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Host-site institutions, Regional Production Linkages and Technological Upgrading: A study of Automotive Firms in Viet Nam*

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Abstract: *Using technological capabilities that take account of technology embodied in machinery, organization, processes and products, this article examines its link with host-site institutions and regional production linkages. The statistical results show no relationship between these variables. In-depth interviews complement the quantitative findings. Overall, the result show that the government's localization efforts failed because too many joint-venture assemblers were approved in the 1990s when the domestic market was small. The lack of economies of scale also affected the growth of national suppliers. Hence, national producers are confined to low value added segments and lack the quality to compete in export markets.*

Keywords: automotive, investment, regional production linkages, technological capabilities, Viet Nam
JEL Classification: L62, L22, L14, O31

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1. Introduction

Technological innovation is an essential driver of industrialization and catch-up in developing countries. The sources of technological change can be indigenously grown or drawn from foreign sources through foreign direct investment (FDI) and imports or a combination of both indigenous and foreign sources. FDI is not only expected to create employment, but also to attract scarce capital, improve business environment, and technological spillover to stimulate the upgrading of national Vietnamese firms.

Spillover effects from foreign firms occur when their operations stimulate productivity improvements in domestic firms even if several aspects of them are not measurable (Rasiah, 2004). Despite the potential positive effects of spillovers, FDI can also have negative effects, which in some cases may be large enough to crowd out national firms (Damijan *et al.*, 2013). The capital, managerial, technological and know-how advantages of FDI firms enable them to take over the market of domestic firms, forcing domestic firms into less efficient scales and less productivity activities. Without appropriate policies, FDI could result in the so-called "enclave economy" the benefits of which were confined to an international sector not connected to the wider economy (Warr, 1989; Gallagher and Zarsky, 2007).

Viet Nam has been reasonably successful in attracting FDI, amounting to US$ 237 billion by early 2014.[1] Beyond the initial direct effect on the local economy in terms of capital injection and employment creation, the questions that a developing country like Viet Nam faces is how to stimulate the diffusion of technology and productivity gains from such investment inflows on the national economy.

In Viet Nam, the development of the automobile industry occupies central stage in government policies with significant directions charted in its master plans, including the imposition of high tariff protection against imports to promote the sector. However, the results so far are not encouraging as publicly admitted by officials of the Ministry of Industry and Trade. According to a study by Truong and Nguyen (2011) after over 20 years of implementing FDI reliant automobile industry

[1] Quoted from official statistics from the Ministry of Planning and Investment, from 1987 to the April 2014 total FDI inflows to Vietnam were approximately US$ 237 billion in terms of commitments.

policies over 90 percent of automobile parts and components are still imported from parent companies or foreign suppliers with the national firms participating only in labour-intensive and low value added parts production. Hence, it is pertinent that the contribution of FDI to the development of Viet Nam's national firms is investigated, especially when the government provides incentives to attract these firms. However, although spillovers are critical, as Rasiah (2004, 2006) has explained, they are difficult to estimate and some of them are not measurable at all. Thus, we seek to examine technological capabilities as articulated by Dahlman, Ross-Larson and Westphal (1987), Lall (1992) and Rasiah (2006) instead, which provide the potential for spillovers.

Using primary data and secondary data from the government's statistical office, this article represents the first attempt to explore the firm-level relationship econometrically between technological capabilities, investment environment and government support in Viet Nam's automotive industry. This study use econometrics regression to examine the statistical relationship between technological capability and investment environment and government supports as well as the regional production linkages and technological capability of the Vietnamese automobile firms. The remainder of the article is structured as follows. Section two presents a description of Viet Nam's automobile sector, which is followed by a literature review in the third section. Section four presents the methodology and data used in the econometrics analysis. Section five analyses the econometric evidence. The final section presents the conclusions.

2. A Snapshot of Viet Nam's Automobile Industry

Viet Nam's automobile industry began in 1991 when two joint ventures between Auto Hoa Binh and the two foreign partners, Colombian Motors (Philippines) and Nichmen Corporation (Japan) started production.[2] Ten more joint ventures were established between 1991 and 1997 with a total registered capital of US$940 million,

[2] Before this, the only automobile factory was Hoa Binh Auto, which has operated since 1951 mostly undertaking repair of military vehicles. The two joint-ventures are Motor Company (VMC) and Mekong Auto.

and production capacity of 144,660 cars per annum. National automobile companies only entered the industry after 1998, including Vinamotor, Samco, Vinacomin, Veam, Vinaxuki and Thaco. According to the Viet Nam Automobile Manufacturers Association (VAMA) there were 18 car assemblers in 2011 (See Appendix 1). Besides the assemblers, Viet Nam's enterprise census showed the presence of 335 firms engaged in parts and component manufacturing. Foreign controlled firms amounted to 132 firms in 2011, which increased from 109 firms in 2001. In total, the sector employed about 63,000 workers in 2010, which grew by five times over the period 2001-2011.[3] The components sector experienced a large increase in FDI in this period as they grew by 5.2 times compared to the overall growth of 3.4 times among component firms.

