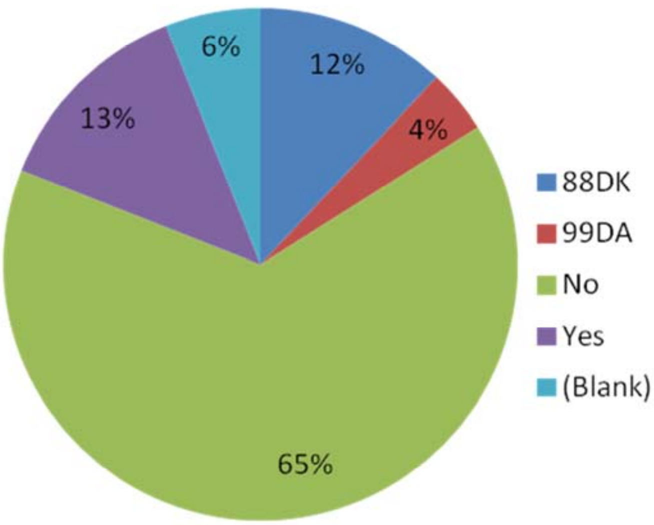

Biggest Obstacle
2%
3%
3%
11%
6%
12%
4%
18%
2%
13%
2%
1%
4%
3%
12%
7%
88DK
99DA
Corruption
Customs and trade regulation
Business licensing and permits
Practices of competitors
Access to finance
Adequately educated workforce
Political instability
Tax administration
Tax rates
Intellectual property rightion
Electricity
Crime, theft and disorder
Transportations
(Blank)

Competitors

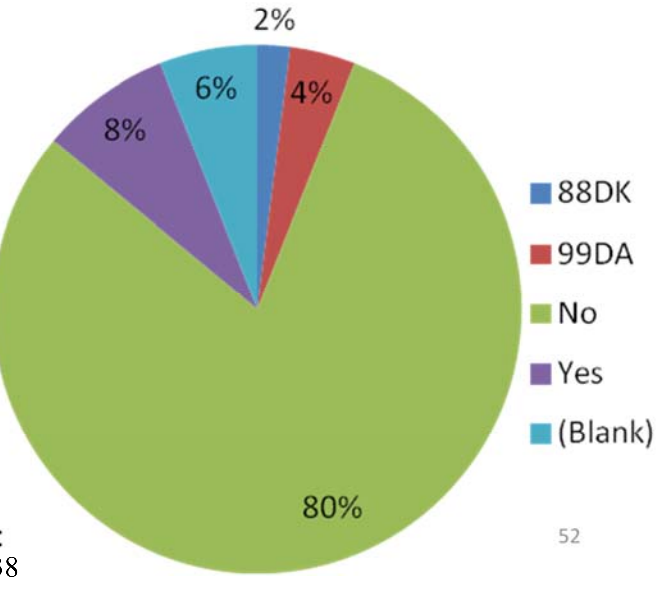


51

Use of CEPA Preferential System



Participation in DMIC



CEPA: Comprehensive Economic Partnership Agreement
DMIC: Delhi-Mumbai Industrial Corridor Project

52

Concluding Remarks

- Existing Statistics in section 2 shows:

(1) Since the mid-2000s, investment of Japanese companies grows especially in NCR.

(2) Transport equipment, electronics, and machinery industries dominate the Japanese investment.

(3) Maharashtra and Delhi absorb capital of Japanese companies. Recently the Japanese capital goes to Haryana.

(4) Share of transport equipment industry in terms of sales and employee is very high.

- Long-term economic relation between India and Japan: *Cotton* era → *Iron* era → *Car* era (Pls. see Takahiro Sato, ``Economic Relations between India and Japan, '' *Eurasian Geography and Economics*, Vol.53, No.4, pp.457-478, 2012)

53

- The results of questionnaire survey in section 3 shows:

(1) Responding companies have the following characteristics: more NCR in location, less transport equipment and more commerce/ transportation in industry, and smaller in size.

(2) Reason for investment in India: Many companies market potentiality not only in India but also in the neighbor countries. Indeed, some companies have export destination diversity. India as step stone for business in Africa, Middle East, and EU.

(3) Local content ratio is not high. Many companies procure the goods from Japan and East Asia.
→Implications for exchange rate problem and the opportunities of cost advantage induced by increase of local contents.

54

(4) Employment of contract labors is common.
→Implications for labor laws and industrial relations.

(5) Despite of the serious recession of the Indian economy, more than half of companies have good performance.

(6) The most serious obstacle for the business is the difficulty to obtain good human resources (turnover rate is also high). →Implication for ``Skill Development'' for promoting ``Make in India.'' Many companies suffer from inadequate infrastructure and strong regulations (ex. High tax rate, inflexible and retrospective tax administration and introduction of MAT to SEZs).

(7) A few Japanese companies involve the CEPA and the DMIC. Further investigation of low utilization of preferential tax treatment under the CEPA is needed.

Thank you.

Email: takahirodevelop@gmail.com

Identifying Competition Neutrality of SOEs in China

Mariko Watanabe*

November 30, 2015

Abstract

This paper attempts to identify competition neutrality of state owned enterprises (SOEs) in three consumer electronics industries in China. First, I draw a benefit-price indifference curve, at the mode of consumer surplus for each year, and a benefit-price supply curve by the manufacturers and ownership types, based on the demand estimates of for the color TV (CTV), Mobile phone and Air conditioner industries in the 2000s. These exercises indicate heterogeneous situations of the market neutrality of SOEs in the Chinese consumer electronics industries: The air conditioner market shows a clear positive relationship between benefit and price for all the ownership types. At the same time, no clear correlation between ownership and strategies focusing on price or benefit is observed. On the other hand, SOEs and privately-owned enterprises (POEs) in CTV and mobile phone markets concentrate their products based on lower prices and lower benefit area, namely, they are taking cost advantage strategies. Ownership type and strategies appears to have a correlation. Furthermore, price becomes independent to the level of benefit for local firms. These tendencies are clearly observed in the price-benefit supply curve of the two markets. A simple model of differentiated competition with one agent committing predatory pricing in expropriating soft financial constraint shows that the price set by the rivals of a soft constrained firm is independent to the benefit.

Keywords Competitive advantage, SOEs, FOEs, competition neutrality
JEL Classification Number L11 M21 L63 P52

---

*Gakushuin University, 1-5-1 Mejiro, Toshima, Tokyo 171-8588, Japan. Phone: +81-3-5992-3075, Fax: +81-3-5992-1002, E-mail: mariko.watanabe@gakushuin.ac.jp. Acknowledgment: This paper is a result of RIETI project titled Comprehensive Research on the Current International Trade/Investment System (pt. II) (project leader: Tsuyoshi Kawase, RIETI FF/Professor, Sophia University) undertaken at the Research Institute of Economy, Trade and Industry (RIETI). Data the author used here is obtained during a project on the analysis of development process of Chinese industries, funded by Institute of Developing Economies, JETRO. This study is conducted as a part of the Project “Comprehensive Research on the Current International Trade/Investment System (pt.II)” undertaken at Research Institute of Economy, Trade and Industry (RIETI). I appreciates comments from audience at RIETI project members and seminar, Transition and Economic Development (TED) conference at Fudan University, workshop at Hosei University, Institute of Comparative Economics Studies, a Conference at The Ronald Coase Centre for Property Rights Research, The University of Hong Kong. Atsushi Kato provided a very comprehensive and detailed comments for all the manuscript. All the remained errors belong to author.

1 Introduction

This paper attempts to identify the competition neutrality of SOEs in Chinese markets. Attempts to identify behaviors abusing the competition neutrality has been regarded as controversial in the field of international law. This paper will undertake this task by building a small empirical model and empirically tested. The empirical test was exercised based on the data utilizing empirical industrial organization's technique and the concept of Porter's competitive advantage strategies (Watanbe, 2015). The competition neutrality of SOEs became a focus of research following the improvement of corporate governance principles in the OECD and international institution buildings is developed within the international trade rules develops. Mixed markets, where SOEs, private firms and foreign owned invested firms are competing each other, though under somehow different institutional settings, are very prevalent in China. Some industries maintain sound competition or neutrality in the presence of SOEs, whereas other industries do not. Therefore, whether the presence of SOEs in the market is capable of being neutral to market competition and social welfare is a quite a complex empirical question. This paper tries to answer the question.

This paper proceeds as follows: Section 2 reviews the literature on market competition and SOEs. Section 3 presents the strategy of analysis of this paper. Secion5 provides exercise tests on pricing behavior with soft financial constraint. Section 6 discusses the results and implication for understanding the characteristics of the Chinese markets, then concludes. Methodology of estimating benefit of individual benefitis elaborated in Appendix sections: Section A presents economic models as an analytical framework, and Section B reports the estimated results.

2 SOEs and Competition

THe motivation behind this paper is understanding whether the presence of SOEs may substantially affect outcomes of market competition, including not only price but also quality.

The mixed market literature originally studied this issues, but it needs to be modified to apply to China's case. On the other hand , the other literature from legal studies and the practical world began to argue a concept of "competitive neutrality." Essentially, the OECD began to propose the SOEs' competitive neutrality framework. I surveyed the argements from these two stream of literature.

2.1 Mixed Markets Literature

Public economics began to analyze outcomes of competition in the mixed market in the 1990s, along with development in the privatization of SOEs in the public utility industries. Heterogeneity of purpose or constraints between public enterprises and privte enterprises may generate unexpected outcomes.

The main characteristics that these theoretical papers share is an assumption that SOEs are constrained to maximizing social welfare, not profit, only the private firms are allowed to maximize profit. Under this assumption, the following papers developed the economic models of mixed oligopoly competition. Some of the relatively recent models of differentiated market presented the following outcomes: Matsuura and Matsushima (2004) showed that the private firm's cost is lower than the public firm's because the private firm engages in excessive strategic cost-reducing activities. Privatization of the public firms would improve welfare because it would mitigate losses arising from excessive cost-reducing investments. Luts and Pezzioni (2009) provided a review of a mixed oligopoly with a differentiated market where there is possibility that not all of the market is not covered. They argued that mixed competition is more socially plausible than private duopoly and seems to produce more efficient regulatory instruments than merely adop the minimum quality. Ghosh, Mitra and Saha (2015) argued that the SOEs will set prices under their marginal cost when they are duopolies competing with foreign profit maximizing firms. A partial privatization of domestic public firms will improve the welfare by decreasing the deficits of public firms competing against the foreign firms.

These theoretical papers presented diversified results under heterogeneous assumptions: some argues that partial privatization and mixed oligopoly are plausible options for maintaining a certain quality level in the market. Others argue that full privatization is better due to the smaller amoung of loss incurred. I must note that all these theoretical analyses assume that the SOEs or public firms are constrained to pursue welfare maximization, whereas the private firms pursue profit maximization. The reality is that the SOEs have never been constrained to maximizing social welfare, but have been allowed to simply pursue private profit [1].

2.2 SOEs Governance and Competitive Neutrality by OECD

Entering the 2000s, the OECD and other international trade regulation entities began to discuss the impact of SOEs' presence on market competition neutrality. Here, the State owned enterprises are regarded a special entity in terms of the following points: First, the enterprise is burdened to fulfill public welfare not only pursing their own private profit. This is facilitated through the public ownership by exercising decision power that allocated to the owners. As long as SOEs are producing public benefits, subsidies to the SOEs from the government are legitimate. This perspective can bell called the" burdened SOEs view." The problem expected to be solved under this view is how to alleviate the inefficiency of SOEs due to the public welfare burden. Secondly, however, the definition of public welfare is not clear and is difficult to distinguish whether the action of the SOEs really serves to the public welfare. Under this setting, the enterprises can ask for the government to exercise its power to favor them against their rivals in the market even if their actions do not serve public welfare at all. This phenomenon can be called as "not legally constrained SOEs views." The problem most concerned with this type of phenomenon is to how to control the SOEs unconstrained behaviors. Chaprbianco and Christiansen (2011) introduced the historical development of SOEs governance code to competitive neutrality principles, and discusses

[1] Concerning the details of the institution, see Unirele (2012) and Watanabe (2014)

the Competitive Neutrality Frameworks (CNFs). Then, they cataloged the various "anti-competitive practices" that SOEs might take, and then argued for remedies that competitive agencies can take. The OECD (2012) is a proposal following the argument of Chapribianco and Christiansen (2011). Kawashima (2015) introduced the Australian' "Market Neutrality Principle" and discussed its applicability to international trade regulation.

2.3 Anti-Competitive Practices and Remedy for Competitive Neutrality

Chapribianco and Christiansen (2011) discussed the four "anti competitive actions" and remedies for them as follows: The anti-competitive practices are (1) predatory pricing, (2) raising rivals costs, (3) cross subsidization and (4) strategic adopting of inefficient technology. Remedies that the anti competitive agency can take are (1) ex post enforcement of competition rules on unilateral conduct (2) using merger control rules to level the playing field and (3) exemptions from antitrust liability for SOEs.

3 Research Strategy and Background

3.1 Research Strategy

This paper attempts to identify the competitive strategy of Chinese brands, or by ownership type. I refer to an idea of Porter's generic competitive advantage strategies, that is, the cost advantage strategy and benefit advantage strategy. In implementing the exercise here, I used the predicted values that estimate in Watanabe (2015).

Researh of this papher goes as follows: First, I observe outcome of market competition in the three consumer electornics industies in China. Then, summarized the observation and indentified tendency and characteristics that might be related to "competition neutrality." Second, set up a model to explain the findings in the fist step, then, empirically test the prediction from the model. Detailed procedure of individual step will be elaborate in each section.

3.2 Description of Industries

In this paper, three electronics industries in China were the target of analysis: color TV, air conditioner and mobile phone. These industries all share competitive and mixed market characteristics. This is why I chose the three industry for the excersice of this paper to identify the competitive neutrality of SOEs.

Among these, the CTV industry was the earliest to have emerged, dating back to the late 1980s. There was a technological transfer from the Japanese manufacturer, Panasonic, to several SOEs including Changhong. The air conditioner industry began to grow in the 1990s, nearly ten years later. Initially, the technology was also transferred from Japanese manufacturers, such as Sanyo and Mitsubishi and German companies to the SOEs. The mobile phone industry is the newest of the three industries and emerged in the 2000s. In the very initial stage, Nokia and Motorola dominated the industry. Since the late 1990s, the government has encouraged foreign investment firm to transfer the technology by forming joint ventures. However, because the government lifted the regulation in 2006, massive entry of private brands was repeated[2].

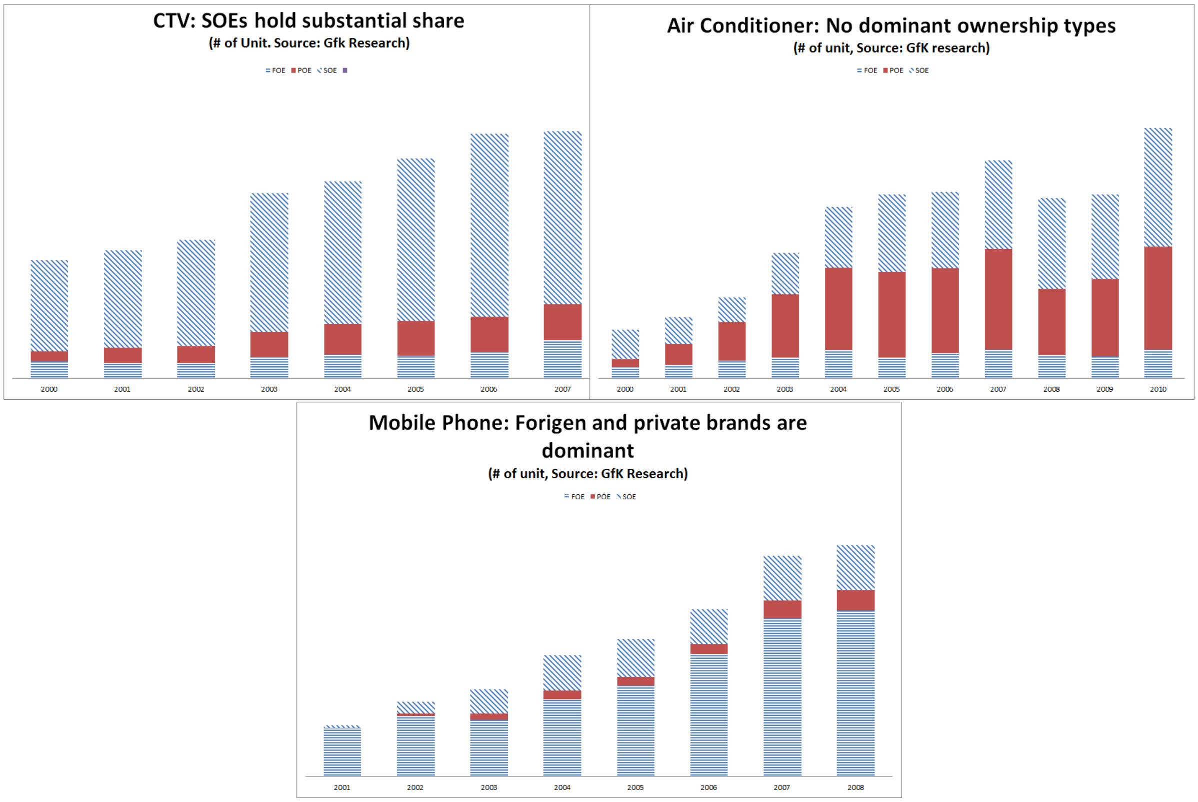
Figures 1 indicates how many products were supplied by privately owned, SOE or foreign investment enterprises. This figre shows extremely contrasting profiles among the three industries. In the color TV industry, SOEs dominate more than 80 per cent of units were produced by SOEs. Conversely, the mobile phone industry is dominated by foreign invested and privately owned ifirms.

3.3 Institutional setting: Law and Politics with SOEs

In China, the three types of ownership, foreign investment, SOEs and privately owned firms are faced with different institutional settings. Although they sometimes compete with each other in a market, the institutional constraints they face with are often substantially different. In terms of this nature, I regard the three ownership types as heterogeneous

[2]Detailed case studies of these industries were extended in Watanabe ed.,(2014).

Figure 1: Shares of production by ownership types of
Color TVs, Air Conditioners and Mobile Phones



Source GfK Market Auditing Survey.

agents in a market, and the market should be called a "mixed market."

Legal institution since the 1980s clearly discriminated private enterprises and SOEs until the middle of 2000s: Company Law, Security Law, Bankruptcy Law provided respective clauses for SOEs and private enterprises. Foreign investment enterprises are regulated by independent special laws and regulations. There was a substantial reform of these legal institution around 2006. Although major institutional discrimination among ownerships disappeared in the laws, but the enforcement remains widely a preferential toward SOEs[3].

[3]Referring legal institutions related to SOEs, Watanabe (2014) reviewed in detail. In October 2015, Communist Party of China revealed their plan of the SOE reform. It announced that SOEs will be classifiend into "commercial SOEs" and "Public welfare pursing SOEs." A part of SOEs in People's Republiuc of China are constrained to pursuing public welfare for the first time.

4 Competitive Strategy and Ownership Types: Observation

4.1 Comparing Consumer Surpluses and Benefits by Ownership types

The estimated demand parameters in Watanabe (2015) allow us to compute the consumer surplus and the benefit of individual products[4]. By summing up these consumer surplus and benefits, I can quantify the (relative) size of consumer surplus and benefit for each brand or ownership types. Here, I compare whether there is a systematic difference in consumer surplus or benefit across ownership types (Figures 2, 3 and 4 summarize the results.).

Across the three industries, foreign-investment firms offer the greatest benefit to the Chinese market, alsthough ther price are also the highest. Privately owned firms offer the lowest or not higher prices in all the three industries and offer the not smaller or higher consumer surplus to SOEs acrossthe industries. State owned enterprises does not show consistent advantages in price, benefit and consumer surplus across the three industries.

In the air conditioner market, in which no single type of ownership had a dominant share, foreign-investement firm supplies products with the greatest benefit, but their prices are high as well. As a result, the consumer surplus offered by foreign-investment firm is not higher than SOEs. Privately owned firms offered the larget consumer surplus by following the cost advantage strategy.

