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Coping with a Giant: Challenges and Opportunities for Thai and Vietnamese Motorcycle Industry from China

PATARAPONG INTARAKUMNERD AND MAI FUJITA*

This article focuses on how sectoral systems of innovation and production in the same industry but across countries may evolve differently after facing similar threats and opportunities caused by the same external factor. To elaborate on this, we will use the case of evolution of the automotive sectors in Thailand and Vietnam, and their dynamics and transformation when they are facing threats and opportunities from their fierce competitor, China. The findings illustrate that different sectoral systems of innovation and production evolve differently. The direction and the pace of evolution depends very much on existing absorptive capabilities of agents, strength of their linkages, and their process of collective learning to withstand the threats and exploit opportunities.

Introduction

OVER THE LAST few years, the automotive sector is considered an important unit in perspectives of innovation systems both by academics and policy professionals. Related to several theoretical perspectives, such as innovation system approach, evolutionary theory, industry life-cycle analysis

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and others, the concept of sectoral system of innovation (SSI) and production is seen to have an advantage over mainstream industrial economic analysis. This relates to features such as structure, conduct and performance, game theory and transaction cost analysis, as it provides a broader and longer-term view of the evolution and dynamics of sectors. A sectoral system of innovation and production is a set of new and established products for specific uses and the set of agents carrying out market and non-market interactions for the creation, production and sale of those products. Sectoral systems have a knowledge base, technologies, inputs and demand. The agents are individuals and organisations at various levels of aggregation, with specific learning processes, competencies, organisational structure, beliefs, objectives and behaviours. They interact through processes of communication, exchange, cooperation, competition and command, and their interactions are shaped by institutions. A sectoral system undergoes processes of change and transformation through co-evolution of its various elements (Malerba 2002). The concept may be used to analyse sectors in several aspects, namely, for better understanding of the working, dynamics and transformation of sectors, for the identification of the factors affecting performance and competitiveness of firms and countries, and for the development of new public policy proposals.

Albeit useful, the concept needs further development, especially verification and elucidation from more empirical research. One important field of research in this area is to study how and why sectoral systems of innovation and production in the same industry but different countries differ from each other, that is, their differences in terms of learning processes, technologies, input, demands, types and structures of interaction of players in the sector, underlying institutions and the sector's evolution. This article will shed a light on this very important issue. A special attention will be paid to how sectoral systems of innovation and production in the same industry but across countries may evolve differently after facing similar threats and opportunities caused by the same external factor. To study this, we will use the case of evolution of the automotive sectors with a focus on the motorcycle industries in Thailand and Vietnam, and their dynamics and transformation when they are facing threats and opportunities from China, a fierce competitor.

Overview of the Motorcycle Industries in Thailand and Vietnam, and Threats and Opportunities from China

Threats and opportunities from China are probably among the most popular topics for Asian academics and policy makers. Members of the Association of South-East Asian Nations (ASEAN) in particular are very much concerned with the rise of China. It is seen as both a threat and an opportunity for ASEAN. Obviously, its huge market is very attractive for export and investment from ASEAN. Chinese tourists, increasing rapidly, are one of main target groups of ASEAN's tourism promotion authorities. Several large Chinese conglomerates have invested in the heavy industries and energy sector in ASEAN. At the same time, for second-tier newly industrialising countries (Thailand, Malaysia, Indonesia and the Philippines), China is a fierce competitor in their key industries such as automotives, electronics, textiles and garments, and so on. For ASEAN's members, who are transitional economies (Vietnam, Lao, Cambodia), the rise of China can be viewed even more problematic, as it strongly affects efforts by these countries to industrialise and build up their indigenous technological capabilities. Not only have opportunities for their export-led industrialisation strategies lately been compromised by Chinese goods, their import-substitution strategies are in jeopardy because of the flooding of Chinese consumer and industrial goods.

On the global scale, the motorcycle industry is a mid-tech and rather technologically mature industry. Automotive sectors of several Asian latecomer economies started with assembling motorcycles and producing their parts by using imported technologies. Within ASEAN, Thailand and Vietnam are large producers with production capacities of 3.5 million¹ and 2 million (General Statistics Office 2006) respectively in 2005. In both countries, markets are basically dominated by Japanese TNCs. Local companies are suppliers, especially second- or third-tier ones. Some of them, especially at the first tier, are joint ventures with foreign component makers.

The motorcycle industry is also a typical example of one where China's threat on other Asian countries has been enormous. China is the largest producer as well as the largest market of motorcycles in the world. In 2004, it produced over 17 million motorcycles, 3.9 million of which were

exported overseas (China Automotive Technology & Research Center, and China Automotive Industry League 2005). The Chinese motorcycle industry is dominated by local companies that boast competitive advantage in mass production of low-priced products. Since the end of the 1990s, harsh competition at home has driven many Chinese motorcycle assembling companies to search for export market. The 'export drive' of Chinese motorcycle companies has been perceived as a serious threat to motorcycle manufacturers in the region as well as the rest of the world, though its actual impact has varied from country to country.

Methodology

The studies of motorcycle industries in Thailand and Vietnam were conducted separately, but in the same year—2004. The study in Thailand was commissioned by the National Science and Technology Development Agency (NSTDA) to the College of Technology and Innovation Management, King Mongkut's University of Technology Thonburi (KMUTT), Thailand. Though its main focus was the Tiger Motorcycle (a pure Thai groups of companies) cluster, the study also analysed and synthesised the motorcycle industry as a whole in Thailand by exploring the roles and capabilities of main agents (both firm and non-firm), their linkages and learning processes. The analysis of Thai motorcycle industry was drawn from data from questionnaire surveys and in-depth interview. One hundred and one questionnaires to relevant agents (mainly parts suppliers) in the industry were sent, with a response rate of 40 per cent. Together with the survey, ten interviews were conducted to explore at length the characteristics, linkages, activities and interactions of key agent in the industry. Apart from the study, this article relies on other secondary sources of information such as industry reports and government plans, and notes from conversation with main senior government officials and companies' executives.