Basic performance indicators of the sector are presented in Table 1. The automobile sector experienced increasing imports of CBUs from 2005 to 2010 due to the widening gap between increasing demand for car and limited capacity of the domestic car assemblers. Imported vehicles increased from 17,000 units to the peak of 76 thousands in 2009 before slightly reduced to 53 thousand in 2010, possibly due to the effects of economic recession. The production capacity of cars did not change significantly during the period from 2005 and 2010. Thus, estimated contribution of sector to GDP did not change significantly in the same period. Figures in table 2 also show that there is increase in the percentage of population owned a car, but the increase is small, from 0.91 percent in 2005 to 1.05 percent in 2009.

[3] Between 2001 and 2010 the number of employees working in component producing firms increased by 4.2 times, while it increased by 6 times in lead firms.

Table 1: Basic indicators, Automobile Industry, Viet Nam, 2005-2010

	2005	2006	2007	2008	2009	2010
Production (value, US$bn)*	0.723	0.753	1.741	1.79	1.833	1.917
Production (CBUs)	31,600	18,211	20,750	21,288	33,689	37,199
Sales (value, US$bn)*	3.14	3.404	4.765	5.13	n.a.	n.a.
Total sales (CBUs)*	52,264	46,787	108,392	160,400	119,460	112,224
Domestically produced sales	35,264	40,808	80,392	110,000	n.a.	n.a.
Domestically produced sales value, US$bn*	0.951	1.019	1.987	n.a.	n.a.	n.a.
Imports (CBUs)	17,000	12,050	13,000	50,400	85,771	75,025
Imports (value, US$mn)*	280	202	523	2.413	n.a.	n.a.
Contribution to GDP* (%)	1.46	1.39	1.37	1.33	1.41	n.a.
Total stock of passenger cars (CBUs)*	746,289	789,577	833,182	874,841	918,583	n.a.
Car ownership (% of population)*	0.91	0.95	0.99	1.03	1.05	n.a.

Note: *- estimate; CBU- completely-built-unit; n.a.- Not Available
Source: Business Monitoring International, Viet Nam Auto Report (various years)

In an attempt to promote automobile industry through import-substitution measures, the Vietnamese government launched various protection policies. During the period from 1991 to 2005, the government imposed 100 percent tariffs on imported cars while maintaining much lower tariff rates on imported components and parts (5-25 percent). High excise taxes were also applied on imported cars. According to the 1998 excise tax law, the highest excise tax rate applied on imported cars was 100 percent, while domestically assembled cars were subjected to only an excise tax rate of 5 percent. The 2003 excise tax law also imposed different rates on imported cars and nationally produced cars. However, in preparation for accession to the World Trade Organization (WTO), Viet Nam reduced its import tariffs on imported passenger cars and vans in 2006 so that both foreign and national producers were no longer subjected to pay different excise tax rates.

Furthermore, the government also rationalized its non-tariff protection measures. Before joining WTO in 2006 imports of used cars were prohibited. The strict quota regime that was in place was lifted in 2006. Although some technical barriers have been used since, they comply with WTO Trade Rated Investment Measures (TRIMs) agreement. For example, in 2008 the government introduced licenses on imported

cars, while in 2011, firms were required to obtain import authorization licenses from the Ministry of Transportation to import foreign cars. Technical barriers were also introduced by applying EURO II standards since 2007 for cars operating in the big five cities in the country. Finally, local content of 60 percent was introduced in 2007 to boost the domestic automotive industry.

3. Literature Review

One of the responses of firms to maintain or increase their competitiveness in the increasingly globalized economy is through upgrading their production. Upgrading of technology and production capacity helps firms to engage in the production of higher value-added products, and in employing more efficient production strategies (Humphrey and Schmitz, 2002). According to the global value chain (GVC) approach, industrial upgrading refers to a 'move from low-value to relatively high-value added activities (Gereffi, 2005). A survey of automobile firms in four countries, including Indonesia, Thailand, the Philippines, and Viet Nam classified automobile firms into several types such as (i) passive, (ii) reactive, (iii) strategic, and (iv) creative firms (Intarakumnerd, Sunami, and Ueki, 2013). Creative and reactive automobile firms have a sense for technological change and upgrading and can keep up to compete with firms in the international technological frontier. In contrast, passive and reactive automobile firms are unable to shape and exploit technological opportunities, as well as possibilities to advance their technological and production capabilities.