In the CTV market, in which a substantial share of the products are supplied by the state-owned enterprises, foreign-investment firms offers the largest consumer surplus, and those of privately owned and state-owned enterprises remain equal.

In the mobile phone market, in which foreign-investment firms shared the largest percentage of the market, but private firms vigorously entered, private firms provided the largest consumer surplus by following the cost advantage strategy, whereas foreign investment firms supply products with the highest benefit. Their benefit advantage strategies does not succeeded in offering the largest consumer surplus.

[4]Appendix of this paper also provide details of procedure to estimate the benefit and consumer surplus.

Figure 2: Difference in mean among ownerships - Air Conditioner

unit: RMB	Consumer Surplus	Benefit	Price
F-P	-128	1431***	1559***
F-S	259	1264***	1005***
P-S	387***	-166	-553***

Standard errors were not displayed

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Figure 3: Difference in mean among ownerships - CTV

unit: RMB	Consumer Surplus	Benefit	Price
F-P	4352***	8532***	4180***
F-S	4190***	8138***	3948***
P-S	-162	-393	-232

Standard errors were not displayed.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Figure 4: Difference in mean among ownerships - Mobile Phone

unit: RMB	Consumer Surplus	Benefit	Price
F-P	-735***	243***	980***
F-S	-237***	348***	587***
P-S	498***	104	-393***

Standard errors were not displayed.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

In summary, foreign-investment firms supply products that provide greater benefit. In other words, they follow the benefit advantage strategy. At the same time, privately owned firms offers the cheapest class of products: They look to follow the cost advantage products. State-owned enterprises fell into the trap of the middle, and the size of the consumer surplus that offered by SOEs to the Chinese markets is lower than that of either the privately owned firms or foreign-investment firms[5].

[5]Besanko argues that a strategy of positioning in the middle of cost advantage and benefit advantage is effective as long as they are suceeding in providing largest "benefit of trade," that is B - C in the notation in this paper. Their argument makes sense. Now we can observe B the benefit offered by the SOEs is lowest, but not sure how much C the cost is.

4.2 Drawing Price-Benefit Curves

As we have the data on the price and benefit of the products, and we can draw a price-benefit indifference curve and a price-benefit supply curve for the three industries[6]. The procedures are as follows: First, utilizing the demand function estimates obtained in Watanabe (2015), I obtain the predicted value of the benefit of individual products in equation (19). Second, I draw a spline within the group, such as ownership or brand. I employ splines with equally spaced knots based on the prices and benefits of all units sold in each year.

4.2.1 Price-Benefit Indifference Curve

First, I depict price-benefit indifference curve. The curve depicts the relationship between price and benefit fixed at a certain level. Here, I took the price-benefit relationship at the mode value of consumer surplus for each year. The mode is a value that has the maximum observation on the distribution[7]. That is, I can see the price benefit relationship at the volume zone of the year. Under this setting, if a brand list products with larger benefit and higher price on the curve, we can see the brand is taking "benefit advantage" strategy. If the brand list products with lower benefit and lower price on the indifference curve, it implies the brand took "cost (price) advantage strategy."

Figures 5, 6 and 7 graphs actual distributions of strategies at the volume zone for each years for the three consumer electronics market.

In air conditioner market, Figure 5, the strategies that represented by positioning at price- benefit axis is relatively concentrated into a narrow area from 2001 to 2008. Difference of positioning among ownership types are not clear, except in 2006 and 2007. In 2006 and 2007, the FIEs took position at the higher price but relatively similar benefits compared to

[6]We depicted the cost-benefit supply curve by connecting the predicted value of benefit and consumer surplus by brands or ownerships. This is the line chosen by the suppliers. When you connected the predicted values of benefits and consumer surplus according to the equivalence of consumer surplus or benefit levels, it becomes the cost-benefit indifference cutve that Figure A.1 showed.

[7]I took a certain range between the mode value when I made these graphs so as to maintain a certain number of observations. Because of this, we can see a difference of consumer surplus in the actual figures

the local rivals. This implies FIE is inferior to SOEs and POEs in terms of this period. In 2008, difference of positioning of the strategies by ownership types disappeared in 2009. In 2010, relatively speaking, FIEs and SOEs exhibit "benefit advantage strategies," whereas POEs shows "cost advantage strategies".

In CTV market, Figure 6, FIEs took a wider positioning at price-benefit axis, that is, low price-low benefit to high price- high benefit between 2001 to 2006 and 2007. On the contrary, SOEs and POEs shows distribution of positioning concentrating into the low price and low benefit area at the same period. Ownership type and distribution of the strategies appears to be correlated.

What I need to note here is that, the price benefit curve get horizontal along with the progress of years.

In mobile phone market, Figure 7, difference of the positioning at at the price-benefit axis get more clear. FIEs took the higher price - higher benefit positioning, that is "the benefit advantage strategies," whereas SOEs and POEs adopt the low price and low benefit positioning, that is the "cost advantage strategies." In this market, the curve got horizontal in an area where SOEs and POEs are competing with each other.

In summary, the correlation between the ownership type and the strategies appeared in the CTV and mobile phone markets, whereas the correlation is not so clear as the other two markets. In the previous group, the curve get horizontal.

4.2.2 Price-Benefit Supply Curve

Figures 8, 9 and 10 graph the price and benefit supply curve for selected brands. I chose the brands that have data for the entire period of the study and for which the number of sales units is relatively large.

The graphs visualize the competitive positions of the ownership types or the brands. If a brand or one type of ownership listed the products with higher benefit and keeps price at approximately the same level as a competitor's, the brand or ownership type have a "benefit advantage". On the other hand, a brand or a type of ownership that provides a product with a lower price and keeps the benefit more or less the same as that of a competitor has a "cost advantage" (Besanko, et. al 2010: Chapter 9).

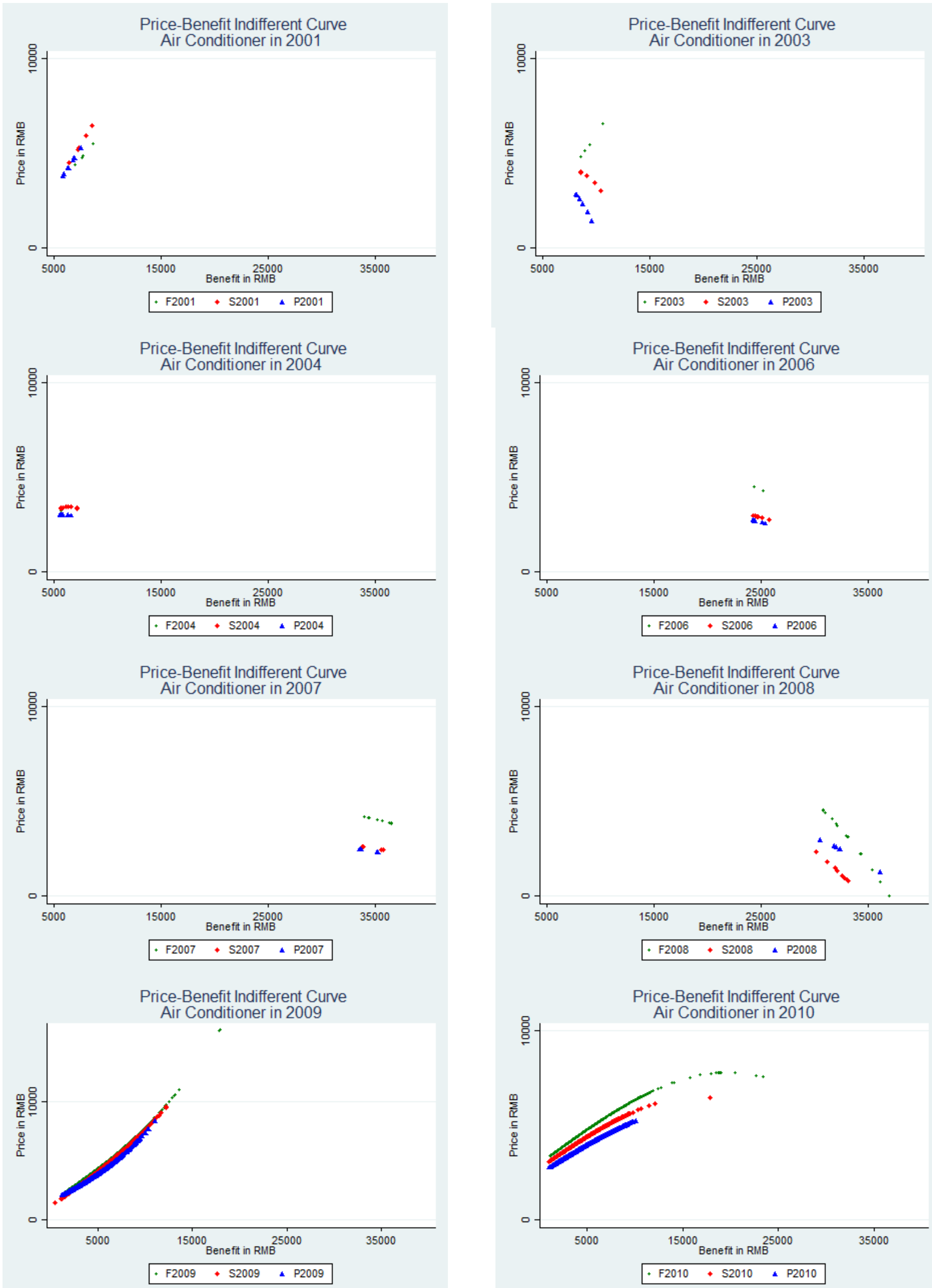
Figure 10 clearly indicates this positioning pattern in the mobile phone market. This indicate that foreign brands, such as Nokia, Samsung and Motorola listed the products with nearly all the support of the benefit distribution. Foreign brands monopolizes the higher benefit ranges, for example, 12,000 RMB and above range for 2001, 25,000 RMB and higher for 2005 and 40,000 RMB and above for 2008. Foreign brands succeeded in taking the"benefit advantage" position. On the contrary,the private and SOE price-benefit supply curves move nearly horizontally over the benefit. They are positioning at a lower cost and offer the same benefit to foreign brands. This relationship basically holds in the color TV market (Figure 9). For air conditioner market (Figure 8), the support of benefits for SOEs, POEs and FIEs does not show a substantial difference, although FIEs supply with systematically higher prices than their counterparts.

A comparison of the positioning among ownership types indicates that SOEs fail to take an advantageous positions and are "stuck in the middle" as argued by Porter (Besanko et.al, 2010, Chapter 9. Porter 1980: Chapter 2). This is because of the following point: In terms of benefit, SOEs are inferior to foreign investment brands: however, in terms of costs, I presume they could be inferior to the private brands because as the price advantage is taken by the privately owned firms, it implies SOEs do not have cost advantage. This observation is consistent with anecdotal evidences that appeared in the accumulated previous researches, news or reports.

Moreover, it is important to note the direction of correlation between benefits and price (the cost of the consumer). When the benefit is large, the consumer values the products to a larger degree, and there is more room for raising price. Usually, this is necessary for suppliers, as suppliers bear the additional cost of producing products with greater benefits. Relatively speaking, foreign brands can enjoy positive correlation between price and benefit.

However, private firms and SOEs are faced with a horizontal cost benefit indifference curve. That is, price is independent of benefits. For suppliers, this is a harsh market condition, and they may lose incentives to invest in upgrading the quality or benefit of products. Next sections will focus on this point and try to address why this phenomenon appears.

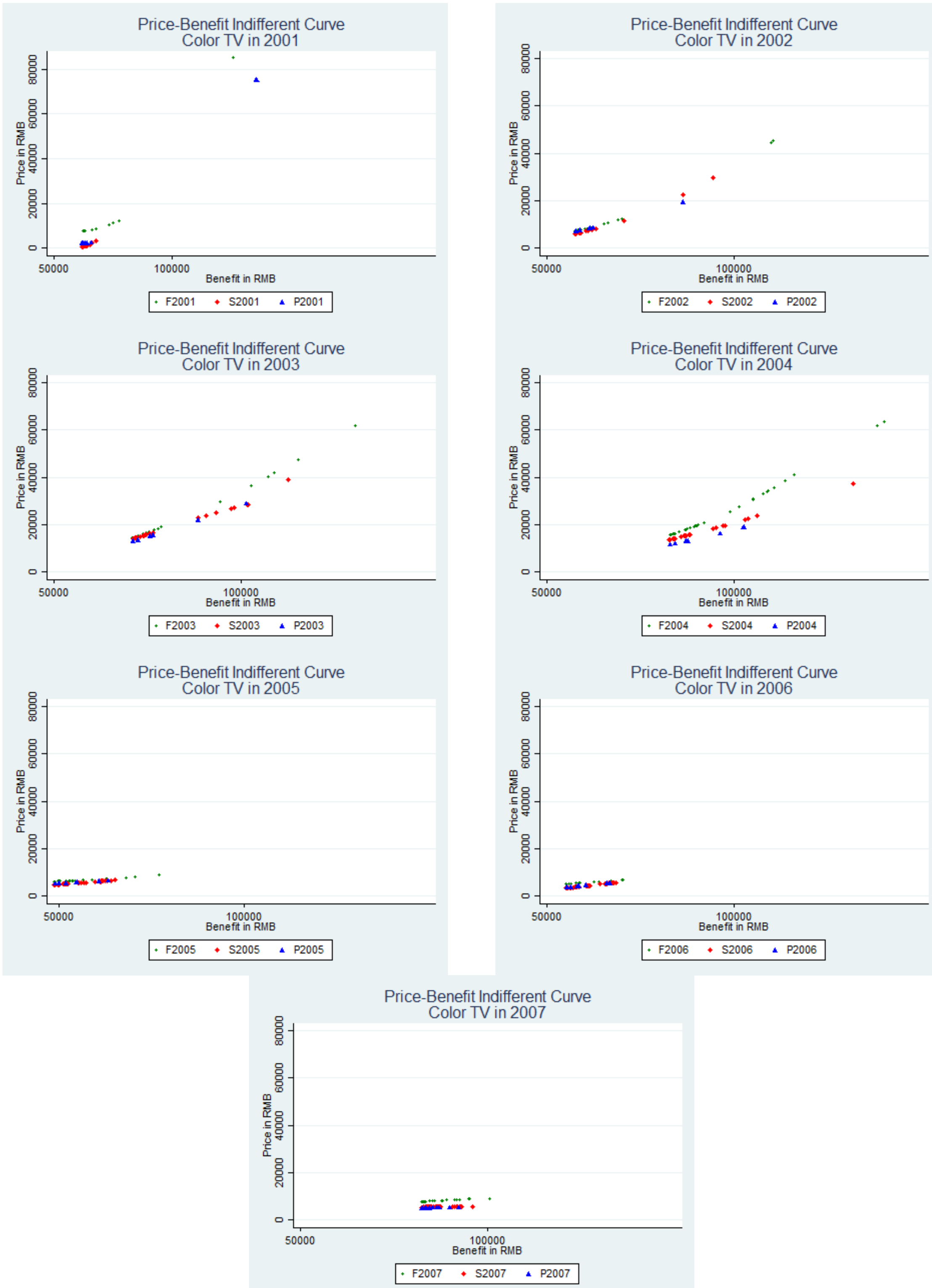
Figure 5: Price and Benefit Indifference Curve by Ownership Type - Air Conditioner



Note: Red/Orange dots represent SOEs. Blue dots represent Private owned firms. Green dots represent Foreign Owned firms.

Source Author's estimation.

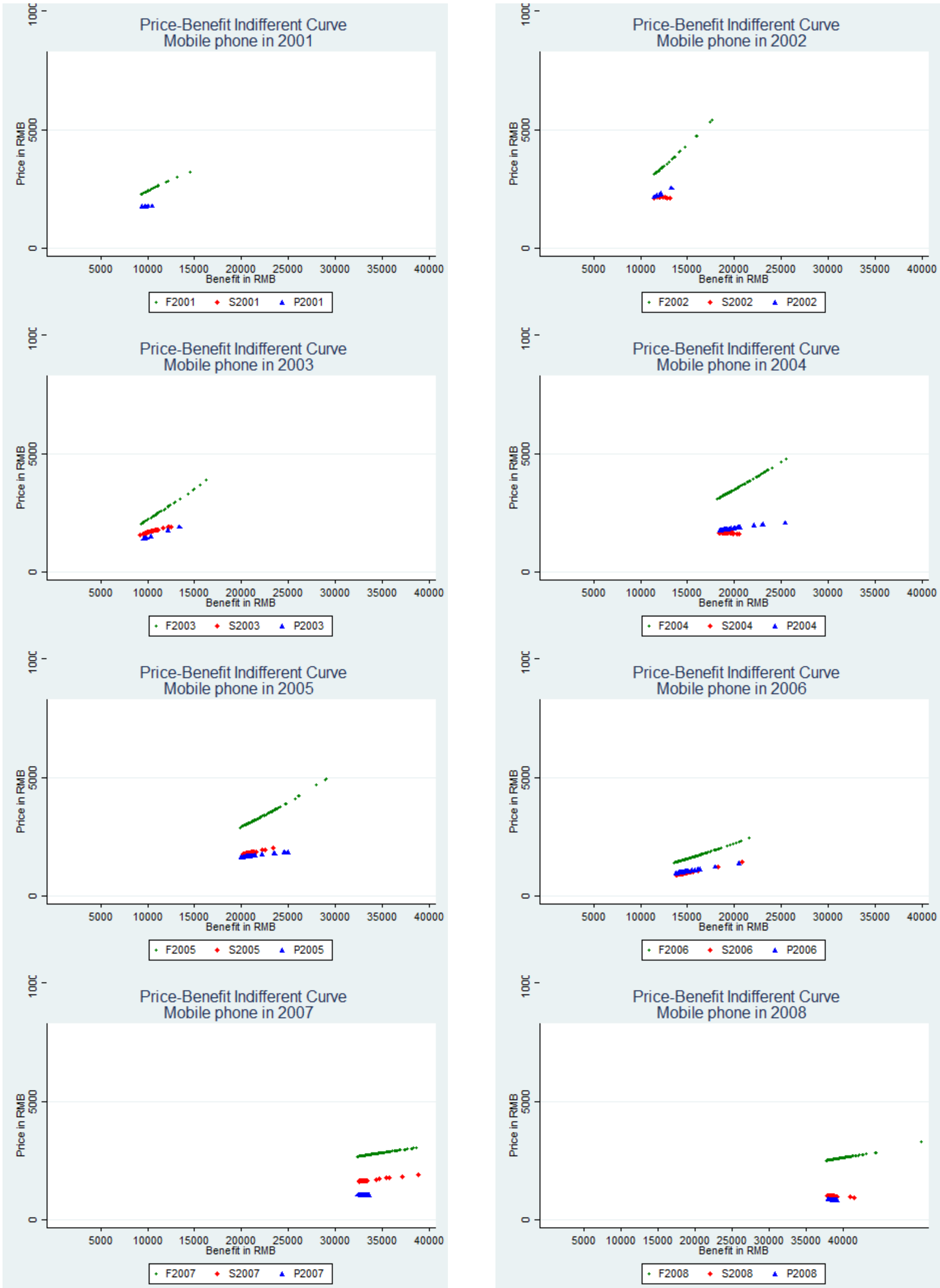
Figure 6: Price Benefit Indifference Curve by Ownership Types - Color TV



Note: Red/Orage dots represent SOEs. Blue dots represent Private owned firms. Green dots represent Foreign Owned firms.

Source Author's estimation.

Figure 7: Price and Benefit Indifference Curve of Selected Brand - Mobile Phone



Note: Red/Orange dots represent SOEs. Blue dots represent Private owned firms. Green dots represent foreign-owned firms.

Source Author's estimation.