The study on Vietnam was conducted within the framework of the research project titled 'Motorcycle Industry in Asia' by the Institute of Developing Economies (IDE), Japan, during 2004–05. The IDE commissioned a survey of motorcycle and parts companies in Vietnam to the Vietnam Institute of Economics, Vietnam Academy of Social Science (VIE-VASS), for which VIE-VASS conducted questionnaire surveys of

forty companies, including local and foreign (Taiwanese, Korean and Chinese) motorcycle and parts companies. The author, in collaboration with VIE, also studied ten of the surveyed companies to obtain qualitative information on their development process and current operations. In a separate attempt, the author conducted in-depth interviews with Japanese motorcycle and parts manufacturing companies in Vietnam, Thailand and China. In 2005, the author conducted follow-up interviews with some of the local and foreign (Japanese and Taiwanese) companies.

The Motorcycle Sectoral Innovation Systems in Thailand and Vietnam

This section analyses and compares elements of motorcycle sectoral systems of innovation and production of Thailand and Vietnam. The main aspects considered for exploration are: products, agent (types, interactions and learning processes), demand conditions and institutions (for example, norms, routines, laws, regulations and standards) that shape agents cognition and action, and affect the interaction among agents.

Products

According to size of engine, motorcycles can be classified into four types: small (50 cc–250 cc), medium (251 cc–750 cc), large (751 cc–1199 cc) and very large (1200 cc or more). Application-wise, again there are four types: standard motorcycle (small, simple, economical and easy to use), performance motorcycle (normally equipped with engine of more than 251 cc and mostly for racing), styling/touring/luxury motorcycle (normally with medium or large engine) and individual owner customised motorcycle (normally with large engine) (see Kosnick 1995).

Motorcycles produced and used in developing countries, including Thailand and Vietnam, usually belong to the standard type with economical price and small engine (125 cc or below). This segment has two prominent characteristics: (a) the use of mature technology and (b) the dominance of Japanese motorcycle companies. In the business motorcycle segment, Honda's Supercub equipped with C100 engine still remains the dominant model. The C100 was developed back in the 1950s, and its basic technology has not gone through any major innovations for the past thirty to forty years. Yet the models developed on the basis of the C100 still keep an overwhelming market share, though individual models

are adjusted to meet local conditions such as climate, road conditions and preferences of consumers (Ohara 2006a, 2006b). Reflecting the proprietary advantage in technology, brand and distribution channels, along with the dominant model, Japanese motorcycle companies, and especially Honda, hold an overwhelming share in the economical business motorcycle segment on the global scale (Ohara 2006b)

Motorcycle units can be classified to two types: completely built unit (CBU) and completely knock-down (CKD) unit (a complete set of all parts ready for assembling). Many developing countries start import substitution of CBUs by simple assembly of imported CKD units, followed by the stage where the government policies force the domestic assembling companies to increase the local content ratio of the motorcycles. Motorcycle industries in both Thailand and Vietnam followed this development path.

There are also motorcycle parts. Important among these are body parts, exhaust system/filter/fuel system, drive/transmission and steering parts, engine parts, suspension/brake/wheel, and instrument and seal. In terms of models produced by Japanese motorcycle companies, the majority of the parts are custom-made parts, specifically produced according to the specifications of the motorcycle company.² In contrast, Chinese motorcycle companies have imitated the base models developed by Japanese motorcycle companies, including the C100, often providing some 'minor changes' (Ohara 2006a). This is also the case of Thai motorcycle companies. In China, the base models and engines are shared by companies in the entire industry and, for parts that do not require either originality in appearance design and technology or high accuracy and high quality, readymade parts available in the market are widely utilised (*ibid.*). Such market-based transactions also prevail in procurement networks of Vietnam's local motorcycle companies, which started with simple assembly of Chinese parts.

Agents: Types, Interactions and Learning Processes

The main agents of the sector in the two countries are both firms (namely, own-brand manufacturers and parts suppliers) and non-firms (such as education institutes, research institutes, government sector-specific regulatory and supporting institutes). This section outlines the main agents of the sectors in the two countries prior to China's export drive.

Firms

Japanese TNCs that are own-brand manufacturers (OBMs) play significant roles in both countries. Thailand, however, has a longer history of producing motorcycles locally. Japanese TNCs have invested in countries since 1960s, while investment in Vietnam started in the mid-1990s. Each TNC (Honda, Suzuki, Yamaha and Kawasaki) has developed its own network of suppliers. In 2004, Honda had the largest market share of 72 per cent. For suppliers, in total, there were 323 suppliers in Thailand, 122 of whom supplied to both automobile and motorcycle producers (GMI 2004). First-tier suppliers are usually medium-size firms and joint ventures between foreign firms (especially Japanese) and Thai entrepreneurs. They used to be original equipment manufacturers or OEMs. However, due to global sourcing strategies of TNCs (sourcing parts and components from any supplier worldwide provided that the TNCs' demanded specifications and prices are met) since mid-1990s, they were forced to continuously improve efficiency and develop their design capabilities, thereby becoming own-design manufacturers or ODMs (Intarakumnerd et al. 2002).³ The second- and third-tier (OEMs) suppliers are usually Thai companies with small factories, and limited technological capability and employees. They sell motorcycle parts to the first-tier suppliers. Some parts makers, the so-called replacement equipment manufacturers (REMs), instead, focus on selling parts in replacement markets locally and abroad. Some parts makers are both OEMs and REMs. Suppliers in Thailand have longer experiences in learning and accumulating technological capabilities than those in Vietnam. Apart from engine and gear, which require highest technological capabilities, other components can be made locally. In Thailand there are two emerging pure-Thai OBM companies producing motorcycles with their own brand, distributing channels and networks of suppliers. Started in 2000, Tiger Motor became the fourth largest producer of motorcycles in Thailand with a market share of 3 per cent (see Table 1). This pure-Thai firm has an aim of not only having its own brand, but trying to build and upgrade technological capabilities of a network of pure-Thai suppliers under the slogan 'Tiger, Pure-Thai Motorcycle'. However, in practice, Tiger still has to seek technologically sophisticated parts from Japanese joint ventures in Thailand. Another example is a group of Thai suppliers, SME 007 Plus. They began