Research shows that both firm-level and external factors can affect the enhancement of technological capabilities, and hence, performance of automotive firms (e.g. Rasiah, 2011). Such internal factors can include technology strategy and strategic intent, absorptive capacity, and learning processes. The institutional factors can include regulatory and policy environment, demand and product life cycle (Rasiah, 2004; Intarakumnerd, Sunami, and Ueki, 2013).

In addition, education and the skills regime can influence firms' ability to absorb knowledge and to innovate. Rasiah (2011) provided evidence to show that Indian

automotive producers were able to innovate extensively, *inter alia,* because of a massive supply of technical education labour force. Yet, the Indian automotive industry is significantly less export-intensive than those in Brazil and South Africa (Rasiah, 2011). In some countries the automobile industry accounts for a major share of innovation costs in the manufacturing sector. For example, Dias, Pereira and Britto (2012) noted that the automotive industry in Brazil accounted for over 16 percent of the total cost of innovation expenditure borne by the manufacturing sector in 2008.

Technology transfer also depends on the interaction between firms, and organizations parties. Some processes rely heavily on external sources of knowledge and technology, including universities and R&D labs. R&D collaboration is the most common technology transfer channel within multinational companies and their subsidiaries (Ivarsson and Alvstam, 2005a). However, technology transfer in joint ventures is often dependent on the conditions behind mergers (UNCTAD, 2005).

In addition, it is difficult to guarantee the success of the transfer of strategic technologies in the short term (Lorentzen and Gastrow, 2012). The establishment of manufacturing facilities as part of a global network of production may require skills mainly at the lower levels (workers, technicians and monitoring), while the establishment of a R&D centre will require skills at a higher level of engineering and management. The availability of these skills in the host country can facilitate upgrading and technology transfer and the development of global innovation networks. In the absence of tacit knowledge, which is a problem in Viet Nam, there should be a bridge to close the technology gap between the parties.

The automotive industry represents a typical example of producer-driven networks where dominant players organize and coordinate investment-based vertical production networks of component suppliers (Gereffi, 2001). This is a typical example of the so-called quasi-hierarchy in which leading firms drive the organization and regulation of the value chain through their corporate and market power. The quasi-hierarchy corresponds with captive value chains as one type of value chain governance (Gereffi, Humphrey and Sturgeon, 2005), which allows leading firms to determine which suppliers will be included or excluded from the value chain based on price, quality, and timeliness of delivery. In the meantime, they

are also able to pressure selected suppliers to engage in follow-up sourcing (Pavlinek & Zenka, 2010), as well as, to specify the characteristics of the components supplied (Humphrey and Schmitz, 2002).

In addition, industrial upgrading in automotive clusters are strongly influenced by the type of value chain firms are linked with. Since the barriers to entry in such environments are high, the upgrading prospects of small automotive firms at the bottom of the supplier hierarchy will be limited, which increases transaction costs of suppliers. Thus, smaller suppliers' investment in production equipment and product development customer-specific, which limits their ability to develop unique products and technologies. Leading firms may encourage process and product upgrading but typically discourage functional upgrading of their suppliers to prevent other firms in the industry from becoming competitors (Humphrey and Schmitz, 2004; Tokatli, 2007; Isaksen and Kalsaas, 2009).

In addition, the institutional environment can be a key determinant of firms' capacity to absorb or deepen technological capabilities (Rasiah, 2004). However, there is no consensus on the impact of institutions and policy instruments has been inconclusive as can be seen from the varying impact of industrial policies among the developing economies. Some researchers and policy makers believe that upgrading technology capabilities require government regulations, as well as, public-private collaboration (McDermott, 2012). Moreover, firm-level technological capability building involve significant collection action problems, such that organizations engaged in training, basic R&D, universities and designing centres located outside of firms become important, especially among small firms. Vernon (1966) had alluded to these issues when, inter alia, explaining why MNCs prefer to retain high technology activities at developed country sites. Hence, the role of external factors, such as, markets, information, and policy environment is critical when examining technological upgrading in firms (Quimba and Rosellon, 2011).