4.3 Summary: Heterogeneous Market Outcomes and Horizontal Price Benefit Curve

The main findings so far are summarized as follows. Concerning the relationship between ownership type and the chosen competitive strategy, we present the following findings; (1) Foreign brands exhibit a strategy to list products all in support of benefit of price-benefit indifference curve. This applies to all three markets. FIEs adopts the "benefit advantage strategy," at least, relative to SOEs or POEs. (2) In CTV and mobile markets, Private brands and SOEs concentrate on listing lower benefits products. This phenomenon is clearly captured in the price benefit supply curves for the two markets. In terms of this relative positioning, SOEs and POEs exhibit "cost advantage strategies" In these two markets, there seems to exist correlation between ownership type and chosen strategy. (3) In the air conditioner market, all three ownership types lists their products all over the price benefit indifference curve. It appears that there is no systematic relationship between ownership type and chosen strategy. Correlation between ownership type and strategy take are observed in some industry, and not observed in other industries.

One more aspect that needs to be noted is the relationship between price and benefit. (1) In the air conditioner market, price and benefit are positively correlated, except during a period between 2005 to 2007[8].(2) On the other hand, the price benefit curves for CTV and mobile phones tend to become horizontal as time progresses. This is very explicit for SOEs and POEs. The price benefit supply curve for CTV markets clearly exhibits that the price is maintained at the same level although benefits increase[9]. Interestingly, FIEs began to raise prices once SOEs and POEs give up listing at the higher benefit area. These

[8]The positive correlation between benefit and price reappeared in 2008, 2009 and 2010. In 2008, the Chinese government implemented a energy efficiency standard and labeling system to mitigate information asymmetry between consumers and suppliers in terms of the energy efficiency of products. Further study to investigate how the system intervene the market outcome.

[9]There are several anecdote that might be related to this market outcome feature in the CTV industry. From 2006 to 07, there took place an intense price competition among LCD, CRT and PDPs occured. At the same time, PDP was an advanced and expensive technology then, but Changhong began listing the PDP with a support of local government and technology transfer from Philips. The detailed story is developed in Watanabe ed. (2015). Until 2015, the project completely failed.

results imply that there exists a mechanism that causes price to beome independent from the benefits. In the next section, I will explore a mechanism that explain this phenomenon.

5 A Test on Competition Neutrality

The exercise above shows that there is a peculiarity in that (1) the price-benefit indifference curve tends to shrink and the price tends to become independent of the benefit, and (2) the price-benefit supply curve of Color TV industry shows that the curve of the FIEs resume goes correlated from the point that their rivals, the SOEs and POEs resume listing. This implies that the disappearance of competition to local brands allow them to price their products according to the cost to generate the benefit.

Several studies on Chinese SOEs system have referred to several points as a source of problem Among them, I will test a hypothesis that the "excess competition" phenomenon is caused by favorable financial constraints on the SOEs. In this section, I describe this phenomenon by using a simple model, and test whether the hypothesis is supported by the data.

5.1 Model: Pricing when one agent is facing soft financial constraint

Here, I consider a duopoly model of pricing behavior when one agent is faced with softened financial constraint based on the well known Hotelling model.

5.1.1 Basic model

Consumers will buy a product either from Firm A or Firm B. Assume the consumers are located at $x(0 \leq x \leq 1)$ according to the relative preference between A and B at x. A fan of firm A's products requires compensation when they will buy product B. The compensation cost is described as $t_A x$. t_A, t_B are the index of the consumer's royalties for the particular brands, that is, ones's costs to give up the favorite products.

The payoff of the consumer who choose product A is as follows:

$$B_A - p_A - t_B \times x$$

The payoff of the consumer who choose product B is as follows:

$$B_B - p_B - t_A \times (1 - x)$$

The payoff of a consumer who is indifferent between product A and B is equivalent. That is,

$$B_A - p_A - t_B \times x = B_B - p_B - t_A \times (1 - x) \tag{1}$$

where the x that satisfies equation (1) is,

$$x = \frac{t_A + (B_A - B_B) - (p_A - p_B)}{t_A + t_B} \tag{2}$$

Faced with this differentiated demand, firm A will maximize its profit with regard to price p_A.

$$(p_A - c_A) \times x = (p_A - c_A)\frac{(t_A + B_A - B_B - (p_A - p_B))}{t_A + t_B}$$

Firm B will maximize its profit with regard to price p_B.

$$(p_B - c_B) \times (1 - x) = (p_B - c_B)(1 - \frac{(t_A + B_A - B_B - (p_A - p_B))}{t_A + t_B})$$

The best response strategies for firms A and B satisfy the following conditions:

$$2p_A = p_B + c_A + t_A + B_A - B_B \tag{3}$$
$$2p_B = p_A + c_B + t_B + B_B - B_A \tag{4}$$

Prices A and B follow the relationships below:

$$p_A^* = \frac{2c_A + c_B + t_B + 2t_A + B_A - B_B}{3}$$
$$p_B^* = \frac{2c_B + c_A + t_A + 2t_B + B_B - B_A}{3}$$

The market share of A, x, becomes as follows:

$$x^* = \frac{2t_A + t_B + (B_A - B_B) - (c_A - c_B)}{t_A + t_B}$$

5.1.2 Model with soft financial constraint

Assume that firm A is facing a soft budget constraint; that is, if they incure a deficit, they can make it up by relying on borrowing from banks or trade credit. Under this environment, Firm A can set their price level below the cost and above the amount of debt D[10]. Deficit is feasible as long as it is smaller than debt. This is the assumption of predatory pricing by A:

$$p_A - c_A \leq D$$
$$p_A - D \leq c_A \tag{5}$$

I assume that firm A is faced with soft financial constraint: it can set its price p_A lower than cost c_A as long as the deficit $p_A - c_A$ is not bigger than its debt D. Firm B has no favorable condition: thus it cannot set the price p_B lower than their marginal cost c_B.

[10]This items can be regarded as subsidy.

Because of the strategic relationship described by equations (3) and (4), firm A has an incentive to shift the best response function by utilizing its soft constraint. If so, the best response strategy for firm A changed from equation (3). According to the condition of equation (5), c_A is replaced with $p_A - D$.

$$\begin{aligned} 2p_A &= p_B + p_A - D + t_A + B_A - B_B \\ p_A &= p_B - D + t_A + B_A - B_B \end{aligned}$$

These equations indicate that firm A, when faced with soft constraint, will set its price lower, and that the rival firm B should lower its price. If firm A set their price p_A lower than its rivals cost c_B, they can force firm B to exit from the market and thus obtain the whole demand.

In this case, the prices at equilibrium changed as follows:

$$p_A^* = c_B - 2D + t_B + 2t_A + B_A - B_B \tag{6}$$

$$p_B^* = c_B - D + t_A + t_B \tag{7}$$

The price at equilibrium shows that firm B, which received pressure to cut price fell into a situation in which it cannot raise its price according to its benefit advantage. The pricing of firm B become independent of the benefit they provide, although consumers still values them. This implies that the rivals of firms with soft budget constraints fell into a situation in which they will not be rewarded for their investment in the benefits for the consumer.

Thus, the market share of A, x_A, becomes as follows:

$$x_A^* = \frac{D}{t_A + t_B} \tag{8}$$

Propositions that derived from the model analysis above are as follows: under differentiated market competition, when there exists a player with soft financial constraints, the soft constraint firm tends to set its price as low as possible.

Proposition 1 Amount of debt determines level of equilibrium price and market shares.

Proposition 2. Equilibrium price of the rival of a soft constraint firm becomes independent of the benefit they supplied to the society. That is, the price benefit function of rivals to soft budget constraint firms becomes horizontal when the soft budget constraint entity commits predatory pricing.

5.2 Estimation of Price Benefit Supply Curve

To test the relationship between the price benefit curve and financial constraint, I combined the estimated demand data with the financial statement data of companies listed in stock markets within China. About half of the market data for the three markets were matched. Although there exist substantial data omission, most of SOE listed firms were covered[11].

Therefore, I do assume that listed SOEs as "the soft budget constraint firm." According to this classification, I did estimate price benefit supply curve focusing on SOE's behavior on respective market[12].

Test functions are derived from equations (6 and 7) and described as follows:

$$\begin{aligned} ln(p^*_{soft}) &= \beta_1 ln(c_{hard}) + \beta_2 ln(c_{soft}) + \beta_3 ln(D_{soft}) + \beta_4 ln(t_{hard}) \\ &\quad + \beta_5 ln(t_{soft}) + \beta_6 ln(B_{self}) + \beta_7 ln(B_{others}) \qquad (9) \\ ln(p^*_{hard}) &= \beta_1 ln(c_{hard}) + \beta_2 ln(c_{soft}) + \beta_3 ln(D_{soft}) \\ &\quad + \beta_4 ln(t_{soft}) + \beta_5 ln(t_{hard}) + \beta_6 ln(B_{self}) + \beta_7 ln(B_{others}) \qquad (10) \end{aligned}$$

Figure 11 shows a consistent result with model prediction in equations (6 and 7): the benefit of own products is positively and the benefits of rivals is negatively correlated with

[11]Matched observation for respective market is as follows. the matched data in CTV market covers 59% in total, 97% for SOE. Air conditioner 59% for total, 99% for SOE. 16% for total and 67% for SOE.

[12]Here, I do not have sufficient information about financial constraint (e.g. amount of debt) and cost for FIEs.

price. Marginal costs are positively correlated. What interests us most is that the amount of own debt is negatively correlated with pricing. That implies that a brand with the larger borrowing sets lower prices. This is consistent with a prediction of the financial soft budget morel above, and contradict with an intuition that the more leveraged firm is faced with a higher financial cost and thus, tends to set higher prices.

I do also estimate following reduced form of price function of product j of firm h for the all three consumer electronics .

$$price_{hj} = \beta_0 benefit_{hj} \times Ownership + \beta_1 benefit_{hj}^2 \times Ownership + \beta_2 cost_h + \beta_3 Debt_h + \epsilon_{hij} \quad (11)$$

As for Debt, I use sum of following items: (1) amount of short term debt, (2) amount of account receivable, and (3) amount of account payable of the brand for respective year. Cost variables are (1) financial cost, (2) operating tax, (3) marketing cost, (4) management cost from the financial statement and (4) estimated costs from demand functions. OLS and IV estimation were conducted.

Tables (C.1), (C.2) and (C.3) indicates results of regression. Results shows again heterogeneous situation: (1) CTV markets data shows negative relationship between price and debt and positive relationship between financial cost for IV estimation. OLS estimation of the third column shows that insignificant parameters for debt variable. This implies the possibility of predatory pricing behavior thanks to loose financial constraint of SOEs in CTV market. (2) Air conditioner market shows that insignificant results for debt variable for both OLS and IV estimation. Financial cost and marketing cost is positively correlated with price for OLS estimator. Evidence for predatory behavior is not clear. (3) Mobile phone market, both debt amount and financial cost are not correlated with price for OLS estimates and financial cost is negatively correlated with price for GMM. The latter is against the hypothesis above.

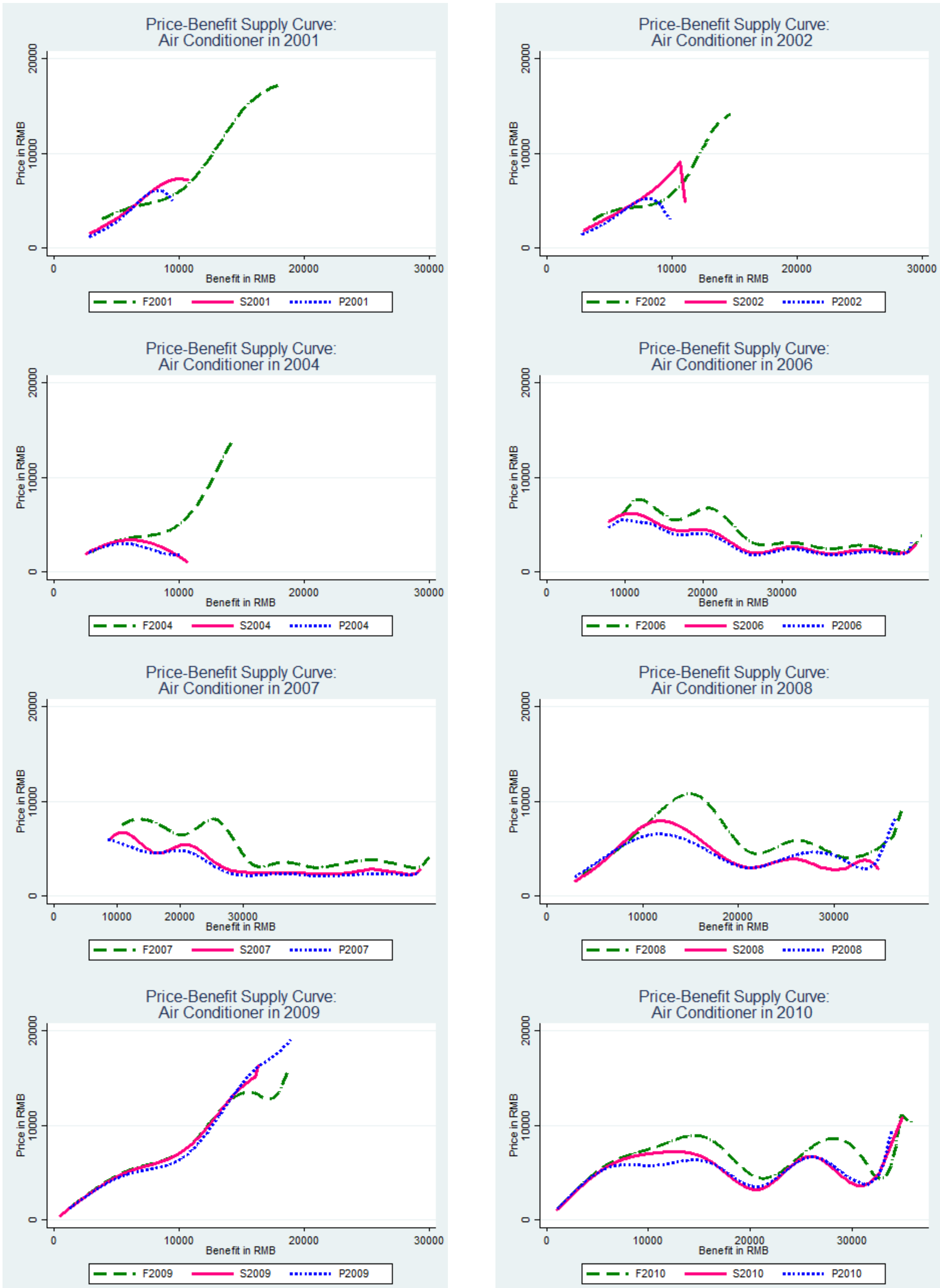
As a whole, CTV market data could not reject the possibility that competitive neutrality are violated due to soft financial constraint.

6 Conclusion

This paper attempted to identify competition neutrality of SOEs for three electronics industries in China . First, I draw price benefit demand and supply curves in order to identify positioning and the "competitive advantage" of brands in Chinese markets. The results reveal that there is a tendency across three industries for foreign brands to hold a "benefit advantage" and for private brands to maintain a "cost advantage". The SOEs are trapped in the middle, failing to hold competitive advantages.

One more important feature is the SOEs and private firms looks to have been trapped in the "excess" price competition equilibrium where price is independent to the benefit that firms offers to the society. Price Benefit curves goes horizontally, that is, price is independent to benefit of product. Theoretical analysis based on differentiated products competition with one soft financial constraint shows that due to predatory pricing strategy by the soft constraint firm, their rivals pricing got independent to benefit level of products. Profit from differentiation disappeared for their rivals. Regression of specification following model analysis on the CTV data shows that amount of debt of the soft constraint firm shows negative coefficient in the price function. Larger the debt amount of the soft budget firm, the lower price are set. Reduced form regression on price benefit function incorporating financial data shows contradicting results: SOEs in the color tv markets price their products lower when their debt is large and financial cost is lower. Estimating structural functions and identifying the mechanism that is generating the market equilibrium is attempting in line with the results of this paper.

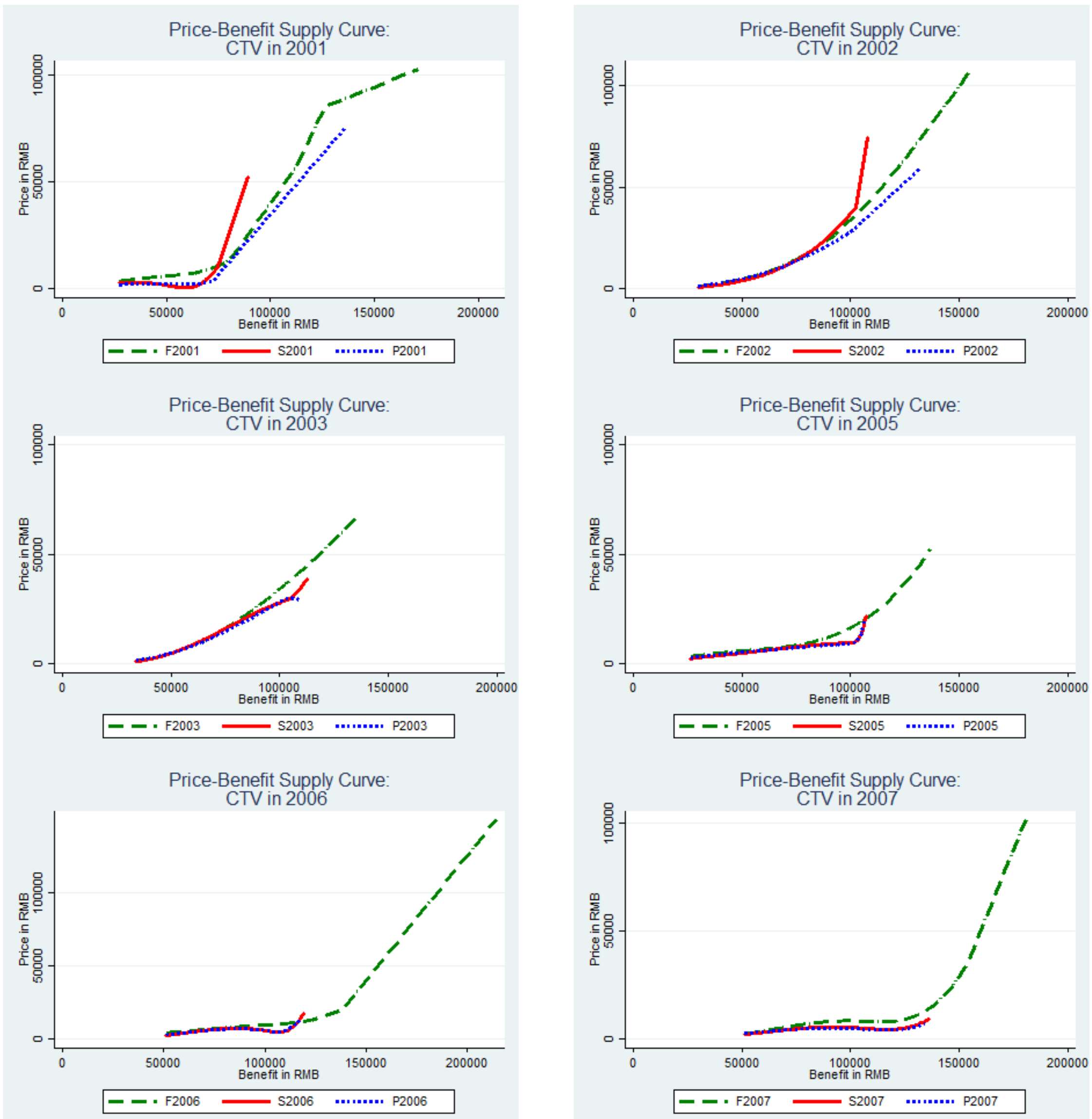
Figure 8: Price and Benefit Supply Curve by Ownership Type - Air Conditioner



Note: Red/Orange lines represent SOEs. Blue lines represent Private owned firms. Green lines represent Foreign Owned firms.

Source Author's estimation.