TABLE 1
Market Share of the Motorcycle Industry in Thailand, 2003

<i>Company</i>	<i>Year of establishment</i>	<i>Market share (%)</i>
Thai Honda Manufacturing	1965	72
Thai Suzuki Motor	1968	13
Thai Yamaha Motor	1966	10
Tiger Motor	2000	3
Kawasaki Motors (Thailand)	1976	2

Source: GMI (2004).

with supplying motorcycle parts to Japanese TNCs and selling their products in replacement markets both in Thailand and abroad. With five core companies, a network of almost 100 SMEs has been built. They have jointly developed a few motorcycle parts (for example, chain and choke) and have been selling them under the co-brand SME 007 Plus. They expanded their distribution network to cover repair shops all over Thailand. Recently, they teamed up with a Thai electrical appliance, DiStar, which has financial strength and an extensive distribution network, to produce a prototype of the whole motorcycle, initially expected to be sold in 2006.

There are also companies that are capital goods (mostly engine) suppliers to motorcycles assemblers and parts makers. The local capital goods industry in Thailand is relatively weak. Most types of engines are, therefore, imported from abroad. The linkages between producers in motorcycle industry and their capital good suppliers are only limited to market transactions and advice on how to 'operate' machines. There are virtually no knowledge exchanges leading to technological upgrading (GMI 2004).

The motorcycle industry in Vietnam started to develop only in the early to mid-1990s, when the government launched an import substitution policy of motorcycles by erecting trade barriers and providing incentives for foreign direct investment. By the late 1990s, the major motorcycle companies in Vietnam included one Taiwanese TNC (VMEP, a subsidiary of Taiwan's Sanyang Motors)⁴ and three Japanese TNCs (Suzuki, Honda and Yamaha) (Table 2). Some Taiwanese and Japanese parts manufacturers followed the motorcycle companies to invest in Vietnam, producing such parts as tyres, batteries, electric parts, brakes and plastic parts. The number of Taiwanese suppliers that initially followed Sanyang amounted to thirteen (Chen and Jou 2002). The number of Japanese suppliers was smaller, reflecting Vietnam's small market size and unstable investment

TABLE 2
Major Foreign Motorcycle Companies in Vietnam

<i>Company</i>	<i>Year of licence</i>	<i>Ownership structure</i>
Vietnam Manufacture & Export Processing Co. Ltd (VMEP)	1992	Taiwan (100%)
GMN Automobile & Motorcycle Parts Manufacture JV Co. Ltd (GMN)	1995	JV (Thailand, Laos, Vietnam)
Vietnam Suzuki Corp.	1995	JV (Japan, Vietnam)
Honda Vietnam Co. Ltd	1996	JV (Japan, Thailand, Vietnam)
Yamaha Vietnam Co. Ltd	1998	JV (Japan, Malaysia, Vietnam)
Lifan Motorcycle Manufacturing JV Co.	2002	JV (China, Vietnam)

Source: Survey by the VIE-VASS in 2004 and authors' interviews.

Note: JV = joint venture.

environment in the mid-1990s. The number of local parts suppliers was even more limited. Although there were numerous local companies producing replacement parts, they were outside the procurement networks of foreign motorcycle companies for two reasons. First, the foreign motorcycle companies were not compelled to increase the local content ratio at this stage. Second, the parts produced by local companies did not meet the quality standards of TNCs. Apart from a limited number of state-owned machinery companies that started to produce parts for Honda Vietnam in the late 1990s, virtually no local parts suppliers participated in the procurement network of the TNCs. As of the late 1990s, Japanese motorcycle companies depended largely on parts produced in-house and parts imported from abroad, especially Thailand.

Government

Apart from firms, differences in roles played by non-firm agents contribute to differences of the evolution of the two countries' sectoral system of innovation and production. The Thai government, for the first time in the history of the country's industrial policy, has selective policies under Thaksin administration, which started in 2001 (see Intarakumnerd 2006). The government had an 'idea' to make Thailand the 'Detroit of Asia', that is, to be a global centre for producing cars, motorcycles and automotive parts. It set a clear target for the country to produce 10 million cars by 2010. To realise this mission, the ten-year National Science and Technology Strategic Plan (2004–13) aims to produce 1,000 researchers

and 4,000 specialised engineers in the automotive industry (National Science and Technology Policy Committee 2004).

Implementation of these government plans by the concerned agencies is still far from being coherent and synergistic (Intellectual Property Institute 2006: 29). However, there is a specific organisation responsible for development of the country's automotive industry. The Thai Automotive Institute was set up as an independent public organisation under the Ministry of Industry in 1988. It aims to operate like a private sector organisation with a high level of flexibility and efficiency. The main objective is to be a centre for supporting development of the Thai automotive sector to develop it into a main exporting base in the world. The institute has broad functions. It plays an important role in formulating policies for the industry, coordinating to implement those policies, setting and enforcing industrial standards, providing technical services such as testing, calibrating and quality assurance, and market information, applying results from research to upgrade technological capabilities and quality control system to the global standard, and finally developing high-calibre human resources for the industry. The institute is trying to act as an intermediary by bringing in external technology and knowledge to upgrade technological capabilities of local suppliers. One of the important programs of the institute was Automotive Experts Dispatching Programme (2003–05) to bring Japanese experts to transfer key production technologies and skills, including those for mould and die design, and plant management to engineers and technicians of 200 Thai OEMs and REMs that joined the programme. It was a collaborative programme between Thai and Japanese governments. Japanese experts were dispatched from their own country, including those who used to work for Japanese TNCs before.⁵