In contrast, a number of works have also shown how inefficient institutional roles have discouraged improvements in technology capabilities. For example, Padilla-Pérez and Gaudin (2013) observed from involving six Central American countries that tough government designed institutional measures, such as, law, national plans, and other policy instruments targeted at fostering science, technology,

and innovation has generated meager returns. Meanwhile, Chadee and Roxas (2013) noted that the formal institutional elements of regulatory quality, rule of law, and corruption generally produced a negative impact on both innovation capacity and firm performance in Russia. Small automotive firms in South Africa also do not consider government support or universities and publicly funded institutions as crucial in their R&D and innovation activities (Phaho, 2008). The lack of belief in government programmes is held not only among low technology firms but also among high technology firms (Fischer and Reuben, 2003). Hence, although institutional support has been established as critical to solve collective action problems in firms' quest to upgrade (Nelson and Winter, 1982), they have produced mixed results across the developing economies, which begs the question, "under what circumstances will institutions foster firm-level technological capability building?"

4. Methodology and Data

In order to analyse the role of host-site institutions, such as, government efforts and regional production linkages, on the technological capability of automotive firms in Viet Nam, we rely on a mixed method of quantitative analysis and qualitative analysis. Data for the quantitative analysis come from a survey of automotive parts and component suppliers, and assemblers.

The quantitative survey was completed in April 2013.[4] In total, 40 firms, including 6 assemblers and 34 suppliers responded to the survey. We complemented missing data from the survey by accessing information from the 2012 enterprises census survey undertaken by the Government Statistics Office (GSO). This census collected information for 2011, which coincided with the data collected in our survey. In particular, we added information on fixed assets and total sales for 17 firms. This is possible by matching names and tax codes of firms in our survey. The

[4] The questionnaire was originally designed Rajah Rasiah but was later modified and adapted for Vietnam by the authors. We use a random sampling strategy to select firms for inclusion in the study. The sampling frame was constructed using the Vietnam Enterprises Census 2012 conducted by the Vietnam Government Statistical Office.

qualitative analysis relies on a series of in-depth interviews we carried out with relevant policy makers, researchers and mid-level managers of automobile assemblers and suppliers. Particularly, it aims at answering the question of whether host-site institutional support has any impact on firm-level technological capabilities in automotive sector of Viet Nam.

The primary data collected is used to analyse the impact of host-site institutional support and regional production linkages on firm-level technological capabilities (*TC*). Drawing from Penrose (1959), Rosenberg (1982) and Dahlman, Ross-Larson and Westphal (1987), Rasiah (2004) defined firm-level technological capabilities as resources at firms' disposal to generate, acquire, adapt or assimilate codified and tacit knowledge embodied in products, processes, machinery and equipment and humans in the production of new knowledge and goods and services. Nelson (2008) discussed its evolutionary underpinnings arguing that it is location, industry and time specific (Nelson, 2008). Drawing from Rasiah (2006, 2010), we classify firms' technological capabilities as composed of the following component proxies:

$$TC = f\left(CIQT, AC, PD, RD, TE\right)$$

Whereby *CIQT* refers to cutting-edge inventory and quality control techniques (*CIQT*),[5] *AC* refers to the presence of adaptive capabilities (*AC*) on processes, layouts, machinery and products. A score of 1 is given for the presence of each of them and zero otherwise, *PD* refers to the presence of product development (*PD*) which is counted as 1 if it exists and 0 otherwise. *RD* refers to R&D expenditure as a share of sales. *TE* refers to training expenditure as a share of payroll. As these factors, themselves are made up of different indicators, we normalize them using the formula, $(X_i-X_{min})/(X_{max}-X_{min})$, where X_i, X_{min} *and* X_{max} refer to the observed, minimum and maximum values of the proxies respectively. The composite index of technological capability is then estimated by adding the normalized scores and dividing them by the number of proxies used.

[5] Examples include just-in-time (JIT), *Kaizen*, quality control circles (QCC), the international standards organization (ISO) series, total preventive maintenance (TPM), and total quality management (TQM).

To capture the influence of host-site institutions, we focus on (i) basic infrastructure environment and (ii) direct government support. In the survey questionnaire, we asked respondents to rate the quality of several host-site institutions in Viet Nam such as transport services, power supply, water supply, and telecommunication networks as they are important for the automobile sector. We construct a composite variable of infrastructure environment (*infras)* from these institutional components:

$$Infras = f(trans, power, water, telecom)$$

where *trans* refers to transport service, *power* refers to power supply, *water* refers to water supply, and *telecom* refers to telecommunication network. Similar to the case of technology capability, we also normalize these variables using the formula $(X_i - X_{min})/(X_{max} - X_{min})$.