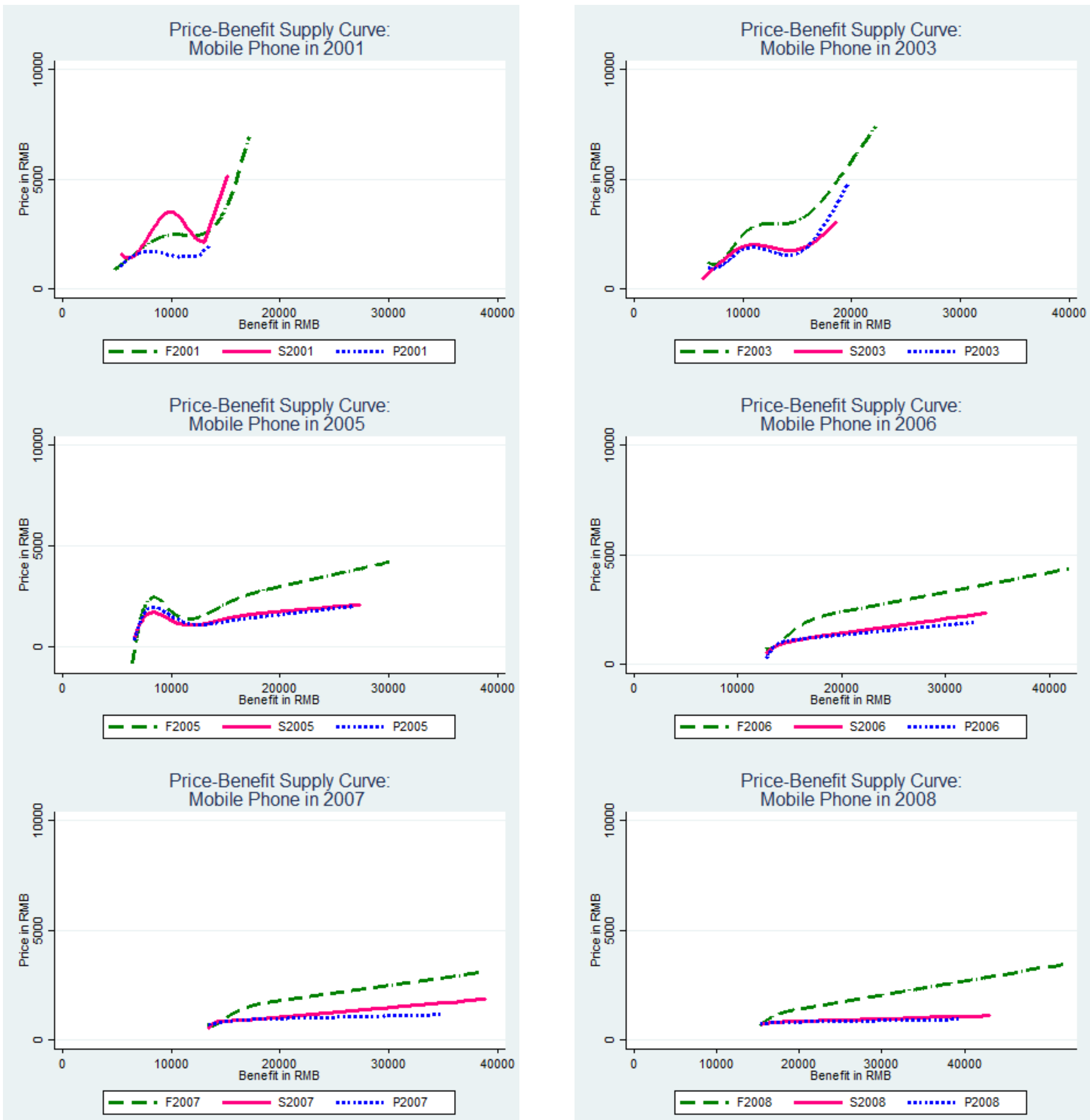
Figure 9: Price and Benefit Supply Curve by Ownership Types - Color TV



Note: Red/Orage lines represent SOEs. Blue lines represent Private owned firms. Green lines represent Foreign Owned firms.

Source Author's estimation.

Figure 10: Price and Benefit Supply Curve by ownership - Mobile Phone



Note: Red/Orange lines represent SOEs. Blue lines represent Private owned firms. Green lines represent foreign-owned firms.

Source Author's estimation.

Figure 11: Price Benefit Supply Curve (Structural form) - CTV market

	(1) Hard Constraint OLS ln $price_{constraint}$	(2) Soft budget constraint OLS ln $price_{softbudget}$
ln $benefit_{own}$	4.527***	6.354***
	(0.000)	(0.000)
ln $benefit_{others}$	-3.995***	-6.127***
	(0.000)	(0.000)
ln $mc_{softbudget}$	0.097	0.277***
	(0.163)	(0.000)
ln $mc_{constraint}$	0.308***	0.016
	(0.000)	(0.609)
ln $debt_{own}$		-0.047***
		(0.000)
ln $debt_{rivals}$	0.076	
	(0.496)	
constant	-3.466	4.589***
	(0.264)	(0.000)
City Dummies	+	+
Year Dummies	+	+
Brand Dummies	+	+
N	5734	6377
R^2	0.709	0.709

p-values in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

(Note) Marginal costs (mc) are computed from the equation: $p_{jt} - mc_{jt} = -q_{jt} \frac{\partial p_{jt}}{\partial q_{jt}}$ $\frac{\partial p_{jt}}{\partial q_{jt}}$ is estimated from demand estimates in previous setion.

References

[1] Ackerberg, Daniel A. and Gregory S. Crawford (2009), "Estimating Price Elasticities in Differentiated Product Demand Models with Endogenous Characteristics," mimeo, 2009.

[2] Besanko, David et.al (2010), *Economics of Strategy*, 6th edition, Wiley. (Japanese version, Besanko et.al 2002 is translated from the 2nd edition.)

[3] Berry, Steven (1994) "Estimating Discrete-Choice Models of Product Differentiation" *Rand Journal of Economics*, 25 (2) 242-262

[4] Berry, Steven, James Levinson Ariel Pakes (1995) "Automobile Prices in Market Equilibrium" *Econometrica*, 63 (4): 841-890.

[5] Cheng, Thomas (2015) "Competitive Neutrality from Asian Perspective" ROUNDTABLE ON COMPETITION NEUTRALITY at OECD, 16-18 June 2015

[6] Capobianco, A. and H. Christiansen (2011), " Competitive Neutrality and State-Owned Enterprises: Challenges and Policy Options ", OECD Corporate Governance Working Papers, No. 1, OECD Publishing. http://dx.doi.org/10.1787/5kg9xfgjdhg6-en

[7] De Fraja, Giovanni and Flavio Delbono(1990), " Game Theoretic Models of Mixed Oligoply " , Journal of Economics Survey, Wiley, Volume 4, Issue 1, pp 1–17, March 1990

[8] De Fraja, Giovanni (2009) "Mixed Oligopoly: Old and New," Working Paper No.09/20, University of Leicester, Department of Economics

[9] Fjell, Kenneth and Debasis Pal (1996) "A Mixed Oligopoly in the Presence of Foreign

Private Firms" The Canadian Journal of Economics / Revue canadienne d'Economique Vol. 29, No. 3 (Aug., 1996), pp. 737-743

[10] Ghosh, A., et al. (2015). "Privatization, Underpricing, and Welfare in the Presence of Foreign Competition." Journal of Public Economic Theory 17(3): 433-460.

[11] Grigolon, Laura and Franc Verboven (2011) " Nested logit or random coefficient logit? A comparison of alternative discrete choice models of product differentiation" Center for Economic Studies, Discussion Paper Series 11-24.

[12] Hausman, J. (1996) " Valuation of New Goods under Perfect and Imperfect Competition, " in *The Economics of New Goods*, ed. by T. Bresnahan, and R. Gordon. University of Chicago Press.

[13] Hotelling

[14] Ivaldi and Frank Vanboven (2005), "Quantifying the effects from horizontal mergers in European competition policy" *International Journal of Industrial Organization* 23 (2005) 669-691.

[15] Kawashima, Fujio (2015) "On Market Competition Neutrality" RIETI Discussion Paper.

[16] Luts, Stefani and Mario Pezzino (2010) " Mixed Oligopoly, Vertical Product Differentiation and Fixed Quality Dependent Costs, " Working Paper Series, International Center for Economic Research.

[17] Matsumura, T. and N. Matsushima (2004). "Endogenous Cost Differentials between Public and Private Enterprises: A Mixed Duopoly Approach." Economica 71(284): 671-688.

[18] Organization of Economic Cooperation and Development (OECD), t (2012), *Compet-*

itive Neutrality: Maintaining a level playing field between public and private business, OECD Publishing.

[19] Porter, M. E.(1980) *Competitive Strategy: Techniques for Analyzing Industries and Competitors*. New York: Free Press, 1980. (Republished with a new introduction, 1998.)

[20] Train, Kenneth (2009),*Discrete Choice Methods with Simulation*, 2nd edition, 2009. Cambridge University Press.

[21] Unirele Institute of Economic Research, SOE report, 2012.

[22] UNCTAD Research Partnershi p Platform Publication Series " Competitive neutrality and its application in selected developing countries" Project Coordinator, Deborah Healey, UNITED NATIONS Geneva, 2014 $http://unctad.org/en/PublicationsLibrary/ditcclpmisc2014d1_en.pdf$

[23] Nevo, A. (2001): " Measuring Market Power in the Ready-To-Eat Cereal Industry, " *Econometrica*, 69(2), 307–342.'

[24] Verboven, Frank (1996). "International Price Discrimination in the European Car Market." RAND Journal of Economics 27(2).

[25] Watanabe, Mariko ed.(2014), *Disintegration of Production* Palgrave-McMillan.

[26] Watanabe, Mariko (2014), "Institution related to Corporate System"Katsuji Nakagane ed.,*How China Eonomy has changed? Evaluating Policy and Institution of Reform and Open Policy Era of China* (In Japanese) Kokusai-Shoin (publisher)

[27] Watanabe, Mariko (2015), "Estimating Competitive Advantages of SOEs and their rivals: A preliminary result," Journal of Chinese Economy and Management, 2015 June, Japan Association for Chinese Economy and Management, Vol. xx, No. x.

[28] Zhou, Qiren (2006) "Excess capacity problem only appears in the market where the governments heavily intervene' *The Economic Observer*, 29, April, 2006 (*http://finance.sina.com.cn/review/*20060429/09432541373.*shtml*). In Chinese.

A Demand Estimation

A.1 Estimating Benefits of the Products

A theory behind my exercise is as follows: Consumers prefer more benefits and lower priced/cost products. At the same time, there is a trade-off between benefit and cost at a certain level of total utility. Figure A.1 indicates this indifferent relationship. [13] Consumers evaluate the products equivalently as long as configuration of benefit and price of the product remains along with indifference curve or left down the curve and will buy either of the products with the same probability.

Faced with this consumer's preference, supplier can take either of following two strategies. One is the "cost advantage strategy" whereby a manufacturer lists a product with lower cost maintaining the same level of benefit with their rivals. The other is the "benefit advantage strategies" whereby the manufacturers lists a product with greater benefits products whereby maintaining their price as the same level with their rivals. This is the familiar concept of generic competitive advantage strategies in business management studies(Porter(1980), Besanko, et.al (2010)).

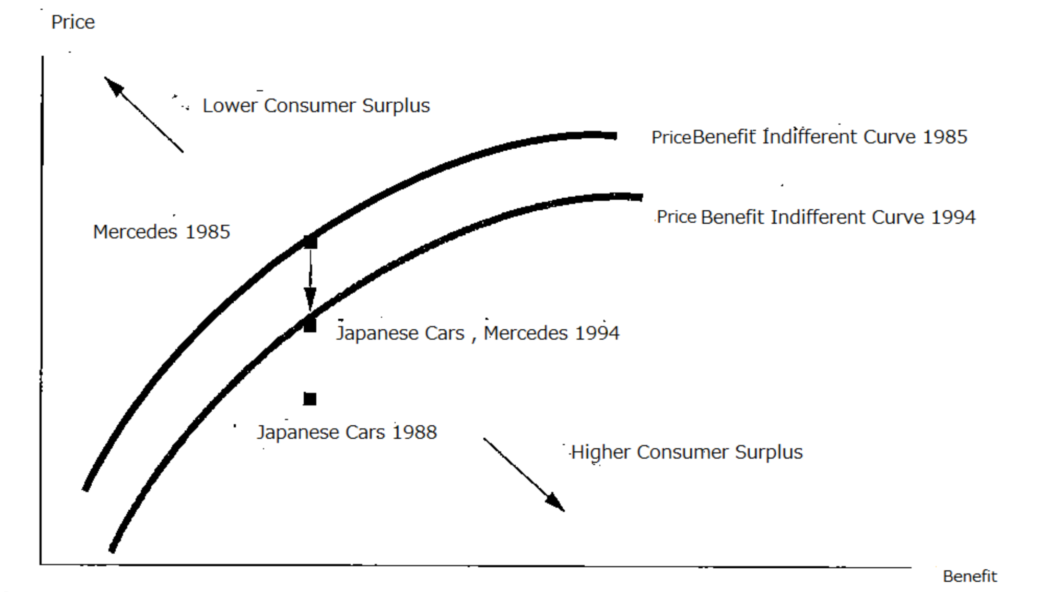
Once the price-benefit curve were depicted, we can identify where a brand's strategies locates. When the curve is going to be depicted, we need to get the data of benefit. I use estimated utility from the product as the benefit of transaction that explained below.

When a products are traded, the product that are generating a benefit B that was valued by a consumer/buyer. The net value or social welfare[14] of an economic transaction is defined as a difference between a benefit B of product j for consumer i, and its production

[13] In 1985, Mercedes' products stayed on the cost benefit indifference curve 1985. In 1988, Japanese cars appeared on the point that named Japanese Cars 1988. The positioning of the Japanese cars product 1988 is far superior to Mercedes 1985 in terms of consumer welfare: Japanese cars in 1988 is much cheaper and better in quality than Mercedes then. In 1994, Mercedes recovered their positioning which is equivalent to Japanese cars in terms of consumer surplus. As is seen in this story of Mercedes positioning, utility of consumer remains the same on the bold line in Figure A.1 for Japanese cars and Mercedes, but configuration of price and benefit changes along the line.

[14] If the transaction generates positive or negative externality, we need to grasp its impact and we can explicitly describe them out in the model.

Figure A.1: Concept of Price and Benefit Indifference Curve



Source:Besanko, et.al (2002, Japanese edition), Figure 12.5

cost C. As long as $B - C$ is not smaller than zero, the business is viable. The larger the benefit of transaction, $B - C$, the larger is the contribution provided by the business to the society.

$$\begin{aligned} Value\ of\ transaction &= (B - P) + (P - C) \\ &= B - C \end{aligned}$$

Value of the transaction are divided between the consumer and producer: Consumers/buyer receives a fraction as much as $B - P$. This is called consumer surplus. The seller receives another fraction of value as much as $P - C$, which is profit. Once we obtained the data of consumer surplus, $B - P$, we can quantitatively compare the size of welfare produced by particular type of sellers or products. Then, question remains as to how to obtain the benefit or consumer welfare? I obtained them by estimating demand function for the markets. Demand function induced from product choice model based on individual utility will be detailed in Section A.2.

Based on this estimated parameters of demand function for products supplied by manufacturers, I can depict price-benefit curves for the consumers.

A.2 Estimation model of demand

Here, I develop a model for demand estimation. Consumer demand is modeled using a discrete-choice formulation. This model describes a process that consumer will choose a product according to the size of the utilities. On the supply side, I assume competition between several brands in different geographical markets at different timings.

A.2.1 Utility and Demand

First, I describe the utility of consumer i that consists of the benefit product j. Consumers chose a brand j in a given market (=city and year, here) to maximize their utility. I view a product as a particular brand sold in a city market $m = 1, 2, ...M$.(I delete m hereafter simply 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,

$$u_{ijt} = -\alpha_i p_{jt} + \beta X_{jt} + \xi_{jt} + \epsilon_{ijt}. \tag{12}$$

p_{jt} denotes price of brand j at market m in time t. Other factors affect product choice, such as the features of product x_{jt}. ξ_{jt} is a product-market specific unobservable. ϵ_{ijt} is the random unobservable error. To predict consumer surplus as much as appropriately, we need capture difference of elasticity of price to the same product by attributes of consumers. We need some random coefficient of the price. The random coefficients of price in this paper are defined as $\alpha_i = \alpha/Y_i$, whereas Y_{it} is the observed income[15].

[15] I used average income of each city-year segments in this paper because we do not have data of individual income. That means $Y_i = Y_{mt} = \sum Y_i/I_{mt}$ and $\alpha_i = \alpha_{mt} = \alpha/Y_{mt}$. I_{mt} is population at market m and

Mean utility of product[16] j can be rewritten as,

$$\delta_{jt} = -\alpha_i p_{jt} + \beta X_{jt} + \xi_{jt}, \tag{13}$$

where ξ_{jt} represents unobservable and time specific characteristics. Each consumer i in market m will choose product j to maximize her utility. Therefore, the aggregate market share for product j in market m is the probability that product j yields the highest utility across all products including outside goods 0. Therefore, the predicted market share of product $j = 1, ...J$, s_j is a function of mean utility δ_{jt} and parameter vector $\theta = (\alpha, \beta, \rho$[17]). If the unobserved error, ϵ_{ijt} in the equation (12) follows i.i.d. extreme value, this relationship can be rewritten as a logit choice probability(see Train (2009)) as below.

$$\begin{aligned} P_{jt} &= s_{jt}(\delta_{jt}, \theta) \\ &= \frac{e^{u_{jt}}}{\sum_k e^{u_{kt}}} \\ &= \frac{e^{-\alpha_i p_{jt} + \beta X_{jt} + \xi_{jt} + \epsilon_{ijt}.}}{1 + \sum_k e^{-\alpha_i p_{kt} + \beta X_{kt} + \xi_{kt} + \epsilon_{ikt}}} \end{aligned} \tag{14}$$

Here, 1 in denominator in equation (14) represents value of outside option, because $exp(u_0) = exp(0) = 1$. Remaining variables in the denominator is sum of exponential utilities of all of the choices in every market.

Under this logit assumption, consumer surplus CS_i for consumer i, previously indicated by $B - P$, takes the following closed format.

$$E(CS_i) = \frac{1}{\alpha_i} E[Max(u_{jt})] \tag{15}$$

The expectation is over all possible values of error ϵ_{ijt}. Here, expected consumer surplus

time t in this paper.

[16] Because this is the mean of utility, unobserved independent error ξ_{jt} in equation (12) can be regarded as zero.

[17] ρ is the nesting parameter that explained later referring to equation (21)

for individual i or product j can be written as follows.

$$E(CS_i) = \frac{1}{\alpha_i} ln(\sum_{j=1}^{J} e^{u_{ijt}}) + C.^{18} \tag{16}$$

$$E(CS_j) = \sum_{i=1}^{I} \frac{1}{\alpha_i} ln(e^{u_{ijt}}) + C \tag{17}$$

Absolute value of consumer surplus is meaningless because of the unknown C. But the difference between several states of consumer surplus as a figure generated from the structure. This paper focused on difference between two different agents, for example, agent h or ownership type h comparing to agent k or ownership type k, difference of sum of consumer surplus of products supplied by firm k and firm h. This can be written as follows:

$$\Delta CS_{hk} = [\sum_{j=1}^{J|h} \frac{1}{\alpha_i} ln(e^{u_{ijt}}) - \sum_{j=1}^{J|h} \frac{1}{\alpha_i} ln(e^{u_{ijt}})] \tag{18}$$

Once you obtained CS_j for product j from above estimates, we can compute the value of benefit of product j, B_{jt}.

$$Benefit_j = CS_j + Price_j \tag{19}$$

Here, we can see the relative size of benefits of the product following the same way as we can do for consumer surplus.

A.2.2 Nested Logit Model and Identification

The logit-based utility model provides an estimating equation of utility in the following form (see Train(2009) for an explicit explanation.). Based on the model, I estimate the demand parameters following Berry (1994) and Nevo (2000) and other BLP literatures.

Our estimation equation is,

$$ln(s_{jt}) - ln(s_{ot}) = -\alpha_i p_{jt} + \beta X_{jt} + \rho ln(s_j t|g) + \xi_{jt}. \tag{20}$$

Here, I set the outside option as a difference between population and total number of air conditioner for individual market and year that represents number of potential buyer of the products. $s_{jt|g}$ is the share of product j withing group g.