Vietnam has regarded the motorcycle industry as a 'key industry' since the mid-1990s. However, comprehensive strategy for development of the motorcycle industry was not promulgated until 2006.⁶ From the mid-1990s, individual policy instruments, such as import protection, incentives for foreign direct investment, and product quality and safety standards, have been formulated in an ad hoc and often inconsistent manner. Involvement of different ministries, such as those of industry, trade, and science, technology and environment, and the lack of coordination between them were partly responsible for these problems. Frequent policy changes and

weak enforcement have been noted by foreign companies as serious problems. To illustrate, despite the fact that imports of CBUs were controlled by import quotas up to 1998 and was prohibited from 1998, new and second-hand CBUs made in Thailand and Japan continued to be smuggled into Vietnam in large numbers. Recurrent complaints by the foreign companies about Vietnamese government policies,⁷ as reported, seem to reflect the general absence of trust between the government and foreign companies. Public–private collaboration in the motorcycle industry as seen in the case of Thailand did not emerge.

Supporting Knowledge-producing Agents

Given the size and significance of the automotive industry in Thailand, special education programmes for the industry are very much needed. There are a few education programmes for the automotive industry. Chulalongkorn University's Faculty of Engineering has the most recognised and specific one, as it offers bachelor of engineering in automotive engineering. A Thai-language programme was started in 1995. It produces fifteen high-quality graduates annually. Toyota has been providing significant support in terms of equipment and instructors. After graduation, many students were recruited by Toyota. Since 2005, the faculty has offered an English-language programme aiming at producing 100 graduates per year. The instructors include both Thai and foreign academics, as well as guest lecturers from the automotive industry.⁸

Besides education, the linkages and knowledge flow between firms in motorcycle industry and education institutes in Thailand are rather weak and fragmented. Firms have linkages with individual faculty members rather than organisational linkages. The organisational linkages mostly limited to sending students on internships with companies, and testing and consultancy for solving basic production problems. In Thai universities, there are some research projects on automotive technologies, but there are none specifically on motorcycle technologies, let alone the collaborative research between firms and universities (GMI 2004).

The linkages with research and technological supporting organisations are insufficient, but better than those with education institutes. For example, the Thai German Institute, the largest and most advanced training centre for industrial technologies in Thailand, provides technical services and course-based or tailor-made training to entrepreneurs in rather

advanced technology-related design and production systems, especially in mould and die technology, computer-aided design and computer-aided manufacturing, automated production and precision machining.⁹ The National Metal and Materials Centre (MTEC) under the NSTDA has been conducting research quite relevant to the automotive industry, such as finite elements, which can be used for designing many parts of motorcycle and automobile, computer-aided design, engineering and manufacturing, failure analysis and material degradation. It also provides testing and training services to the private sector in the aforementioned areas as well.¹⁰ As mentioned earlier, a higher degree of competition due to global sourcing strategies of TNCs and China's threats are making Thai companies to try to forge more, and deeper, collaborations with local universities and research institutes.

In Vietnam, while formal education and training institutions targeting the demands of the industry remain insufficient, in-house training within foreign companies seems to have worked relatively well.¹¹ Hanoi and Ho Chi Minh City Universities of Technology, with programmes on mechanical engineering, were cited as important sources of engineers for Japanese motorcycle manufacturers. The newly recruited engineers generally go through substantial in-house training for more practical skills as specific methods of management and requirements of Japanese companies. Most Japanese companies interviewed by the author emphasised the high quality of Vietnamese engineers and workers, a key to improving the quality and production efficiency within the factory.

For Japanese motorcycle and parts companies in Vietnam, knowledge flows mainly originate abroad, especially from their headquarters (research institutes) in Japan. For instance, Honda has regional R&D centre in Thailand, which cooperates with headquarters in Japan closely in product development and design for Honda's subsidiaries in South-East Asia. Honda's factory in Vietnam receives substantial technical support from its headquarters in Japan and R&D centre in Thailand in launching new models, finding potential local suppliers, providing technical assistance to them, and so on.

Vietnam does not have a research institute specifically targeting the automotive industry, but has a few public research institutes engaged in the wider field of machinery industry. Among them, the Research Institute of Technology for Machinery (RITM) under the state-owned Vietnam Engine and Agricultural Machinery Corporation and Industrial Machinery

and Instruments (IMI) Holding under the direct management of the Ministry of Industry are engaged in research and training in the fields closely related to the production of motorcycle parts, such as die casting, forging, metal stamping, testing, and production of moulds and dies. In particular, IMI Holding has been successful in upgrading the level of equipment and technology through assistance from international organisations and companies in developed countries.¹² However, even IMI Holding is fraught with weaknesses such as limited linkages between its R&D and training activities, and actual demands of the industry. Virtually none of the local or foreign-invested companies surveyed by the author, including state-owned ones, had substantial linkages with the public research institutes.

Demand Conditions

In general, Thai consumers have more purchasing power than Vietnamese. The country's GNI per capita was US\$ 2,750 compared to US\$ 620 of Vietnam in 2005 (World Bank 2006). Demand in Thailand for the motorcycle is also more sophisticated. The country embarked on industrialisation since the early 1960s with a relatively high economic growth of 6 to 7 per cent during the last forty years. The number of middle-class people who require sophisticated products is rather high. Moreover, the motorcycle was adopted as a major means of transportation much sooner in Thailand. Some sections of consumers, especially the middle class, have more time than Vietnamese counterparts to develop special tastes, that is, demanding motorcycles with higher capacity and better appearance. The more sophisticated demands in Thailand also pressure local companies and Japanese subsidiaries to respond by deepening their technological and innovative capabilities. In Thailand, motorcycles and their parts produced from China are perceived as inferior products to those produced locally. Japanese motorcycles on the other hand have long-established brand names.