The parameters of this demand can be identified as the previous empirical industrial organization literatures claimed (see Ackerberg and Crawford (2009)). Identification of price parameters, which is critical for our benefit computing, relies on the fact that the unobserved determinants of demand are uncorrelated with input prices. To account for this potential endogeneity of prices that may be caused by the presence of changes in unobserved attributes, we use the GMM estimator with either type of instruments variables discussed in Section A.4.

To account for the degree of preference correlation between products of the same group, I imposed a further assumption on the error term, ϵ_{ijt} of equation (12).

$$\epsilon_{ijt} = \rho\eta_{igt} + \bar{\epsilon_{ijt}} \tag{21}$$

ρ is a "nesting parameter" , $0 \leq \rho \leq 1$ that captures the correlation between preference and product characteristics. $\bar{\epsilon_{ijt}}$ is independently distributed error for consumer, product and timing.

When demand function parameters estimated based on the nested logit model, consumer surplus will be computed as follows (see Ivaldi and Verboven[2005:677]).

$$E(CS_i) = \frac{1}{\alpha_i} ln(1 + \sum_{j=1}^{J} D_g^{1-\rho}) + C. \tag{22}$$

$$D_g = \sum_{k=1}^{G_g} exp(\delta_{jt}/(1-\rho)) \tag{23}$$

A.3 Data

I use the market survey data of GfK market services for the three industries: air conditioner, color TV and mobile phone. Sales value and number of units for individual model categories are available for each top 10 brands and others for several features of the products for 30 cities in China. The features of the products are as follows: Air conditioners are divided by (1) horsepower (1 HP, 1 to 2 HP and 2 HP and above) (2) grades of the energy efficiency labels, and (3) types of installment, (4) whether inverter controlled or not. Color TV data are divided by (1) types of panels (CRT, LCD, PDP) , (2) screen size (21 inches and below, 21 to 32 inches, 32 inches and over). Mobile phones are divided by (1) types of networks (CDMA, GSM, TDS-CDMA), (2) types of operation system (no OS installed, Linux, Symbian, Windows Mobile and others) (3) Number of colors in the panel, and (4) Camera is installed or not.

Regarding the air conditioner data, the data on sales and information related to energy consumption begins with the year 2008 and is obtained from the GfK market auditing data. Data for power consumption are not available directly from this data base. Hence, I supplemented the power consumption information from the catalog data on e-commerce site, SOHU.

A.4 Instruments

The estimation of the models I employed here is typically done using IV or GMM using instruments for p_{jt} and nested variables. Instruments z_{jt} that are correlated to p_{jt} but are independent to $\bar{\epsilon}_{ijt}$ or ϵ_{ijt} . In this case, candidates of instruments here mainly come from following four sources: (1) cost shifters; fees of electricity etc. (2) price of the same products of the same brand in other city. Here, we need to assume that difference of prices of the same products across cities only reflects demand factors, and that the price of other city of the same products are correlated with price via only cost factors. (Berry, Levinson and Pakes, 1995 (BLP paper) , Hausman, 1996. Nevo, 2001). (3) Price of the same type of products by competitor brands in a same city (Berry, Levinson and Pakes, 1995) (4) characteristics of products; it is natural to assume that characteristics of products are designed and planned in advance, before the price is fixed. Exploiting this natural assumption, we use the characteristics of products as instruments that predetermined to the price. Either of four types of instruments were tried; (i) The first type of "quality" dummies are sum of index of characteristics within the own brand, such as capacity of air conditioners or size of visual panels of color television. (ii) The second type of this category's IV is sum of the characteristics of other products of rival firms, and (iii) the third one is sum of the characteristics of other products of own firms (see Grigolon and Verboven (2011) Verboven (1996)). (iv) The fourth is the average index of the characteristics of a competitor.

The Hausman instrument approach ((2)) 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[19]. However, in our estimation case, this IV works effectively[20].

[19] The Herfindahl-Hirschman Index, HHI, that is computed by the data of the three markets shows high competition mode. It clearly denied a monopolistic environment.

[20] GMM c-statistics of demand estimates results in Figures B.1(GMM c-statistics 1.185 and p=0.2763), Figures B.2 (GMM c-statistics is 3.05299 (p = 0.2173)) and B.3 (GMM c-statistics is 1.6e-07 (p = 1.0000)) show that the IV were confirmed as exogenous to our demand.

B Estimated Demand and Market Outcome

B.1 Estimated Parameters

Estimated demand parameters are presented in Figures B.1, B.2 and B.3. The CTV and mobile phone markets demands are estimated with nested logit model and air conditioner market demand is estimated with a logit model. For the all three markets, it is confirmed that the instrument variables used were exogenous to price variation. Nesting parameters in the color TV and mobile phone market indicates that color TV market is homogenized (ρ= 0.995), whereas mobile phone market is more differentiated (ρ=0.245). For the air conditioner markets, I could not find effective instruments variables for the nested logit model, but could find appropriate IVs for the logit specification.

Figure B.1: Demand Estimates:Air Conditioner

	(1)
	$ln(s_j) - ln(s_o)$
price/wage	-5.496***
	(0.431)
cooling capacity	0.0001***
	(0.000)
power consumption capacity	-0.0004***
	(0.000)
HP: 1 to 2	0.544***
(Reference=1HP below)	(0.124)
HP: 2 and over	0.476***
	(0.090)
Label Introduced	0
Introduced X Label 1	4.816***
	(0.125)
Introduced X Label 2	-1.844***
	(0.056)
Introduced X Label 3	-1.052***
	(0.047)
Introduced X Label 4	-0.522***
	(0.041)
Inverter Introduced	-0.983***
	(0.041)
Non Inverter Period	0.000
	(.)
Installment: Stand Alone	0.0046
(Reference=Others)	(0.058)
Installment: Split	-3.137***
	(0.125)
Brand dummies	+
City dummies	+
Year dummies	+
Constant	-5.243***
	(0.247)
N	17914
R^2	0.487
$GMMcstatistics$	1.185
	$p = 0.2763$
IV	average cooling capacity of competing products sum of horse power of products of the same brand average horse power of own brand average horse power of rival brand price of other city of the same brand products, wage per capita space of living

Standard errors in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Figure B.2: Demand Estimates: CTV market

	(1)
	$ln(s_j) - ln(s_o)$
price/wage	-1.110***
	(0.060)
$\rho_{ctvtypes}$	0.995***
	(0.060)
CTV Type: LCD	-2.096***
(Reference= CRT)	(0.037)
CTV Type PDP	-3.356***
	(0.088)
Screen size: 21 to 32 inches	0.316***
(Reference= 21 inches and below)	(0.034)
Screen size: 32 inches and over	0.658***
	(0.059)
Year dummies	+
City dummies	+
Brand dummies	+
Constant	-2.432***
	(0.243)
N	12432
R^2	0.850
IV	average price of other markets of the same products by the same brand sum of the screen size among the same type products the same brand wage, population of other city

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Source: Author's Estimates

Figure B.3: Demand Estimates: Mobile phone market

	(1)
	$ln(s_j) - ln(s_o)$
price/wage	-6.422***
	(0.797)
ρ_{OS}	0.245**
	(0.106)
Network:GSM	1.669***
(Reference=CDMA)	(0.240)
Network: TDS-CDMA	0.823***
	(0.158)
Panel: Color	0.131***
(Reference= B&White)	(0.042)
No Camera	-0.562***
	(0.077)
OS:Others	-2.489***
(Reference=Linux)	(0.390)
OS: Symbian	0.410***
	(0.075)
OS Windows mobile	-0.170
	(0.153)
OS: No OS	1.940***
	(0.279)
Brand dummies	+
Year dummies	+
City dummies	+
Constant	-8.418***
	(0.461)
N	46741
R^2	0.598
IV	price in other markets of the same products by the same brand square of price in other markets of the same products by the same brand

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

C Results of Reduced Form Estimation of Price Benefit Supply Curve

Figure C.1: Listed SOE's Price Benefit Supply Curve (Reduced Form) CTV market

	(1) OLS	(2) OLS	(3) OLS	(4) GMM
Private	3215.01***	0	0	0
	(0.000)	(.)	(.)	(.)
SOE	6846.73***	0	0	0
	(0.000)	(.)	(.)	(.)
benefit	1.05539***	0.86043***	0.85984***	0.85859***
	(0.000)	(0.000)	(0.000)	(0.000)
$Private \times benefit$	-0.069248***	0	0	0
	(0.000)	(.)	(.)	(.)
$SOE \times benefit$	-0.078118***	0	0	0
	(0.000)	(.)	(.)	(.)
$benefit^2$	-1.6809e-06***	-1.4054e-06***	-1.4044e-06***	-1.4022e-06***
	(0.000)	(0.000)	(0.000)	(0.000)
$Private \times benefit^2$	6.5774e-08	0	0	0
	(0.118)	(.)	(.)	(.)
$SOE \times benefit^2$	8.4946e-08**	0	0	0
	(0.011)	(.)	(.)	(.)
debt_total		-2.2137e-08	-2.2586e-08	-3.9581e-08**
		(0.106)	(0.140)	(0.015)
financial_cost			2.1897e-06**	7.7206e-06***
			(0.047)	(0.004)
operating_tax			6.9172e-06	0.000017897***
			(0.123)	(0.005)
marketing_cost			-1.1747e-07	-3.2572e-07***
			(0.154)	(0.009)
management_cost			-1.2729e-07	-9.5519e-08
			(0.123)	(0.249)
constant	-51227.7***	-39673.7***	-39808.4***	-39893.1***
	(0.000)	(0.000)	(0.000)	(0.000)
City Dummies	+	+	+	+
Year Dummies	+	+	+	+
Brand Dummies	+	+	+	+
N	11406	6724	6724	6724
R^2	0.781	0.684	0.684	0.683

P-value in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Figure C.2: Listed SOE's Price Benefit Supply Curve Estimates: Air conditioner market

	(1) OLS	(2) OLS	(3) OLS	(4) GMM
Private	-138.648	0	0	0
	(0.594)	(.)	(.)	(.)
SOE	-1111.59***	0	0	0
	(0.000)	(.)	(.)	(.)
benefit	0.70127***	0.95465***	0.96415***	0.95272***
	(0.000)	(0.000)	(0.000)	(0.000)
Priate X benefit	0.018613	-0.41127***	-0.43382***	-0.42076***
	(0.721)	(0.000)	(0.000)	(0.000)
SOE X benefit	0.28458***	0	0	0
	(0.000)	(.)	(.)	(.)
$benefit^2$	8.1643e-06***	-0.000011399***	-0.000011949***	-0.000011258***
	(0.000)	(0.000)	(0.000)	(0.000)
Private X $benefit^2$	-7.0168e-06*	0.000028382***	0.000029532***	0.000029034***
	(0.056)	(0.000)	(0.000)	(0.000)
SOE X $benefit^2$	-0.000020670***	0	0	0
	(0.000)	(.)	(.)	(.)
debt_total		1.3473e-08***	-6.6514e-09	-5.2525e-09
		(0.000)	(0.283)	(0.820)
financial_cost			9.7814e-07***	8.4396e-07
			(0.000)	(0.673)
operating_tax			-3.1684e-07	-2.6654e-07
			(0.499)	(0.777)
marketing_cost			1.4798e-07***	1.4494e-07***
			(0.000)	(0.000)
management_cost			-2.0695e-08	-2.3661e-08
			(0.674)	(0.686)
constant	-6.97129	-906.748***	-1020.78***	-1005.66***
	(0.968)	(0.000)	(0.000)	(0.000)
City Dummies	+	+	+	+
Year Dummies	+	+	+	+
Brand Dummies	+	+	+	+
N	22308	13158	13158	13158
R^2	0.592	0.545	0.547	0.547

p-values in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Figure C.3: Listed SOE's Price Benefit Supply Curve Estimates: Mobile phone market

	(1) OLS	(2) OLS	(3) OLS	(4) GMM
Private	523.822***	0	0	0
	(0.001)	(.)	(.)	(.)
SOE	535.895***	0	0	0
	(0.001)	(.)	(.)	(.)
benefit	1.07683***	0.54672***	0.55009***	0.55439***
	(0.000)	(0.000)	(0.000)	(0.000)
Private X benefit	-0.026086	0.094058***	0.079277***	0.071988***
	(0.110)	(0.000)	(0.000)	(0.000)
SOE X benefit	-0.017103	0	0	0
	(0.208)	(.)	(.)	(.)
$benefit^2$	-0.000012319***	-7.4103e-06***	-7.5000e-06***	-7.5860e-06***
	(0.000)	(0.000)	(0.000)	(0.000)
Private X$benefit^2$	-7.0780e-07*	-3.2733e-06***	-2.8617e-06***	-2.6990e-06***
	(0.099)	(0.000)	(0.000)	(0.000)
SOE X $benefit^2$	5.7006e-08	0	0	0
	(0.883)	(.)	(.)	(.)
debt_total		-5.1677e-09**	1.6572e-09	2.8493e-09
		(0.014)	(0.478)	(0.230)
financial_cost			1.4784e-07	-7.1338e-07**
			(0.477)	(0.028)
operating_tax			-1.8722e-06***	-4.0129e-06***
			(0.010)	(0.000)
marketing_cost			4.9285e-08*	1.0762e-07***
			(0.072)	(0.001)
management_cost			-1.4395e-07***	-1.5814e-07***
			(0.001)	(0.000)
constant	-9464.13***	-3196.66***	-2812.70***	-2515.81***
	(0.000)	(0.000)	(0.000)	(0.000)
City Dummies	+	+	+	+
Year Dummies	+	+	+	+
Brand Dummies	+	+	+	+
N	22308	13158	13158	13158
R^2	0.592	0.545	0.547	0.547

p-values in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Industrial Dynamics and Innovation for Locating Global Advantage:
Implications for Agglomeration Economies
from A Case Study of the Flat Panel Display industry in Japan*

Akio Kondo

Faculty of Economics, Hosei University

kondo@hosei.ac.jp

Abstract:

The purpose of this study is to investigate how efficient agglomeration economies work and how difficult industrial agglomerations sustain in the high-tech industries by a historical case study of the Flat Panel Display (FPD) industry in Japan in the 1990 and the first decade of the 2000s. Looking globally, the production locations of the FPD industry were concentrated in Eastern Asia during the first half of the 2000s. Particularly, more than 90% of panels were produced in Japan, Korea and Taiwan. Also in Japan, the geographical concentration of production locations was remarkable, shown by the examples that Sharp produces liquid crystal panels only in Kameyama and that Panasonic manufactures plasma display panels (PDP) in Ibaraki and Amagasaki. This led to the creation of high-tech industrial agglomerations. Taking these observable facts and the significant changes in recent economic environment as a starting point, we study the case study the conditions of factory locations of FPD and the factors to change such conditions from the viewpoint of spatial and organizational location for seeking global advantage in focus on technological cycle and facilities investment. From the example of one of the largest FPD manufacturer, Panasonic, we can observe the progress of large-scale production and the shortening of technological cycle, which suggest that the “thickness” of the industrial agglomeration economies was more important as a business environment to maintain competitiveness. However, the FPD industry in Japan has declined since the late 2000s, while these new high-tech industrial agglomerations have faced difficulties to sustain.

Keywords: Agglomeration economies, Industrial location, Locational adjustment, Technological cycle, Facility investment, Flat panel display industry

JEL Classification Numbers: L63, N60, R11

* An early version of this paper was presented at the SIEM International Symposium at Ritsumeikan University on March 24-25, 2010. This revised version was completed in 2015.

Introduction: Acceleration of Location Adjustment

The purpose of this study is to investigate how efficient agglomeration economies work and how difficult industrial agglomerations sustain in the high-tech industries by a historical case study of the Flat Panel Display (FPD) industry in Japan.

The location of the electronics industry in Japan was characterized by the "decentralization" after World War II. Especially, since the second half of the 1960s, the factories in the large-city areas were deconcentrated, and a number of the labor-oriented productions and processes were located in the local areas outside metropolitan areas. These locations created linkage within the areas constituting hierarchies and networks by sharing the works among the factories while the affiliated companies, cooperating companies and subcontractors were also closely located as suppliers to the factories (Kondo 2007). According to the Census of Manufacturers, the percentage of offices and employees of electric equipment and apparatus manufacturers located in the local areas[1] was 15.7% and 21.1% in 1955, respectively, which increased to 50.6% and 59.4% in 2000. This decentralized pattern of locations was also developed from the inside of Japan to overseas countries. The ratio of production outside Japan was raised from a few percent in the period before the 1980s to 21.9% in 2000. This shows that, while the electronics industry was growing, the areas of locations were spread from the inside of the country to overseas.

The adjustment of locations of the electronics industry has been accelerated for the last

[1] Local areas are herein defined as the areas in Japan except three large-city areas, which are the Tokyo capital area (including Saitama-prefecture, Chiba-prefecture, Tokyo-metropolis and Kanagawa-prefecture), Chukyo area (including Gifu-prefecture, Aichi-prefecture and Mie-prefecture) and Hanshin area (including Kyoto-prefecture, Oosaka-prefecture and Hyogo-prefecture).

dozen years or so. Against the background of relative increase of the production cost in Japan due to yen appreciation and the strategic participation in the overseas market after the 1990s, business organizations were restructured. The local production linkage was weakened for the reasons of the consolidation of domestic production sites and the development of international procurement. As a result, a “hollowing out” phenomenon has temporarily appeared in Japan. After the 2000s, productions have been “coming back to the country” because of reinstatement of “monozukuri” (craftsmanship). Thus, the adjustment of locations has remained ongoing in the wider scale of spaces including Japan and overseas.

There is rapid change of the economic environment with acceleration of location adjustment in the background. First of all, globalization and being borderless comprise one of the features of the new economic environment. Not only the final goods in the market but also information, finance, human resources and raw and intermediate materials have become very movable. The barrier of national borders has been lowered. Secondly, the technologies incorporated into the goods have evolved. Concerning information technologies and digitalization, it is said that the reality is that electronic device technologies have been deepened and have become more complex, and that as a result, the cost of R&D and facilities investment have sharply increased. In parallel, the interaction of processes of production systems has become complex. Strategic coordination within a corporate organization and among firms has become important, requiring the review of the “boundaries of the firm,” which concerns questions about which processes should be performed by the firm itself and which processes should be outsourced (Sako, 2006). Thirdly, international competition has become fierce. While the manufacturers in Korea and Taiwan have matured and the Chinese market has been developing more fully, Eastern Asia including Japan has become one of the biggest production sites of the electronics industry in the world and the competition in this area has increasingly been severe. In this rapid change of economic environment, relocation and the location adjustment have been developed in the whole area of Asia including inside Japan.

Under the economic environment as mentioned above, factory investment in Japan has apparently become larger. Particularly, domestic production locations have been redefined as those for high value-added products, and therefore large-scale investment with more than 100 billion yen have continuously been implemented in such sectors as semi-conductors, flat panel displays and high-tech products. One of the reasons for the large-scale investment in production is to target making the production site a “black box” through the business model of vertical integration, which helps the prevention of the leakage of technologies outside the firm. In addition, the recent large investment is characterized by the fact that it has been made continuously in the specific production sites. For example, in the semi-conductor sector, a total of more than 500 billion yen has been invested in the Yokkaichi Plant of Toshiba since 2003. An accumulated amount of more than 600 billion yen has been invested in Hiroshima Elpida, which is the only production plant of DRAM memory chips in Japan. As for liquid crystal panels, the investment in IPS Alpha Technology, which is owned by Sharp, Hitachi, etc., and in Fujifilm’s production of polarizing filter panel protection films has amounted to approximately 100 billion yen in total. These examples indicate that the large-scale investment has come to the areas of materials and parts for “digital domestic appliances.”

In this paper, we will take up as an example the development history of the flat panel display (FPD) industry against the background of the rapid change of the economic environment as mentioned above, and will study the structural factors of recent large-scale investment. We will specifically look into the TV business of Panasonic. Recently, technological innovation has been developed for television receivers, and in parallel with the widespread high-vision broadcasting and digital broadcasting, they are in the transition from one using CRT (Cathode Ray Tube), so-called “brown tube TV,” to one using FPD (flat panel display), so-called “thin-type TV.” FPD TVs consist of, by the different image display devices they adopt, LCD (liquid crystal display) TVs, PDP (plasma display panel) TVs and rear-projection TVs. The market size of FPD TVs is large among the “digital domestic appliances” and has been growing globally. Therefore, the adjustment of production locations has been accelerated by concentrating the management resources and by investing strategically in the facilities (Figure 1). In this paper, we will take up the processes of transitioning the products which were carried out by Panasonic’s TV business, and will study the direction of changes of the production locations from the viewpoint of technological cycle and facilities investment. Finally, based on the example of FPD manufacturers, we will consider the relation between the organizational adjustment of locations and the industrial agglomeration as well as the new direction of factory locations. Also, we will discuss about agglomeration economies in the fact that the FPD industry in Japan has declined since the late 2000s, while these new high-tech industrial agglomerations have faced difficulties to sustain.

--Figure 1--

The Case Study of Panasonic: Shifting from CRT TV to PDP business

Panasonic's TV business started its full-scale operation in 1953, and developed into one of the core businesses of Panasonic. Looking at the transition of Panasonic's production in Japan, the main factories were located in Ibaraki and Moriguchi in Osaka till the first half of the era of rapid economic growth of Japan ("Golden Sixties". The factories were established in Fujisawa of Kanagawa in 1963 for assembly of CRTs for black and white TVs and in Utsunomiya of Tochigi in 1967 solely for assembly of color TVs. Thus, the production locations were diversified along with the expansion of the demand for the products. In the middle of the 1970s, the mainstream of TVs shifted from black and white to color ones, and after the restructuring of the business organization of TVs for exports and black and white TVs, the production of color CRT TVs was carried out mainly in the Ibaraki Plant of Osaka and in the Utsunomiya Plant in Tochigi since the late 1970s. Outside Japan, factories were established in Mexico for the North American market and in Malaysia for the Asian market. Thus, international production network was formed in such a way that new technologically adapted goods were developed in Japan and the mass-produced goods were transferred abroad, which was the so-called "vertical-model" between Japan and overseas countries. The production of color CRT TVs was at its peak in the middle of the 1980s, and the number of CRT TVs produced by Panasonic exceeded 10 million units.

Production in Japan decreased in the late 1980s since the market in Japan was saturated and competition against the goods of foreign manufacturers became fierce. Although domestic production was specialized for high added-value goods, such as flat CRT TVs, in the

1990s, it must have been restructured because it was less competitive in terms of production cost. Indeed, the Panasonic corporate group faced a management crisis between the late 1990s and early 2000s, and drastic management reform was conducted after President of Panasonic Yoichi Morishita took over the position from former President Kunio Nakamura[2]. In this movement, the TV business was substantially restructured, and the mainstream of goods was transposed from CRT TVs to PDP (plasma display panel) TVs.

After the late 1990s, Panasonic underwent restructuring of the TV business through the stages of the establishment of new business, the reduction of CRT TV business and the substantial shift to PDP business. PDP business in Japan actually started in 1994 when the “Joint Development Committee of Plasma Display Panel for High-Vision Broadcasting”[3] was established. Panasonic kicked off its PDP business unit in 1998, when the other competitors, i.e. Fujitsu, NEC and Hitachi, had entered into the mass-production phase. Panasonic was the fourth participant in the PDP market in Japan. It required Panasonic to make a large investment to catch up with its advanced competitors. Panasonic established its PDP manufacturing subsidiary, “Matsushita Plasma Display Panel Company Ltd.,” in July 2000, and formed a coalition with Toray in October 2000, which resulted in the establishment of “Matsushita PDP Company Ltd.” (MPDP) with 1.2 billion yen in capital (75% owned by Panasonic and 25% owned by Toray). The separate entity engaging in the production of PDP co-funded with Toray was motivated by the diversification of investment risks and the direction for the business model of vertical

[2] Especially, the restructuring of business organizations involved the abolishment of business units which were reorganized into 14 business domains, and the delisting of subsidiary companies which were merged into their parent company.
[3] The Committee was established under the leadership of NHK for the purpose of commercializing PDP television receivers with 40 inch displays and developing PDP television receivers with 50 inch displays. 27 companies, institutions and associations participated in the Committee.

integration.

In the meantime, Panasonic invested continuously in the liquid crystal panel business throughout the 1990s as well as PDP, both of which were considered as post-CRT products. However, as the decision of “concentration in core competence” was made, CRT business and LCD business were restructured after the PDP business was chosen to make a concentrated investment of management resources. LCD business was decided to be sold to Toshiba in 2002, which resulted in the formation of a manufacturing subsidiary, “Toshiba Matsushita Display Technology Co., Ltd.,” with 60% owned by Toshiba and 40% owned by Panasonic. In the end of October 2004, Hitachi took the lead to establish a production company of LCD panels for TVs, “IPS Alpha Technology, Ltd.,”[4] in which Toshiba and Panasonic jointly invested. Thus, Panasonic’s LCD business was restructured in such a way as to transfer the businesses to the entities jointly operated with other companies. CRT business was also restructured into the joint-venture company with Toshiba, “Matsushita Toshiba Picture Display Co., Ltd.,” established in 2003, which is a joint operation in charge of development, production and sales of CRTs on a global basis[5]. As seen above, in the case of Panasonic, it reduced the importance of CRT business and LCD business through the alliance with other companies, and reformed its structure allowing it to invest intensively in PDP business.

In this process of shifting to PDP business, how was the adjustment of locations developed? According to the classification of Watts (1987), the adjustment of locations is

[4] About 110 billion yen was invested in the Mobara Plant of Chiba-prefecture in May 2006, which started its operation with a production capacity of 1.6 million pieces of panels in a year (in terms of 32 inch size panel) using the sixth generation glass base plate (with a size of 1,500 millimeters by 1,850 millimeters). The production capacity was increased to 2.5 million pieces per annum (in terms of 32 inch size panel) in April 2007.

[5] In the end of March 2007, Panasonic bought all shares of MTPD owned by Toshiba (35.5%), which made the company a wholly owned subsidiary of Panasonic. The corporate name was changed to “MT Picture Display Co., Ltd.” Its capital is 10 billion yen and the employees of group companies are 9,077 (as of the end of 2006).

defined as the process in which two or more production companies restructure their production facilities and which consists of the phases of establishment of a factory, adjustment within the factory (in situ adjustment), closure of the factory, etc. If we put the adjustment of locations accompanied with the restructuring of TV businesses in these phases, the factories of CRTs and TV parts were at first closed. Panasonic's CRT production was carried out in the Takatsuki Plant and Utsunomiya (Hiraide) Plant, both of which were located close to the factories for final assembly in Ibaraki and Utsunomiya. The Utsunomiya Plant was closed in August 2003 and the Takatsuki Plant was reduced to a part of a trial production line while its mass-production line was transferred overseas in September 2004. Along with these changes, many suppliers producing the peripheral parts of CRT closed their domestic factories and transferred their production to outside Japan.

The next phase is the changes within the existing factories, in which the production facilities for CRT TVs were transformed to those for FPD panels. When PDP business started in 1998, the only production facility of PDP was the production line at the trial level in the Takatsuki Plant. The No.1 Factory was constructed in Ibaraki in June 2001, and the full-scale production facilities for PDPs were launched in the Takatsuki Plant and Ibaraki Plant respectively. The No.2 Factory in the Ibaraki Plant, with its operations started in April 2004, was constructed in the empty space after the production facilities for CRTs were removed. As for the relocation of employees, about 700 employees were transferred from the parent company to the manufacturing subsidiary, "Matsushita Plasma Display Co., Ltd." when it was established. 700 employees was nearly equivalent to the total number of such subsidiary. The relocation of factory employees also progressed to each of the other factories. In the development groups, about 400 employees working in the Takatsuki Plant were transferred to the Second Factory of the Ibaraki Plant in 2004. In addition, the development groups, which had been divided into the Ibaraki Plant for TV production and the Kadoma Plant for production of other AV products, were concentrated in the Kadoma Plant, into which about 1,500 engineers in charge of development of TV products were transferred. In other areas, the Utsunomiya Plant, which had been the biggest domestic production site for CRT TVs, was transformed to the assembly base of LCD TVs[6], and the Ishikawa Plant, which had been the production base of LCD panels, was merged into the joint-venture company with Toshiba and specialized in production of small to medium size LCD panels. Thus, the adjustment of production resources was completed through the utilization of the existing factories.

Finally, along with the transformation of the existing factories, the new factories were established with the characteristic of large investment. In the production of FPD panels, many types of alliance & cooperation and merger & acquisition were made among the companies. This may prove that the specific image display devices require huge investment. The factories established for the production of such devices are very large-scale, which requires such a large investment that may affect the management of the company. As for Panasonic's factories of PDP productions, there were two factories in Takatsuki and Ibaraki which reorganized the existing production facilities. In addition, the Shanghai Plant (2002), the No.3 Factory (2005), the No.4 Factory(2007), and the No.5 Factory of the Amagasaki Plant (2009) were newly established in the years indicated, respectively. As a result, the factory locations of panel productions of Panasonic's PDP business were, as seen in Figure 2, five locations in Japan and one location

[6] While Panasonic sells LCD TVs, most of the LCD panels for TVs are outsourced.

overseas. Looking globally, the panel productions were concentrated in Japan and Shanghai, which exported the panels to each of the factories near the market of final consumption. They were the assembling factories to complete the TV sets, which were located in Mexico for the North American market, Brazil for the South American market, the Czech Republic for the European market and Singapore for South East Asia and South Asia.

--Figure 2--

Industrial Characteristics of PDP and Its Production System

Along with the technological innovation from CRT to FPD, the characteristics of the TV (display) industry have significantly changed[7]. Firstly, the industry characteristics have changed in terms of product cycle. The product life is very short, the competition becomes more fierce and the unit price of the product falls in a short period of time. The price per unit area of FPD panel for TVs has fallen about 25% every year since 2003. The TV makers can secure profit if it successfully launches the products at the time when they are actively demanded. If the TV makers lose the timing, it cannot earn sufficient profit. As the pioneer has a bigger advantage (i.e. the first movers' advantage), it is very important to respond quickly to changes in the market conditions. Investment efficiency is higher, assuming that the same amount of finance is invested, if the company starts production earlier. As the product has a short life cycle, it is not easy to differentiate the goods from the competitors' ones and it tends to turn into severe

[7] Please refer to Murtha, Lenway and Hart (2004) which provides an overview of the history of the FPD industry from its start to the substantially developed phase.

price competition. As a result, it easily becomes a "Commodification" (Ogasawara and Matsumoto, 2006).

Secondly, there is the technological characteristic. As the production of CRT TVs consisted mainly of the assembly of parts and units, the production process was "visible."[8] The process of producing PDPs and LCDs is more invisible. Particularly, the panel production process takes place in a clean room, which requires knowledge in the "device" field to assess the yield ratio and the profit volume ratio[9]. In addition, as the ratio of panel component price against the manufacturing cost is high, the source of added-value depends largely on the costs of the glass panel and image processing circuit. This indicates that the development of electronic parts, such as panel materials and semi-conductors and the management of procurement have a considerable weight in the production system.

Thirdly, there was a change in the competitive environment. Large-size FPD TVs, which were first commercialized by Sharp in 1999, have become popular on a global basis since 2002, and their number of shipment exceeded that of CRT TVs in 2005. Until the late 1990s, the mainstream was small and medium LCDs, which were manufactured only by Japanese companies. For the last few years during which the market of FPD TVs has significantly expanded, large investment has been made by the producers of Korea and Taiwan, and the relative market share of FPD panels held by the Japanese manufacturers on a shipment basis has gone down rapidly (see Figure 3). Not only because the companies in these three Asian countries are seriously competing with each other in production while the Korean companies,

[8] Refer to Hiramoto (1994) about the details of the manufacturing process and production system of CRT TVs.
[9] Mr. Ken Morita, who undertook the position of Head of PDP business in 2000, is specializing in the "semiconductor" field. His last position was Head of IC business of Semiconductor Company, Matsushita Electric Industrial Co., Ltd. The fact that a person formerly in semiconductor business is assigned as a leader of PDP business proves that the TV business requires the knowledge and know-how of the "devices."

such as Samsung Electronics and LG Electronics, and the Taiwanese producers are rising, but also because the different image display devices, such as LCD panels, PDPs and rear-projection systems are competing, the market of FPD TVs tends to enter into an oversupply situation against the real demand. Therefore, although the market has come to real growth, the prices of the products are declining and the profitability of business is rapidly going down except a few of the top-share producers. In order for the manufacturers of FPD TVs to increase their profitability, it is indispensable that the company has the scale of economy to reduce the procurement costs and the financial strength that enables continuous investment of huge amounts into their facilities.

--Figure 3--

After shifting its TV business to PDP, Panasonic has segregated the products into two categories, which are PDP with more than 37 inch display and LCD with less than 32 inch display[10]. Although all quantity of LCD panels of less than 32 inches were purchased from the Korean or Taiwanese manufacturers, the panels made in Japan have been partly used after the Mobara Plant of IPS Alpha Technology started its full-scale operations. TVs with more than a 37 inch size are all the PDP system in Panasonic. Its business model of PDP is called “vertical integration.” It makes the production of panels and image processing circuits which are the source of added-value into “black box” and actively expands the internalization of panel parts

[10] Panasonic has started selling LCD TVs with more than 37 inch display since the first half of 2007. LCD panels are outsourced from the Taiwanese manufacturer. The fact that PDP TVs and LCD TVs, both of which have 37 inch display, are sold by Panasonic indicates that the competition among the different image display devices mentioned above has become fiercer.

and related resources.

The technological characteristic of PDP is that it is not as dependent on manufacturing equipment as semi-conductors and LCD panels are. Analog technique is the core of the technology, such as know-how of calcination in the manufacturing process, designing of circuit boards, etc. Panasonic has two unique technologies. One is the production process developed by Toray with “small rooms” in which fluorescent devices are placed that are formed on a glass base plate in a reticular pattern by means of the photosensitive paste system mainly consisting of exposure and development. This system is more productive than the sandblasting system which is generally adopted in the industry. Another technology is the designing of the driving circuit. TV systems incorporate an image quality circuit (which is relevant to image quality) and a driving circuit as well as many peripheral parts, such as decoders, graphics circuits, demodulating circuits, modems, interfaces, etc. The parts relating to the image quality are crucial to differentiate the products from other brands as consumers require high quality image from high-end TVs. Panasonic has developed the universal platform system LSI called “Uniphier” which provides a common circuit design with the system LSIs used in digital domestic appliances. This gives Panasonic a competitive advantage in designing of system LSI, such as an image quality circuit and a driving circuit[11]. Thus, Panasonic has adopted its strategy to differentiate its products with the integrated power of its panel technology and its image processing circuit technology as well as its vertical integration business model.

PDP’s production system consists of the following processes: Rear panel process in which electrodes and dielectrics are formed on glass board, front panel process, panel assembly

[11] The system LSI “PEAKS”, which is a common engine of the products named “VIERA”, is one of the concrete examples of system LSI developed on the basis of Uniphier.

process and final assembly process. In the First Factory in Ibaraki, the first and second floors are allocated to the front panel process, there is a canteen on the third floor, the process of sealing of the front panel and rear panel is located on the fourth floor and the fifth floor is allocated to the set assembly process (after a driver LSI is affixed). The rear panel process is separately located in the Takatsuki Plant, which shares the total processes with Ibaraki[12]. The Shanghai Plant, which is the only panel production site overseas, was constructed in October 2001 and started its operation in December 2001, in which the production line of the First Factory was copied[13]. At the beginning, it imported the panels from Japan and carried out the assembling operation. In April 2003, it introduced the production facilities of panels, and started the production and shipment of PDP in August 2003. As seen above, PDP business pushed location adjustment by utilizing the existing factories and has gradually developed into the vertical integration model.

Integrated production initiated when the Second Plant of Ibaraki started. Cost reduction of PDP requires threefold effort: (1) standardization of processes, (2) energy-saving, reduction of materials and reduction of usage of parts and (3) improvement of productivity. As a precondition of these efforts, the crucial factor is the size of the glass base plate. The bigger the glass base plate is, the more panels can be taken from it. In the FPD production, the number of panels taken from the material is an important parameter because the production cost may be half if the panels taken are twice in number from one glass base plate. For this reason, the

[12] Panasonic explains the reason why the production was not integrated in one location at the First Factory is that "it prioritizes early start-up and the utilization of existing facilities." (Panasonic's corporate materials)

[13] The corporate entity of Shanghai Plant is established in January 2001 as Shanghai Matsushita Plasma Display Co., Ltd. which is jointly invested by Panasonic, Shanghai Ko-Den Electronic Co., Ltd. (SVA), Shanghai Industry Investment (Group) Ltd. and Shanghai Ko-Den (Group) Ltd. It is designated as "the first project of domestic PDP production" by the National Development Committee of the Peoples Republic of China. Registered capital is 70 million dollars, which are invested 51% by Panasonic, 41.9% by Shanghai Ko-Den Electronic and the rest of about 8% by others.

factory building, production facilities and so forth should reasonably be required to be bigger as the glass base plate should be larger for the purpose of cost reduction.

--Table 1--

Table 1 shows the PDP production bases of Panasonic. In the production line of the No.1 Factory of Ibaraki, only one panel can be taken from the glass base plate(“mother glass”) in terms of the 42 inch size panel. In the No.2 Factory, three panels can be taken, six panels can be taken in the No.3 Factory of Amagasaki, and the No.4 Factory increased to eight panels which started operation in June 2007. The number of panels taken from one glass base plate was directly linked to productivity. As for investment productivity which is defined as the ratio of the number of panels to be produced in the factory to the amount of investment made in such factory, it amounts to 5.3 per invested amount for the No.4 Factory of Amagasaki if that of the No.1 Factory is assumed as 1 for the same investment amount. As a result, the amount of facilities investment per factory has rapidly increased, and the investment amount in the No.4 Factory of Amagasaki boosted to about 180 billion yen. Furthermore, in the planned No.5 Factory of Amagasaki, which would be the world’s largest production base of PDP, a total of about 280 billion were be invested. It would be an enormous plant, with a total floor size about nine times that of the No.1 Factory.

The accumulated amount of investment Panasonic made in its PDP business during the period between 2001, when it started its substantial investment, and the end of the first half of 2007 exceeds 700 billion yen. With its cumulative and continuous facilities investment, Panasonic gained the world's top share in 2006 in terms of PDP TVs (as a complete set of product) and PDP panels, respectively[14]. This was the largest amount of investment in a single product ever made by Matsushita Electric Industrial Co., Ltd., of which the entire business focus had been shifted significantly to PDP business. Sales in the PDP business were growing rapidly in proportion to facilities investment, and more than 20% of total facilities investment of the company was made for PDP business. However, a difficult condition to meet was that the manufactures were required to make the facilities investment within the limit of the amount of its owned cash, as cash-flow management was emphasized to maintain its financial rating in the market. There may be a risk of suffering excessive debt, and if it fails to pay off the huge investment, it may be exposed to a risk of going into a negative spiral in which debts increase, the market rating declines, and investment should be reduced. Strategic action becomes more important for making decisions on at which timing and in which production systems investment should be made. As a result of the technological character as mentioned above and the strategic action in facilities investment, factory investment has become large-scale and concentrated.

Concentrated Locations and Industrial Agglomeration

Looking globally, the production sites of the FPD industry are concentrated in Eastern Asia. Particularly, more than 90% of panels are produced in Japan, Korea and Taiwan. While the production of CRT(cathode-ray tubes) was diversified into the United States, Europe and Asia,

[14] According to the "World's Market Share of 26 Items" 2007 version issued by the Nikkei financial newspaper, as for PDP TVs, Panasonic has 29.5% of the total market share, LG Electronics (Korea) has 15.8% and Samsung Electronics (Korea) has 14.1%, and as for PDP panels, Panasonic has 31.5%, LG Electronics (Korea) has 28.2% and Samsung SDI (Korea) has 22.1% (both market shares for PDP TVs and PDP panels are on the basis of shipment value).

the production of FPDs shows an excessive concentration in Eastern Asia. Therefore, it appears to be a sort of “phenomenon of market occupation by a specific winner (Winner-Take-All)" that a winner of the competition in Eastern Asia would be a winner in the global market. In the intensified competition in Eastern Asia, the management of cost reduction, the protection of the intellectual properties[15] and the shortening of “time” have become important.