In Vietnam, the government embarked on market-oriented economic reform in the late 1980s, and rapid economic growth began only in the early 1990s from a low starting point. The shift from bicycles to motorcycles started in the 1990s within the newly emerging 'salaried urban middle class' (Fforde 2003: 50), but this remained a minority in a nation where 80 per cent of the population still lived in rural area as of 1995 (General Statistics Office 2006). The prices of locally-assembled and

imported motorcycles were still far above the reach of the vast majority of the population, exceeding US\$ 2,000 in the late 1990s. The TNCs that entered Vietnam in the late 1990s failed to recognise the vast ‘potential’ demand for low-priced motorcycles, and such missed opportunities were eventually grabbed by the Chinese firms. Until very recently, Honda dominated the Vietnamese market because second-hand Honda C100 motorcycles had been in the country for decades with a reputation of being durable and economical (Fujita 2006).¹³

All these differences had implications when Chinese motorcycles started to penetrate Thai and Vietnam markets.

Institutions

Institutions like laws, norms, routines, standards, and so forth, play important role in shaping the behaviour of agents and their interaction with each other.

One example is product standards. In Thailand, industrial standards concerning quality, efficiency, consumer safety and environment were introduced and enforced more strictly. These, in effect, blocked inferior Chinese imports. Therefore, Chinese motorcycle/parts were not as successful in penetrating the Thai market as they had done in Vietnam. On the other hand, in Vietnam, quality and environmental standards, safety regulations and other policies were newly emerging and enforcement was seriously weak.

Evolution of the Sector Under China’s Threats and Opportunities

The Extent of China’s Impact on the Motorcycle Industries in Thailand and Vietnam

As noted earlier, the export drive of Chinese motorcycle companies accelerated in the late 1990s. Though Chinese products penetrating both markets were the same (cheap and standardised), their impact differed significantly between Thailand and Vietnam. In the former, imports of motorcycles and parts from China remained insignificant throughout the period, though a gradual increase in the imports of parts was observed after 2003 (Table 3). The market structure also remained relatively stable, with major Japanese TNCs keeping the lion’s share (Table 1). In contrast,

TABLE 3
China's Export of Motorcycles and Parts to Thailand and Vietnam

<i>Unit: Number of motorcycles</i>											
(1) Motorcycles	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Thailand	378	6	84	1	361	384	1,041	13,054	14,706	15,906	39,158
Vietnam	3,801	2,417	861	548	89,778	1,229,195	1,833,073	284,194	31,193	25,466	68,203
<i>Unit: Million US\$</i>											
(2) Parts	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Thailand											
Engines	0	0	0	0	0	0	0	3	9	6	8
Other parts	1	2	2	2	2	4	5	8	12	10	17
Total	1	2	2	2	2	4	5	11	20	16	25
Vietnam											
Engines	0	0	0	0	0	5	50	80	23	46	31
Other parts	0	0	0	1	2	19	35	52	36	46	32
Total	0	0	0	1	2	24	85	132	59	92	62

Source: World Trade Atlas.

Notes: HS codes corresponding to each of the categories are as follows motorcycles (8711), engines (840732) and parts other than engines (87119).

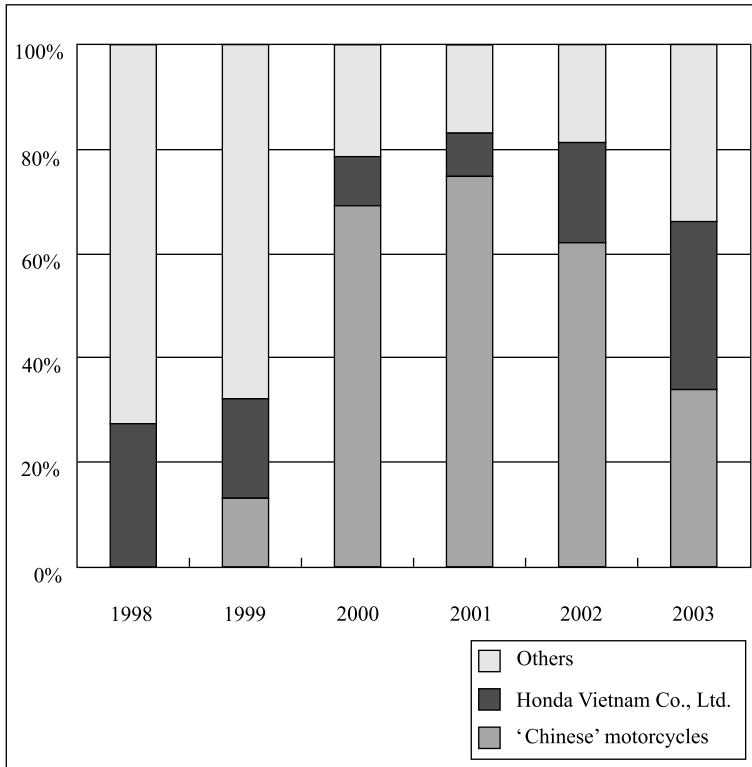
in Vietnam, imports of motorcycles surged dramatically from 1999 to 2001, followed by a sudden drop in 2002 and a steady increase in imports of parts from 2002 onwards. The import of motorcycles reached over 1.8 million units in 2001, more than triple the annual sales in the mid-1990s. In 2000, the so-called Chinese motorcycles, motorcycles assembled by Vietnamese companies using the knocked-down kits imported from China, accounted for nearly 80 per cent of the Vietnamese motorcycle market (see Figure 1), significantly reducing the share of Japanese motorcycle companies. The low-priced Chinese products significantly enlarged Vietnam's motorcycle market, encompassing the middle- to low-income groups in the urban and rural areas. However, the years after 2002 witnessed a sudden drop of motorcycle imports and the quick recovery of market share by Japanese TNCs, including Honda Vietnam, due to the reasons that will be elaborated later.

There are some notable differences between the two countries. First and foremost, there was the difference in effectiveness of import controls by the respective governments. While Vietnam prohibited import of CBUs and imposed tariffs on parts according to the local content ratio, Chinese motorcycles were imported into the country by local traders, who claimed false local content ratios to evade tax. In Thailand, import controls were effectively enforced. Second, price differentials between the locally produced motorcycles and Chinese motorcycles were much larger in Vietnam than in Thailand. In Vietnam, the Chinese motorcycles were priced one-third or even one-fourth (around US\$ 500 to 800, compared to the US\$ 2,000 or over for Japanese brand motorcycles) to those produced locally by Japanese motorcycle companies. Third, Japanese TNCs took a much stronger hold of the market in terms of brand diffusion and nationwide distribution and service networks in Thailand than in Vietnam, reflecting the history of operation in the respective countries. Last but not least, the aforementioned differences in demand conditions in the two countries contributed to different results. Thai consumers, especially the sizeable middle class, had more sophisticated demands than their Vietnamese counterparts. Chinese imports were considered inferior in terms of technology and appearance to locally produced motorcycles.

How Thailand and Vietnam's Sectors were Transformed

Whereas data on imports, sales and market shares demonstrate the difference in terms of the extent to which motorcycle industries in the two

FIGURE 1
Market Share of the Motorcycle Industry in Vietnam



Source: Authors' interview at Honda Vietnam in September 2004.

- Notes:**
1. Chinese motorcycles include those assembled by Vietnamese companies mainly using parts imported from China.
 2. Others include: (a) motorcycles produced by foreign motorcycles assembling companies based in Vietnam other than Honda Vietnam (e.g., VMEP, a subsidiary of Taiwan's Sanyang Motors, Vietnam Suzuki and Yamaha Vietnam); and (b) imported motorcycles including those made by Honda's subsidiaries abroad (e.g., Thailand).

countries were affected by China's export drive, examination of the dynamics of the sectoral innovation system in the two countries provides much deeper insights into similarities and differences in the way different agents and institutions reacted to the new challenges. Generally, the longer

presence of Japanese TNCs and higher indigenous technological and marketing capabilities of Thai assemblers and parts suppliers made Thailand less vulnerable to China's threat.

Different types of firms behave differently when facing a common external factor. To Japanese companies in Vietnam and Thailand, China is undoubtedly a competitor. Here we can observe similarities in strategies within the same company across countries (that is, Thailand and Vietnam), yet differences across companies, which reflect regional strategies of the TNCs. In the case of Honda, the company pursued a common strategy of launching low-priced models in both countries. In Vietnam, where the company's market share diminished sharply, the Wave α was launched in January 2002 with the price nearly one-third of the company's previous models. In Thailand, where the company perceived a 'potential threat' from China, the Wave 100 was launched in June 2002.¹⁴ The Wave α was developed mainly in the Thai factory of Honda (Thai Honda Manufacturing), which was Honda Vietnam's mother factory, in close collaboration with Honda R&D South-East Asia in Thailand (Ohara et al. 2003). The model was developed using the engine and body of Honda's existing models, as well as low-priced Chinese parts to bring down production costs. The new low-priced models quickly gained popularity in both countries. Especially in Vietnam, Honda quickly recovered market share after 2002 (Figure 1). In contrast, Yamaha has pursued a higher value added, with more emphasis on brand, design (for a new model) and quality in both countries, a strategy fundamentally different from Honda's.

In terms of the local companies, we can observe clear differences between the two countries. For a more established Thai OBM like Tiger, China is viewed both as a competitor and an opportunity provider. To differentiate from Chinese motorcycles, Tiger is trying to produce higher-quality product for the 'upper' market. It attempted to increase its own technological capabilities by doing setting up design and development departments and starting collaboration with local universities and public research institutes. At the same time, some Chinese-imported parts, not locally produced, were accepted. This gives Tiger flexibility in choosing the best parts for their motorcycles. For SME 007 Plus, impacts of China are quite substantial. It is a new group of parts producers with rather low level of technological capabilities (relative to Tiger) and they cannot produce all parts on their own. Therefore, they decided to change their strategy from assembling the whole motorcycle with its own brand name

to importing a designed frame and major components that cannot be produced by its group's members, such as engine and crush, from China. The plan to produce its branded motorcycle has been postponed. Instead, the group moved downstream in the value chain to recruit repair shops as members and try to modernise these by introducing new shop layouts and modern management. By doing that, the group aims to stimulate demand from downstream (repair shops) members for components produced by the group's upstream (manufacturing) members.¹⁵ The leaders of the group are very entrepreneurial and are capable of developing relationships with government agencies. The new movement to upgrade repair shops has got financial support from the National Innovation Agency and Department of Industrial Promotion (under the Ministry of Industry), Thailand, and technical support from the Faculty of Engineering, Kasetsart University, Thailand. It also received financial support to develop a software programme for managing its information system and supply chain, especially franchising, and management from Software Industry Promotion Agency and Department of Business Development, Ministry of Commerce, Thailand (see Intellectual Property Institute 2006).

For parts suppliers, there are differences between Japanese (pure-Japanese or joint ventures) suppliers and local (pure-Thai) suppliers. The local pure-Thai suppliers have lower technological capabilities than their Japanese counterparts, who have technological transfer from their mother companies in Japan. Also, first-tier Japanese parts makers in Thailand usually have long-term relationships with their customers (Japanese OBMs). In some cases, engineers from Japanese OBMs are sent to co-develop parts or components manufactured by parts makers, or give advice on how to upgrade production system. But such co-operation has not reached the level of joint R&D, which is mostly done in Japan. Undoubtedly, the threat from China is more intimidating for the pure-Thai suppliers, especially the second- and third-tier ones.