In this competitive environment, the FPD panel manufacturers were trying to concentrate their locations due to various factors, such as focused investment in the production site, the proximity to the suppliers of panel components and related materials, preferential treatment under the governmental or municipal policies (such as industrial park), the use of local resources, etc. Examples are, for LCD panels, Sharp’s Kameyama Factories in which concentrated investment continues, and Samsung Electronics’ factories in Cheonan and Tangjeong, and for PDPs, Panasonic’s Ibaraki and Amagasaki factories as mentioned above. To analyze the concentration of locations, a cross-sectional view of geographical proximity and industry cluster[16] may be effective. In other words, these geographical features led to the development of industrial agglomerations.

If we look at the location adjustment of Panasonic’s PDP business, geographical proximity was one of the key points of the expansion of factories from Takatsuki and Ibaraki to Amagasaki. A similar example, which is very suggestive, was Intel, one of the largest

[15] Although this report does not go into detail on intellectual property management, it is pointed out that patent disputes on the PDPs are caused from time to time between the manufacturers of Japan, Korea and Taiwan, and that the importance of protection of intellectual properties increases. In Japan, the Advanced PDP Development Center Corporation (APDC) was established in July 2003 by the five Japanese PDP manufacturers (Panasonic, Hitachi, Pioneer, Fujitsu and NEC Plasma Display) for the purpose of engaging in joint development of the fundamental technologies of the next generation PDPs. Hitachi and Panasonic made a comprehensive alliance in PDP business in February 2005 by establishing the patent management company “Hitachi Plasma Patent Licensing Co., Ltd.” Thus, Japan has been moving to strengthen the protection of intellectual properties.

[16] According to Porter, industrial cluster is defined as “the status of associated companies, suppliers, service providers, related institutions etc. in the specific sector being geographically concentrated and cooperating with each other while competing with each other.” (Porter 1998)

semiconductor manufacturer, which experiments with "co-location" (Sakakibara 2005: 152-154). Co-location means to conduct R&D and production in the same place. The semiconductor industry has a distinctive product cycle called "silicon cycle". In this cycle, as a frontrunner's benefit is larger if the product cycle becomes shorter, the speed of technological transfer is of great importance from the fundamental research activities to the development and production bases and to other production sites. Co-location may accelerate establishment of the production process, startup of mass-production and improvement of yield ratio. Furthermore, Intel has successfully speeded up its startup of mass-production at a global level by the method of "copy exactly" wherein all processes developed and completed in the mass-production development facility including logistics systems are copied exactly in other mass-production facilities (McDonald, 1998). These examples from Intel suggest that close information exchange and information sharing among each activity of R&D and production were more and more necessary in order to accelerate mass-production by "vertical startup" with the cooperation of these activities. Like Intel's method that maximizes the merit of proximity, Panasonic was also successful in setting up mass-production smoothly among the locations of Takatsuki, Ibaraki and Amagasaki[17].

Since the material cost represented 40 to 65% of the total cost of an FPD panel, the proximity to the panel component manufacturers and the manufacturing equipment producers was also important, as well as the importance of the co-location of R&D and production. Cooperation with components manufacturers and equipment producers was indispensable to

[17] In the assembly process of the Ibaraki Factory, efforts are made to implement the cell production system under the direction of the Deputy Head of Production Innovation Headquarters who formerly worked for Toyota. The production system of the Ibaraki Factory is horizontally spread over Panasonic's other factories in the world. In this sense, the production system of the Ibaraki Factory is designated the role of "mother factory."

start up mass-production quickly, and therefore not only the engineers of Panasonic's R&D activities but also the engineers of the components manufacturers and the equipment producers worked in the PDP production factories of Panasonic. In addition, the different timing of designing of various elements in the production line, such as panels being designed with a two-year cycle, the designing of semiconductors being done every year, and the circuits and mechanisms of the equipment being designed once every half-year, etc., caused the engineers in charge of these elements to make frequent adjustments in the production factories. So, the proximity of locations of the components manufacturers and the equipment producers was one of the requirements to increase the accumulative effect by gathering many diversified engineers in the factories.

Another reason to make proximity more important was transportation cost. Along with the glass base plate becoming larger, the equipment, the components and the materials were all becoming bigger as well. So, the transportation cost becomes serious. In this respect, the industrial agglomeration brings advantages by accumulating the equipment producers and the component manufacturers in proximity to the FPD panel production site. In the past when the locations were diversified, the labor cost was a more important condition for deciding the locations, and the weight of the transportation costs was not so high as it was reduced by the development of social infrastructure such as networks of motorways. However, the FPD TV industry becomes an "apparatus industry" requiring a huge amount of facilities investment, and in such situation, the weight of fixed costs becomes higher than variable costs such as labor cost. For this reason, as well as the other reason of requiring close cooperation within the intra-divisions of the company and with the components and equipment manufacturers ,the associated suppliers and the subcontractors, the importance of transportation cost has come up again. As for the PDP business of Panasonic, the industrial agglomeration of Hanshin large-cities areas where the factories of Takatsuki, Ibaraki and Amagasaki were located brings a large advantage to Panasonic, and also Sharp's LCD business had benefit of agglomeration economies in Osaka, Nara and Mie.

Concluding Remarks

As a summary of this paper, the interrelation between the location adjustment and the industrial agglomeration was mentioned below. Recently, the issues of geographical proximity have been actively discussed, and industrial agglomeration is one of the most important keywords for regional policy[18]. Industrial agglomeration attracts social scientist's attention to its role particularly as a cradle of economic growth and innovation. Its importance has also increased as the corporate competition strategy and the policy subject[19]. The discussions on agglomeration economies are broadly divided into two categories: One concerns the benefits of agglomeration that brings the effect of reduction of transportation costs and transactional costs and improves social infrastructures. For the companies choosing their locations in industrial

[18] In the context of economic geography, industrial agglomeration and industrial cluster have almost the same meaning. However, the concept of cluster involves a partly non-geographical concept. For example, competitive relations and conditions for demands involved in the concept of cluster are not necessarily geographical matters. As for industrial agglomeration, there is an enormous amount of accumulated study results on this subject. As they involve many points of discussion, such as what the benefits of accumulation are, how the accumulation effect can be measured, etc., the geographical concentration of industry cannot be simply called agglomeration. Recognizing the abovementioned points, a more neutral concept of industrial agglomeration is used in this paper.

[19] Japan's regional policy, "Law concerning Regional Industrial agglomeration and Activation," was implemented in 1997, and since 2001, the "Industrial cluster Plan" was developed by the Ministry of Economy, Trade and Industry and the "Knowledge Cluster Project" by the Ministry of Education, Culture, Sports, Science and Technology. There are some reports, such as Ishikura 2003, which discuss the policy subjects comprehensively from the viewpoint of industrial cluster.

agglomeration, the benefits are those connected with economies of scale or economies of scope. The other point of discussion on industrial agglomeration is the benefits from the viewpoint of "knowledge-based activities" such as R&D and technological development. The spillover brought by the stock of knowledge as well as communication through face-to-face communication play an important role, and the existence of external economies relating to the non-market interaction is considered important[20]. In light of this point of discussion on industrial agglomeration, it is suggested in PDP business that the external economies were important as the conditions to enjoy the economies of scale.

In the FPD industry, such as PDP or LCD, one industrial feature is the competition in facilities investment, and another feature is the concentration of knowledge and know-how. In traditional discussions on geographical proximity, the effect of reduction of transportation and transactional costs and the spillover effect of knowledge are identified. However, it is still important how to reinterpret the dynamism of location adjustments from the viewpoint of geographical proximity. In the FPD industry, where the market was changing drastically, a variety of collaborations and alliances have become important to quickly recover the huge amount of facilities investment, and therefore location adjustments are developing in a dynamic way as well. From the historical case studies of PDP industry, the increasing importance of "thickness" of the industrial agglomeration was observed as a business environment which enabled the acceleration of location adjustments and influenced the maintenance and improvement of competitiveness.

[20] As for the external economies relating to non-market interaction, Yamamoto (2005) organizes the subject by comprehensive collection of relevant works. Mizuno (2005) also arranges the subject in the context of innovation and industrial agglomeration. Fujita and Thisse (2003) and others study the theory on the accumulation effect concerning intellectual activities. However, as Fujita and Thisse (2003) pointed out, there is substantial room for future study both in theory and facts to deal with the subject of accumulation effect concerning intellectual activities.

Finally, we would like to mention a new movement of factory locations which can be observed in the FPD cases. It was worth noting that the large-scale factories were located in the bay areas, such as the Amagasaki Plant of Panasonic and the Sakai Complex Plant of Sharp, where there were a lot of complexes of heavy industries, but unused lands have increased in these days. In the lands for industrial use in the bay areas, there were a lot of advantages. For example, supply bases of electricity and gas were located in the vicinity, logistics infrastructure, such as airports and seaports, was provided, and large areas can be secured. On the one hand, it was remarkable in the production of leading-edge and technology-oriented products such as FPDs taken up in this report that facilities investment had become significantly large and that the facilities had concentrated more and more in the main bases. Therefore, the factory locations were concentrated in the bay areas along with the strengthened hub functions in logistics. In the domestic production of FPDs, the importance of the Hanshin Industrial Zone had been growing, which show an aspect of the “panel bay." However, the FPD industry in Japan has declined since the late 2000s, while these new high-tech industrial agglomerations have faced difficulties to sustain. Thus, the current down turn in the industry is causing a lot of these fact-findings in agglomeration economies controversial.

REFERENCES

Fujita, M. and Mori, T. (2005). Frontiers of the new economic geography, *Papers in Regional Science*, 84(3), 377-405.

Fujita, M. and Thisse, J.-F. (2002). *Economics of Agglomeration: Cities, Industrial Location and Regional Growth*, UK: Cambridge University Press.

Hamamoto, K. (2006). Panel display industry faces change. *Knowledge Creation and Integration*, 2006 Issue 1, 72-79.

Hiramoto, A. (1994). *Television Manufacturing Industry in Japan: the Source of Competitive Advantage*. Kyoto: Minerva shobo. (in Japanese)

Industry Research and Consulting (2003). *Matsushita Group in FY2003*. IRC Co., Ltd. (in Japanese)

Industry Research and Consulting (2006). *Matsushita Group in FY2006*. IRC Co., Ltd. (in Japanese)

Ishikura, Y., Fujita, M. Maeda, Kanai, K. and Yamasaki, A. (2003). *Industrial Cluster Strategy in Japan*. Tokyo: Yuhikaku. (in Japanese)

Izumiya, W. (2004). *The Next Generation's Display: Strategy for Winner*. Tokyo: Toyokeizai shinposya. (in Japanese)

Kondo, A. (2007). *Location Strategy and Spatial Divisions of Labor: A Corporate Geography of Japanese Electronics Industries*. Kokon shoin. (in Japanese)

McDonald, C. J. (1998). The evolution of Intel's copy EXACTLY! technology transfer method. *Intel Technology Journal*, 2(4), 17-32.

Mizuno, M.（2005）.A geography for innovation: knowledge, network, and proximity. *Annals of the Japan Association of Economic Geographers*. 51(3), 205-224.

Murtha, T. P., Lenway, S. A. and Hart, J. A.（2004）. Industry creation and the new geography of innovation: the case of flat panel display. In Kenney, M. and Florida, R. (eds.) *Locating Global Advantage: Industry Dynamics in the International Economy*, Stanford, CA: Stanford University Press.

Ogasawara, A. and Matsumoto, Y. (2006). Diversification of profit gains in the competition of television manufacturing industry. In Sakakibara, K. and Koyama, S (eds.), *Innovation and Competitive Advantage: Commoditization of Digital Consumer Electronics Products. Tokyo*: NTT Press.（in Japanese）

Porter, M. E.（1998）. *On Competition*, Boston. Mass.: Harvard Business School Press.

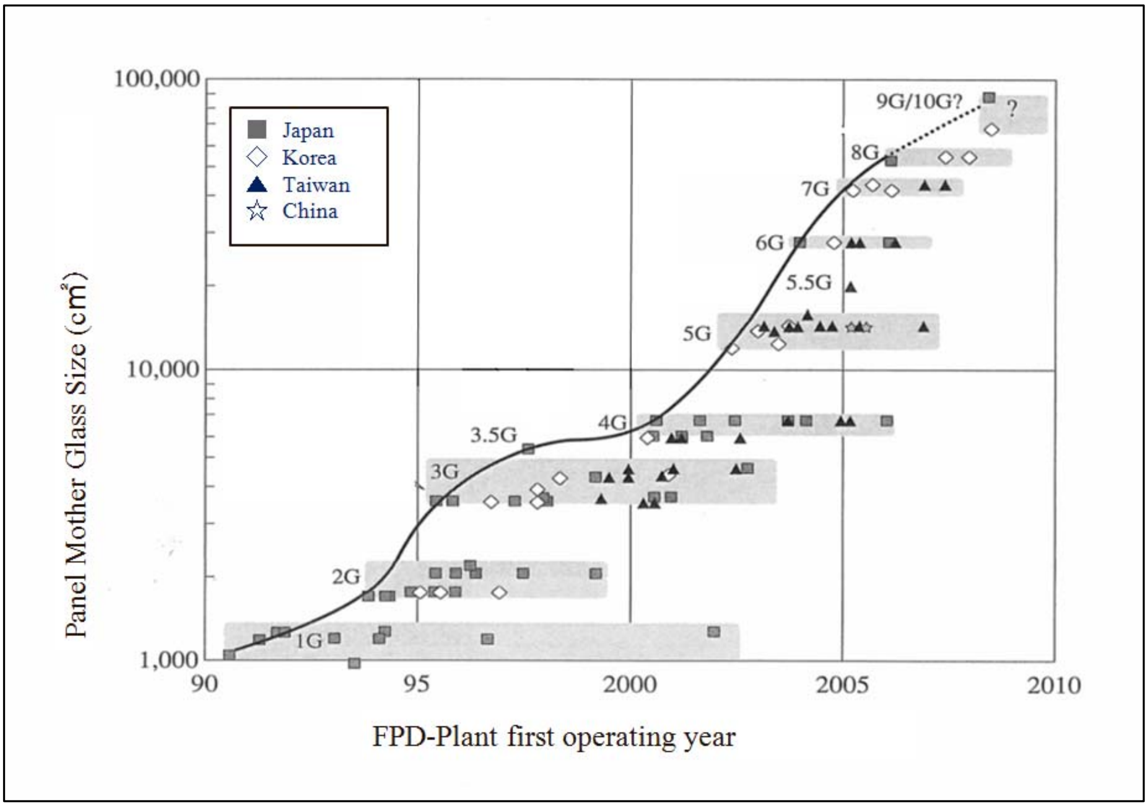
Sakakibara, K. (2005). *Profiting From Innovation: Agenda and Analysis for Management of Technology*. Tokyo: Yuhikaku.（in Japanese）

Sakakibara, K. and Koyama, S. eds. (2006). *Innovation and Competitive Advantage: Commoditization of Digital Consumer Electronics Products*. Tokyo: NTT Press.（in Japanese）

Watts, D. H..（1987）. *Industrial Geography*. Harlow: Longman Scientific & Technical.

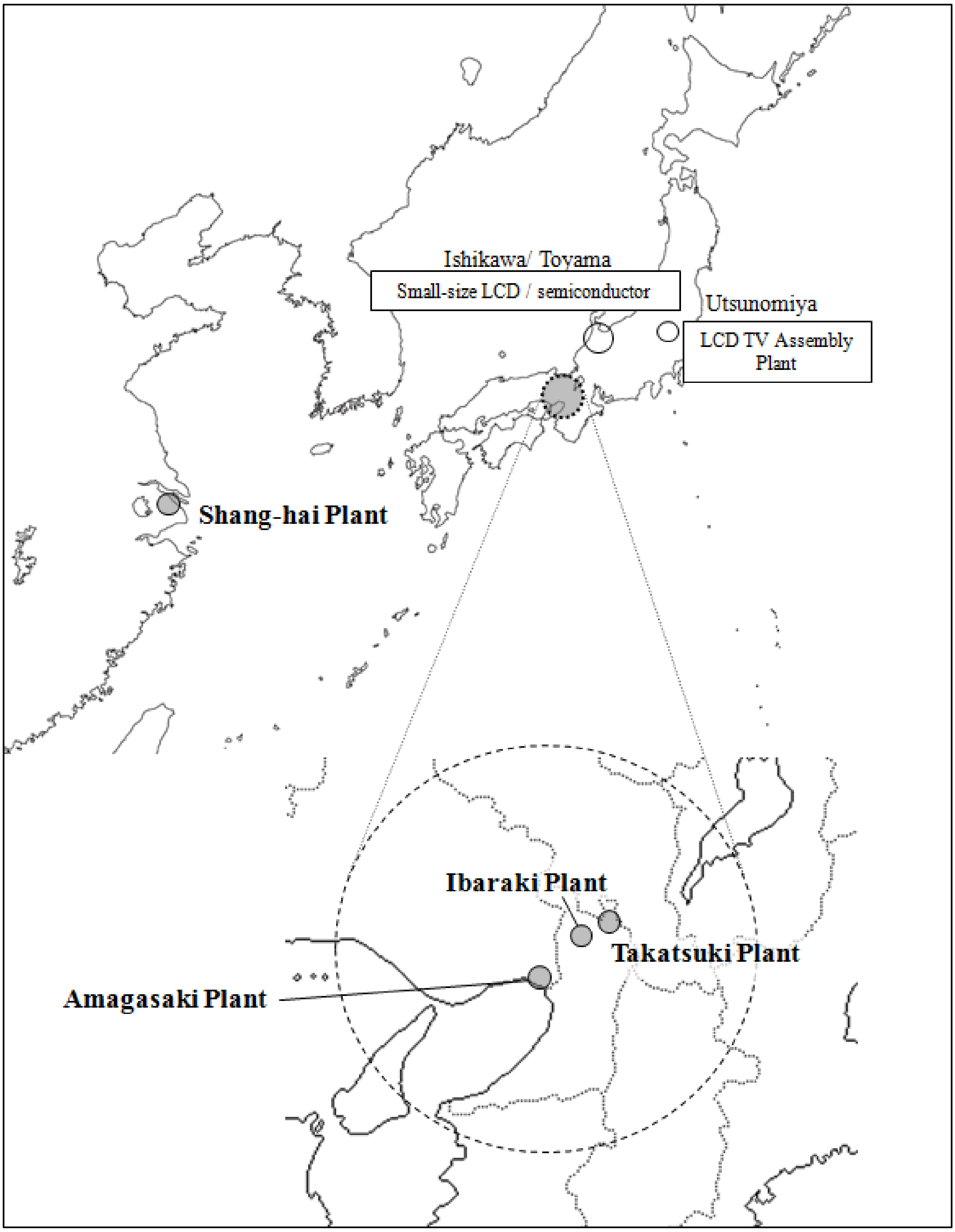
Yamamoto, K.（2005）. *Economic Geography of Industrial Agglomeration*. Tokyo: Hosei University Press.（in Japanese）

Figure 1. FPD Plant Investment and Technological Development



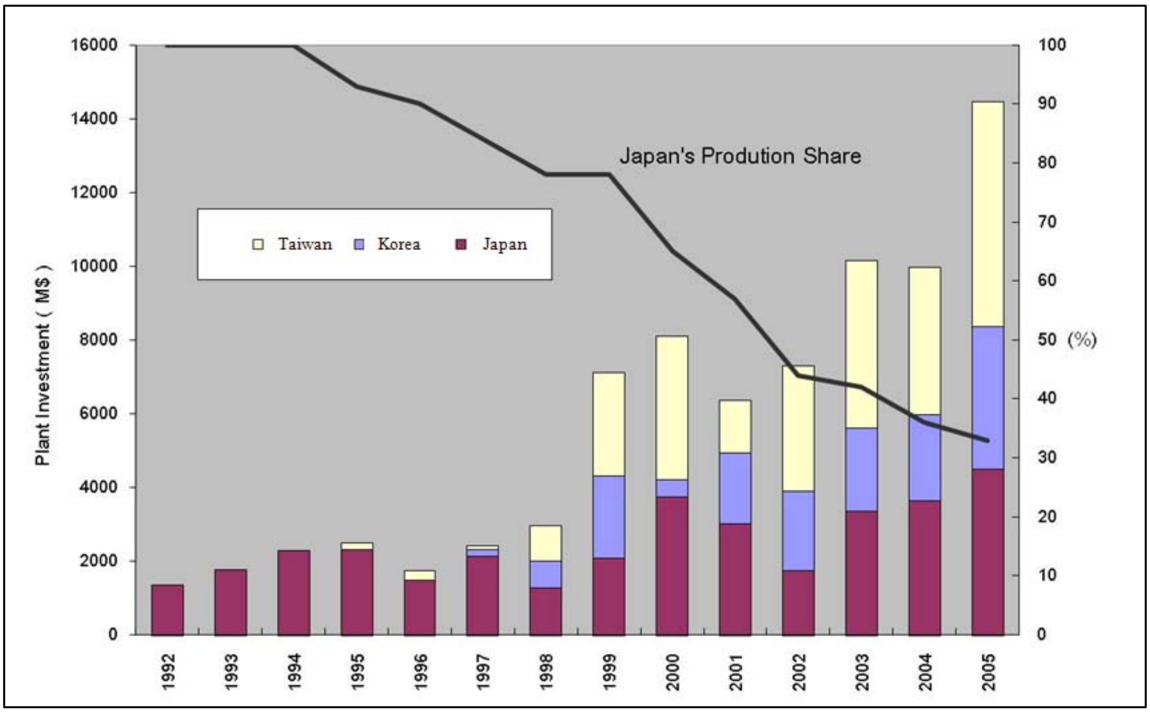
Source: FPD Data Book by Electronic Journal, Inc.