In Vietnam, the surge of imports from China provided new opportunities for local businesses. Since Vietnam prohibited imports of CBUs from 1998 to 2003, Chinese motorcycles had to be imported as knocked-down parts, and had to be reassembled in Vietnam.¹⁶ As a result, over fifty local companies assembling imported Chinese motorcycle parts emerged. However, they faced difficulties from 2002 onwards, when the Vietnamese government strengthened both the substance and enforcement of regulations on motorcycle industry by: (a) stronger enforcement of

import tariffs according to the local content ratio;¹⁷ (b) ‘standards for motorcycle manufacturing companies’, requiring, among others, in-house production of key parts;¹⁸ and (c) renewed quality and environmental standards.¹⁹ While many local companies left the industry, some remained, investing in in-house production of parts. A few even started to develop their own motorcycle brands and distribution networks.

These local companies continue to keep certain market share due to their price advantage vis-à-vis Japanese products (see Figure 1). Yet accumulation of technological capabilities within these local companies remained limited. First, unlike in Thailand, they have not succeeded in developing their own motorcycle models instead of ‘copies’ of Japanese models. Second, many are largely dependent on foreign partners for in-house production of parts, or largely use imported parts or parts produced by Chinese companies based in Vietnam. Among the companies interviewed by the author, Company A, one of the largest local motorcycle companies, whose production reached 200,000 units in 2004, was heavily reliant on the Chinese partner. The company’s basic strategy was that ‘the Vietnamese would look after sales and management, while the Chinese engineers would take care of production’. The company had a joint venture with a Chinese motorcycle company to produce motorcycle parts, where fifty Chinese engineers were stationed to assist Vietnamese workers in 2004, two years after the factory started operations. Company A also cooperated closely with Chinese parts companies located in the neighborhood. The close cooperation with Chinese partners enabled it to rapidly increase production and bring down production costs. In contrast, Company B pursued more self-reliant strategy to avoid overdependence on foreign partners. It has become clear, however, that upgrading its own technological level through trial-and-error is too time-consuming when it has to compete in a highly competitive market consisting of the powerful Japanese TNCs and numerous local companies. Against this background, Company B has had to increase the use of imported parts from China in recent years. The increased use of Chinese parts was widely observed among many local motorcycle companies. Table 2 also confirms that imports of engines and parts from China increased rapidly since 2003.

More positive developments, however, can be observed in motorcycle parts production. As pointed out earlier, companies producing motorcycle parts in Vietnam were extremely limited prior to China’s export drive.

However, the emergence of numerous local motorcycle companies created substantial demand for low-priced motorcycle parts, giving impetus to numerous local companies previously producing motorcycle replacement parts, bicycle parts or machinery parts to enter motorcycle parts production. While many of the new entrants are suffering from the falling demand due to the demise of the local motorcycle companies, some of them have managed to participate in the procurement networks of Japanese and Taiwanese TNCs mainly as second-tier suppliers.²⁰ Two of the three second-tier suppliers interviewed by the author received regular assistance in production technology and quality controls, either from the first-tier supplier or directly from the Japanese motorcycle company.

Apart from emergence of new firms and changes in existing firms' strategies and capabilities, the China factor also induces 'systemic' changes as follows:

1. Inter-firm linkages have been strengthened. In order to survive, Tiger and SME 007, Thailand, were pressured to interact more extensively, for instance, frequent meetings and joint activities like developing closer and stronger supply chains, groups' identity and brand names. In Vietnam, as mentioned before, new inter-firm linkages between local firms and Chinese competitors and parts suppliers in the form of joint ventures, and/or producer-suppliers relationship have been initiated. Some Vietnamese firms started to become OEM suppliers of Japanese TNCs, the relationship that had not happened before.
2. The relationships between firms and non-firm agents, such as government agencies, research institutes and universities, became stronger. This is more obvious in the case of Thailand. As pointed out before, Thai OBMs tried to move up the value chain and develop products superior to the Chinese imports by starting collaborative research with local universities and public research institutes.
3. Institutional changes happened as well. The Vietnamese government, in response to the problems caused by the sudden influx of Chinese motorcycles, such as traffic accidents and congestion, improved the enforcement of import controls and introduced new regulations on industrial and environmental standards. Both the substance and enforcement of policies continued to improve gradually over time.

This analysis suggests that the external threats from China induced changes in firms' strategies and market environment, entries of new firms, and creation of new relationships among firms and between firms and non-firms agents. These, to a certain degree, systemically transformed motorcycle sectoral systems of innovation and production of Vietnam and Thailand, making them stronger and less fragmented.

Conclusion

These findings shed some light on the evolution of the sectoral system of innovation and production. Theoretical implications of the concept of sectoral system of innovation and production can be highlighted.

The same external factor can be both a threat and opportunity that can influence the transformation of a sectoral system of innovation and production, as shown in the cases of motorcycle industries in Thailand and Vietnam. Under such transformation, 'new' types of agents, new inter-firm relationships, and new types of collaboration between firms and non-firm agents can emerge, while 'existing' ones can be strengthened, weakened or disappear.

Different sectoral systems of innovation production can evolve differently when they are facing similar threats and opportunities. The direction and the pace of evolution depends very much on existing capabilities of agents, strength of their linkages, and their processes of collective learning to withstand the threats and exploit the opportunities. To illustrate, Thailand can withstand the threats and exploit opportunities better than Vietnam (that is, being more equal partners with Chinese parts makers) because, despite still being rather weak and fragmented, its motorcycle sectoral system of innovation and production has 'relatively' more capable agents (that is, longer present and more technologically sophisticated TNCs, local champions who are own-brand manufacturers, government with more vivid and targeted government strategies for automotive sector, and more sectoral-specific and active government supporting agencies, universities and research institutes), more sophisticated demand conditions and 'relatively' more interaction especially knowledge transfer among agents.

An external factor, in this case being threats and opportunities from China, induces changes in strategies of agents, higher degree of interactions among agents and more variation in the sectoral system of innovation

and production. For example, a Thai OBM producer, Tiger, and some locally-owned suppliers were forced to make greater in-house effort to deepen their own technological capabilities and develop more outward-looking strategies, such as forging collaborations with local universities and research institutes, to improve existing products and production processes in order to outperform Chinese competitors. Local entrepreneurs in Vietnam seized the opportunity by collaborating with Chinese firms to start new businesses as motorcycle parts suppliers.

Given external threats and opportunities, firms in both countries do play more important roles than non-firm agents. In the case of Vietnam, however, relatively weaker dynamic linkages between firms and non-firm agents, such as universities and research institutes, allow firms to play even more decisive role in the transformation of the sectoral system.

While the direction and the capacities of the local companies to respond to external threat were largely shaped by the capabilities of existing agents, local demand conditions and institutions in the country, explaining the strategies of TNCs calls for a regional perspective. Honda, for instance, perceived what happened in Vietnam in 2000–01 as a fundamental threat to the company's operations in Asia as a whole, which had to be countered by close collaboration between its subsidiaries in the region. The new low-priced model was developed mainly in the company's production and R&D bases in Thailand, and it was launched not only in Vietnam, but also in Thailand, where China's impact was still only a threat. In contrast, Yamaha has tried to increase the value added of their products through brand, design and quality, a strategy common to both Thailand and Vietnam. The different strategies of the two Japanese TNCs also illustrate that even within the same sectoral system of innovation and production, different firms adopt different strategies and change differently when facing similar external factors.

Within the same sectoral system of innovation and production, while there might be an opportunity and a threat created from an external factor for many firms, the 'realisation' of that opportunity and preventing that threat depends very much on firms' abilities to seize such opportunities and fending off threat. For instance, while SME 007 needed to postpone its plan to build the whole motorcycle under its own brand name, Tiger managed to survive and turn the threat into opportunities to be able to source some parts from China. This could be achieved because its level of technological capability is higher than that of SME 007 (and relatively

high compared to Chinese competitors). For parts suppliers, the ability to integrate into global production networks of TNCs is also an important factor in fending off the threat. In Vietnam, more accumulation and learning happen in local parts companies that are incorporated into the procurement networks of TNCs as first- or second-tier suppliers.

NOTES

1. Thai Automotive Institute, <http://www.thaiauto.or.th>, 2006.
2. Otahara (2006) notes that 90 per cent of the motorcycle parts that Japanese motorcycle companies procure from parts manufacturers are specifically designed for each model.
3. OEM and ODM are specific forms of subcontracting. Under OEM, a latecomer firm produces a finished product to the precise specification of a foreign transnational corporation, which will be marketed under its brand name via its own distribution channels. Under ODM, a latecomer firm also carries out some or all of the product design (Hobday 1995: 37).
4. Chinfon Group, the parent company of Sanyang Motors, holds 100 per cent stake in the VMEP.
5. Thai Automotive Institute, <http://www.thaiauto.or.th>, 2006.
6. After a long period of discussion and preparation, the 'Decision of the Ministry of Industry No.33/2006/QD-BCN Approving the Development Strategy for Motorcycle Industry till 2015 and Orientation towards 2020' was promulgated on 13 September 2006. It aims to develop Vietnam into a major producer and exporter of motorcycles, parts and components in the region.
7. There were numerous occasions when Vietnam's policies towards the motorcycle industry received criticisms from companies, both foreign and local. The most prominent example was observed in September 2002, when the Vietnamese government suddenly announced the import quota for motorcycle companies for the whole year (*Japan Times* 2002; *Vietnam Economic Times* 2002). Due to the sudden imposition quota, a number of foreign motorcycle companies that used it up, including Honda Vietnam and Yamaha Vietnam, had to temporarily stop their operations because they could not import parts.
8. K. Boonchukosol, personal communication, 22 August 2006.
9. Thai German Institute, <http://www.tgi.or.th/index.php>, 2006.
10. The National Metal and Materials Centre, <http://www.mtec.or.th>, 2006.
11. Information provided in the following two paragraphs is based on author's interview with Honda Vietnam, Yamaha Vietnam and several Japanese parts manufacturers in Vietnam.
12. This remark was made by two Japanese engineering specialists who visited the company in 2001 under a project by Japan External Trade Organisation (JETRO) aiming at strengthening supporting industry in Vietnam.
13. The first Honda boom in Vietnam took place in the 1960s, in the midst of Vietnam War. Tens of thousands of Honda Supercubs were imported into the country and used

mainly by American military officers stationed in South Vietnam. After the reunification of the country in 1975, second-hand Honda Supercubs continued to be traded within the country due to their remarkable durability, high fuel efficiency, and ease of maintenance and repair.

14. Interestingly, Honda did not launch low-priced models in Indonesia.
15. C. Katikarn, personal communication, 21 August 2006.
16. Since assembled motorcycles could not be imported, Chinese motorcycles went through the Vietnamese customs as knocked-down parts. The parts were reassembled by Vietnamese companies. But the Chinese customs statistics (Table 3) show that China's exports in the years 1999–2001 were in the form of assembled motorcycles, suggesting that the motorcycles were knocked down mainly for the purpose of getting through Vietnam's customs.
17. The inspection carried out by the inter-ministerial fact-finding team in 2002 revealed that all of the fifty-two local motorcycle companies claimed false local content ratio to get access to preferential import tariffs. The Vietnamese government prohibited these companies to import motorcycle parts until they have repaid the unpaid tax amount (*Viet Nam News* 2002).
18. Decision No. 24/2002/QĐ-BCN dated 10 June 2002 of the Ministry of Industry, issuing criteria for motorcycle manufacturing and motorcycle assembling enterprises.
19. Decision No.2557/2002/QĐ-BGTVT dated 16 August 2002 of the Ministry of Transport promulgating the regulation on the inspection of quality, technical safety and environmental protection in the manufacture and assembly of motorcycles and mopeds of all kinds.
20. Six foreign parts suppliers based in Vietnam interviewed by the author (Japanese, Taiwanese and Korean first-tier suppliers) used an average of twenty-seven second-tier suppliers, twenty-two of which were local companies. A majority of the second-tier local suppliers had newly entered the production of motorcycles to supply parts to local motorcycle companies, and were located near the first-tier suppliers.

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