Figure 2. Panasonic PDP Plant Location in 2010



Source: Panasonic corporate profile

Figure 3. FPD Plant Investment among East Asian Countries in the half of the 2000s



Source: Author's collected data

Table 1. Panasonic PDP Plants in Japan and China

	Ibaraki Plant		Amagasaki Plant			Shang-hai Plant
	No.1 fab	No.2	No.3	No.4	No.5 (Under construction)	
Plant site size	122,000㎡		147,000㎡		?	47,000㎡
Plant building size	30,000㎡	75,000㎡	147,000㎡	192,000㎡	284,000㎡	17,000㎡
start year to operate	2001	2004	2005	2007	2009	2002
number of building floors	5th floors	4th floors	4th floors	6th floors	6th floors	-
Investment cost (million YEN)	35,000	60,000	95,000	180,000	280,000	20,000
Production Units per month	30,000	100,000	250,000	500,000	1,000,000?	25,000
Productivity for investment	1	2.4	4.3	5.3	-	1～1.5
Labor Productivity	1	2.3	4.2	-	-	-
Mother Glass Size （per 42 inch）	1 42"	3 42"	6 42"	8 42"	10 42"	1 42"

Source: IRC(2003, 2006) and author’s collected data by corporate interviews

Wrap up

Hideki Esho

The main research question of this conference was how Asian economies interact each other under the changing international economic environment. Especially a notable new trend since 1990s is the penetration of rising Chinese economy in “East and Southeast Asia, the center of economic growth in the world”. How large the penetration of Chinese economy in this region? What are the impacts of rising Chinese economy on this region? How Japan, ASEAN countries, and India respond to this new phenomenon? Can India be a competitor with China in terms of economic performance? On these issues we could get innumerable valuable insights through excellent presentations and discussions in two days’ conference of yesterday and today. First of all, representing Institute of Comparative Economic Studies, Hosei University, I thank all participants of this conference.

Prof. Hongzhong Liu approached to these issues though political economy approach. He focused on the effects of political relations on export flows between China and Asian countries, notably Japan, South Korea, India, Indonesia, and Vietnam. In his conclusion, he warns that “the gap between the demand of economic integration by market forces and the political division among countries is wider and wider”, and suggest that “effectively improving in the political relations between countries will release the spillover effects of China’s economic growth and benefit the whole East Asia”.

The paper of Prof. Tamura and Prof. Xu analyzed international competitiveness of China using a bilateral international trade matrix in manufacturers for China and major Asian and OECD countries in 2003-2008. They found the sources of Chinese competitiveness in lower wages and higher R&D expenditures, and, in addition, the openness to foreign capital and the excellent transportation links. Also they found that China was the most competitive country in 2007 and 2008, and China improved its state of technology since 2003.

The paper of Prof. Nguen Anh Thu, focused on Vietnam’s trade integration with ASEAN+3, depending on RCA index, TC index, and IIT index. She indicates that trade integration in the context of ASEAN+3 contributes to promote Vietnam-ASEAN+3 trade, and trade integration has promoted investment and shifted production network toward potential markets such as Vietnam. In her analysis, it is interesting to know that China is the partner that Vietnam had the largest trade deficit in the ASEAN+3, and conversely Vietnam consistently had trade surplus with Japan.

All these three papers, focusing international trade, clearly indicate the strengthening of Chinese competitiveness and growing influence of rising Chinese economy.

Dr. Fujita's paper tries to deepen our understanding of the Chinese penetration in Asian market, notably focusing motorcycle industry of Vietnam from the viewpoint of industrial organization. She compares the Chinese model of industrial organization with that of Japanese model. She traces the trajectories of organizational change of each model depending on an in-depth longitudinal analysis. And she conclude that although initially Chinese model proved more adaptable to developing country conditions, in the medium term, the Japanese model gained supremacy over Chinese model as Japanese lead firms made certain adjustments to the nature of their products, while actively realigning the capability structure. Also she concludes that while Chinese model lost supremacy in the medium term, it nevertheless continued to function in an adapted form as suppliers gained the complementary competencies required by local assemblers.

There are two papers on India. Prof. Sato analyzed Japanese companies working in India using original questionnaire survey of 113 companies. He indicates locations, industrial sectors, employment, numbers, sales, profit, establishment year, the reason to invest in India, forms of procurement, finance, and so on. Among his conclusions the most interesting and precious findings are that (1) many companies stressed the potential of not only Indian domestic market but also of the neighboring countries, (2) local content ratio is not high, (3) employment of contract labor is common, and (4) the most serious obstacle for business is the difficulty to obtain good human resources. Some of these findings are contrary to our general understanding of Indian economy.

Prof. K. J. Joseph focuses on the development of ICT industry in India and Indian engagement in ASEAN. He first described a contrasting growth story of ICT software and hardware (electronics). And he mentions that "India's export and import to ASEAN and electronics leaders like Japan and Korea declined to reach negligible level at present," and "thank to growing domestic demand, India's imports by and large is confined to final demand goods almost from China."

From these papers, we know that India is no competitor with China in Asian market. Indian penetration into East and Southeast Asia is negligible in terms of trade. Rather for India, China is the biggest importer and trade deficit of India to China is increasing in a big way from US$0.6 billion in 1998 to US$39.1 billion in 2012. On the other hand Chinese FDI in Asia including Japan, India, ASEAN is almost nothing, quite a contrast with huge FDI from Japan. Chinese engagement in Asia confines to trade.

Prof. Watanabe turns her eyes to Chinese domestic market. She took up three electronics industries, namely TV, mobile phone, and air conditioner, and investigated competition neutrality (sound competition) of SOEs in these three markets. Her conclusions are, (1) there is a tendency across three industries for foreign brands to hold a benefit advantage and for private brands to maintain a cost advantage, and the SOEs are trapped in the middle, failing to hold competitive advantages. (2) the SOE s and private firms looks to have been trapped in the excess competition equilibrium.

And finally there are two papers on Japanese market or industry. Prof Kondo analyzed Flat Panel Display (FPD) industry in Japan in terms of economic geography[1]. He showed how efficient agglomeration economies work and how difficult industrial agglomerations sustain in the high-tech industries. He took up the example of one of the largest FPD manufacturer, Panasonic, and found that the “thickness” of the industrial agglomeration economies was more important as a business environment to maintain competitiveness.

Prof. Takechi’s paper focuses on quality sorting, transport costs, specific costs, geographic barriers, and product heterogeneity. To investigate these issues, he used agricultural products (vegetable) prices in Japan. He concludes that specific costs are more distance elastic than ad-valorem costs, and that the presence of specific costs is the key element in the typical empirical observation of a positive link between quality and distance.

These two papers on Japanese economy do not directly relate to our research questions, still they provide us valuable insights and analytical contributions.

These are my summary and final comments. Again I thank you all participants for your serious discussions to deepen our understandings.

[1] He could not attend the conference because he got ill.

Profiles of Participants

Organizers:

Peng Xu: Professor and the Director of the Institute of Comparative Economic Studies (ICES), Hosei University. He joined Hosei University in 1992. He holds a Ph.D. in Economics from the University of Tokyo. His areas of expertise include corporate finance, corporate governance, law and economics and Chinese economy. He has published in several academic journals including *Journal of Financial Markets*, *Journal of Restructuring Finance*, *Journal of the Japanese and International Economies*, and *Japan Commercial Law Review*.

Hideki Esho: Professor, Faculty of Economics, Hosei University. He hold various hosts such as the Dean of the Faculty of Economics, Hosei University (2005-2007) and the President of the The Japan Society for International Development (2002-2005) and so on. His publications include *Indian Economy Took-Off*, Minerva Publication, 2008, *The World of Amartya Sen* (Co-editor), Koyo Publication, 2004, *Development Economics and India*, Nippon Hyoron Publication, 2002, *Development and Poverty* (Co-Editor), Institute of Developing Economies, 1998, *Political Economy of Development*, Nippon Hyoron Publication, 1997 (1998 International Development Studies Okita Award, Foundation for Advanced Studies on International Development), *India's Economic Development*, Hosei University Press (1988 Development Studies Award, Institute of Developing Economies), 1987.

Speakers:

Hongzhong Liu: Dean and Professor of School of International Studies, Liaoning University, China. He got Ph. D. in World Economies from Liaoning University, Shenyang, China. His publications include *On the Economic Transformation in East Asia*, Economic and Scientific Press House (2013), *The Chaebol System in South Korea's Catch-up Economy* (Light News Publisher, 2009), *On the Path of International Direct Investment in East Asia* (Liaoning University Publisher, 2001).

Nguyen Anh Thu: Vice Rector of the University of Economics and Business, Vietnam National University, Hanoi. She received her Ph.D. in Economics in 2009 at Yokohama National University, Japan, specializing in International Development. Dr. Nguyen Anh Thu had a long time working for Ministry of Industry and Trade of Vietnam as the trade policy maker before becoming lecturer in University of Economics and Business – Vietnam National University, Hanoi. As an expert in international economics, she has participated as key member and consultant in many research projects at state-level, ministerial level and many international projects in Vietnam and abroad. She has been the author of a number of books and papers published locally and internationally in the field of international trade, regional and global economic integration. Currently, her key areas of research are international economic integration, especially in ASEAN and AEC, international trade, and green growth.

K. J. Joseph: Ministry of Commerce Chair Professor at Centre for Development Studies Trivandrum, Kerala, India and Editor-in-Chief of Innovation and Development published by Routledge. He also holds the position Vice president Globelics www.globelics.org and Innovation expert in Tianjin University of Finance and Economics, China. Earlier positions that he held include Visiting Senior Fellow at RIS, New Delhi, under the Ministry of External Affairs; Visiting Professor at Jawaharlal Nehru University (CSSP) and an IT Policy Consultant of UNESCAP for Cambodia, Laos, Myanmar, Vietnam, Thailand and the Yunnan Province of China. He has also been a consultant to UNCTAD. Apart from over 80 research papers and a number of policy-oriented reports, he has published six books published by five International Publishers, including *Industry under Economic Liberalization: The Case of Indian Electronics* (Sage Publications), *Information Technology, Innovation System and Trade Regime in Developing Countries* (Palgrave Macmillan), *Export Competitiveness of Knowledge Intensive Industries* (Oxford University Press, coedited with Nagesh Kumar) , *Handbook on "Innovation Systems and Developing Countries"* (Edward Elgar, jointly with B A Lundvall, Cristina Chaminade and Jan Vang), *Technology, Innovations Economic Development* (Sage, 2015), and *Globalization, Inclusive Development and Labour* (Routledge forthcoming)

Takahiro Sato: Professor of the Research Institute for Economics and Business Administration (RIEB), Kobe University. Previously, he served as Visiting Scholar at the Center for South Asian Studies, University of California, Berkeley, Research Fellow, the Jawaharlal Nehru Institute of Advanced Study, JNU and Visiting Scholar of Centre for East Asian Studies, JNU. He has authored numerous articles in the journals such as Economics of Governance, Oxford Development Studies, Journal of Asian Economics, European Journal of Development Research, Journal of Policy Modeling and EPW, and several books on Indian economy. He received the first Japanese Association for South Asian Studies (JASAS) Award in 2007.

Mai Fujita: Senior research fellow at the Institute of Developing Economies, Japan External Trade Organization. Her research covers economic and industrial development, global value chains, economic transition in Asia and particularly Vietnam. While continuing on the in-depth fieldwork-based research on the Vietnamese motorcycle industry its implications for industrial organisation theory, which she has worked on for more than a decade, she is currently undertaking research on the development of private entrepreneurs and the transformation of large state-owned and private businesses under economic transition and globalisation in Vietnam. She holds a bachelor of social studies at Hitotsubashi University and an MPhil and PhD in development studies at the University of Sussex. She is the author of *Exploiting Linkages for Building Technological Capabilities: Vietnam's Motorcycle Component Suppliers under Japanese and Chinese Influence* (Tokyo: Springer, 2013), in addition to numerous journal articles and book chapters.

Mariko Watanabe: Professor, Professor, Department of Management, Faculty of Economics, Gakushuin University, Ph. D Economics from University of Tokyo, M. Phil. School of Business, University of Hong Kong. Her major is Chinese economy, applied micro-economics, empirical analysis in the field of industrial organization, contract theory. She started her research on China in the 1990s by doing field work on SOEs reform and industrial development during her stays in Hong Kong. She conducted case studies and model building, quantitative analysis China firm and industries. She edited and published books and articles, other than numerous Japanese one, such as *The Disintegration of Production: Firm Strategy and Industrial Development in China* (Edward Elger, 2015）.

Akiko Tamura: Professor, Faculty of Economics, Hosei University. She obtained Ph.D. (Economics) in 1996 at Boston University. Her research fields are International Economics, Macroeconomics, and Applied Econometrics. She was a visiting scholar at New York University from 2007 to 2009. She have done some joint research with Professor Jonathan Eaton including "Bilateralism and Regionalism in Japanese and U.S. Trade and Direct Foreign Investment Patterns," *Journal of the Japanese and International Economies*, 1994. She currently research in the firm's foreign direct investment strategy and process which improve its international competitiveness.

Kazuhisa Takechi: Professor, Faculty of Economics, Hosei University. He got Ph.D. from University of British Columbia. His publications include "Exaggerated Death of Distance: Revisiting Distance Effects on Regional Price Dispersions (with Kano and Kano)," *Journal of International Economics*, 2013, "Understanding the Productivity Effect of M&A in Japan: An Empirical Analysis of the Electronics Industry from 1989 to 1998," *Japan and the World Economy*, 2013, "Firm Organizational Heterogeneity and Market Structure: Evidence from the Japanese Pesticide Market (with Keisaku Higashida)," *International Journal of Industrial Organization*, 30, 2012, "R&D Intensity and Domestic and Cross-Border M&A of Japanese Firms before Domestic M&A Deregulation," *Japan and the World Economy*, 2011, "What is Driving the Manufacturing FDI Wave in Asia? *Review of Development Economics*, 2011, "Local Content Protection: Specific Factors for Intermediate Goods Production and Market Segmentation (with Kazuharu Kiyono)," *Japan and the World Economy*, 2003.

Akio Kondo: Professor of Economic Geography, Faculty of Economics at Hosei University. He obtained a Ph.D. from the University of Tokyo in 2004. After completing his PhD, he undertook post-doctoral research on the application of geographical information system to the spatial economic and social analysis at Nihon University. He worked at the National Institute of Science and Technology Policy (NISTEP) in Ministry of Education, Culture, Sports, Science and Technology (MEXT), before joining in Hosei University in 2008. His ongoing research focuses on the spatial dimensions of corporate-driven economic and social change. Especially, having studied the economic geographies of Japan and Asian countries, he is primarily interested in locational behavior and innovation processes of large manufacturing firms, spatial dimensions of the firm and its agglomeration economies. His books include *Jinbun Chirigaku* (*Human Geography*, co-authored) 2015, *Ricchi Cyosei no Keizai Chirigaku* (*Economic Geography of Location Adjustment*, co-authored with Hiroshi Matsubara) 2009, *Handoutai Cluster no Innovation* (*Industrial Cluster and Innovation of Semiconductor Industry in East Asia*, co-authored with Akira Yamasaki) 2008, and *Ricci Senryaku to Kuukanteki Bungyo* (*Location Strategy and Spatial Divisions of Labor*) 2007.

Discussants:

Etsuro Ishigami: Professor of Fukuoka University, Faculty of Commerce in Fukuoka, Japan. He teaches the introductory course of the development study and the Indian economy and business. He was Dean of Faculty of Commerce and Board Member of Fukuoka University Corporate Body from December 2011 to November 2013. He recently visited the Centre for Development Studies, Trivandrum, Kerala, India and the Edinburgh India Institute, School of Social and Political Science, the University of Edinburgh, Scotland during his sabbatical leave from September 7th 2014 to September 6th 2015.

Atsushi Kato: Professor in the School of Business at Aoyama Gakuin University, Japan. He obtained Ph.D. (Economics) in 1996 at the University of Michigan, Ann Arbor. His research interest is political economy of economic development, and in particular, the effects of property right protection, corruption and competition on economic performance. He is currently making research on the effects of violent conflicts on the economic performance in India. He has published articles in Journal of Development Studies, Economic of Governance, Journal of Asian Economics, and others.

He was a visiting scholar at the Institute of Economic Growth in India from 2004 to 2005.

Tomoo Marukawa: Professor, Institute of Social Science, University of Tokyo. Before joining the faculty of the Institute of Social Science in 2001, he was a researcher at the Institute of Developing Economies (IDE) for fourteen years. He has published several books on Chinese industry and economy, including *The Dynamics of Market Development* (IDE, 1999); *The Tectonic Shifts in China's Labor Market* (Nagoya University Press, 2002); *Contemporary Chinese Industries* (Chuko Shinsho, 2007); *Can We Live Without China?* (PHP, 2009); *Chinese Dream: Mass Capitalism Changes the World* (Chikuma Shinsho, 2013); *Contemporary Chinese Economy* (Yuhikaku, 2013). All of the above books are written in Japanese. Beside these books, he has published several articles in international academic journals including, *China: An International Journal*, *Journal of East Asian Studies*, *Eurasian Geography and Economics*, and *Asia Pacific Business Review*.

Participants:

Haruo Horaguchi: Professor, Faculty of Business Administration, Hosei University.

Julia Young: Professor, Faculty of Economics, Hosei University.

Yuko Nikaido: Associate Professor, Musashi University.

Hanako Nagata: Associate Professor, Ibaraki University.

Hajime Sato: Senior Researcher, IDE-JETRO.

Ryusuke Shinohara: Professor, Faculty of Economics, Hosei University.

Ryoichi Watanabe: Senior Research Fellow, Economic and Social Research Institute,

Cabinet Office.

Yuan Yuan: Research Fellow, Institute of Intellectual Property.

Maki Nakaoka: PhD course student, Hosei University.

Sakae Kamozaki: PhD course student, Hosei University.

（本研究は、科学研究費・基盤研究（Ｂ）「アジアにおける日中印の競争、協力と相互依存」、代表者：絵所秀紀、課題番号 25301027 の研究成果の一部である）