Along with the infrastructure environment, government direct support is targeted at the technological and marketing support programmes. It takes the value 1 if the firm enjoys direct support from government programs and 0 otherwise.

To capture firms' linkages with regional production networks, we estimated the share of sales and purchases to and from buyers and sellers in the Association of Southeast Asian Nations (ASEAN). However, sales to markets in the regional economies in particular and to the world economies from Viet Nam's automotive firms are limited.[6]

Besides the above mentioned variables, the technological capability of firms may also be determined by a number of other variables, which include human capital, R&D, technological upgrading strategies, foreign ownership, firm size, firm type, and firm age. A firm's human capital (*HC*) can be measured by the percentage of professional and technical personnel in the workforce. Following Rasiah (2006) we measure R&D as R&D expenditure as percentage in sales. We measured technological upgrading (*TechUp*) activities of firms as a dummy variable, taking the value of one if significant levels of process and product technological upgrading has been recorded by the firm. Also following Rasiah (2006) we use a dummy variable

[6] RL = percentage of firms' imports from ASEAN countries

to classify size of firms in Vietnamese automobile sector as small and medium enterprises (SMEs) and large enterprises. The data collected shows that 30 percent of the surveyed firms are large firms using the definition used by Vietnamese statistics office, which is 300 employees. Foreign ownership (*FO*) is measured as percentage share of foreign equity in total equity. Firms with foreign equity of 50 percent and more are classified as foreign firms. We also include in our model a variable to capture the number of operating years of firms in Viet Nam and distinguish suppliers and assemblers using a dummy variable (type).

We specify and estimate the following regression model using Tobit method.

$$TC = \alpha + \beta_1 HC + \beta_2 TechUp + \beta_3 \text{infras} + \beta_4 \text{supportGov} + \beta_5 \text{RLim} + \beta_6 \text{X} + \varepsilon$$

where *TC, HC, TechUp, infras, supportGov* refer to technological capability, human capital, technological upgrading efforts, infrastructure environment, direct government support enjoyed by firms, and regional production linkages. Vector *X* contains control variables, including type of firms (assemblers or suppliers), *FO*, size and age.

5. Statistical Analysis

The descriptive statistics of dependent and independent variables are shown in Table 2, which provides a description of not only the overall aggregates of the variables, but also distinguish between assemblers and the suppliers. Despite the earlier caveat that the sample is small, given the total population of only eighteen assemblers, our sample is relatively strong with six assemblers. Although the sample of 34 suppliers is small, it (with the assemblers amounting to 40) somewhat just meets the criterion for statistical investigation (n-k-1>30), whereby n is the number of observations and k is the number of independent variables used.

As shown in Table 2, the average level of technological capability of assemblers and suppliers are quite close to each other. In terms of human capital, as expected, the automobile industry employs a relatively high level of professional and technical

personnel in their workforce. However, there are significant differences between the two groups on other variables. Firstly, the suppliers seem not to be supported by the infrastructure environment compared to the assemblers. This is an interesting finding, which reflects the neglect of the government toward the suppliers in comparison with the assemblers. The difference between the two groups is also obvious with linkages with regional production chains. While suppliers show limited regional production linkages, assemblers show a higher level of linkages.

However, suppliers seem to benefit more from direct government support compared to the assemblers. The mean and median of R&D are far from each other and the median shows that a large number of firms do not invest in R&D activities. From the sample, 37 percent of firms participated in R&D activities. There is also a large variation in foreign ownership. The mean and median statistics show that foreign equity in automobile firms in Viet Nam is large. The sample shows that 60 percent of firms have foreign equity in which 50 percent of them are 100 percent owned by foreign capital.

We constructed the infrastructure environment variable using factor analysis of 4 proxies, which shows a wide dispersion. The other variables of industry type, size, age and support from government programs also show large differences between the mean and the scores.[7]

The results of the regressions on the relationship between technological capability and host-site institutional support and regional production linkages are shown in Table 3. We present four sets of estimation results. The baseline model is estimated for the whole sample. To test for the importance of regional production linkages, we extended the baseline model to include a variable constructed to capture linkages. We also estimated a separate model for the sub-sample on automotive parts and component suppliers. Overall, the estimated results tell a consistent story and the estimated coefficients are quite stable across specifications. The results show that technological capabilities of firms in Viet Nam's automotive sector have strong statistical relationship with human capital and efforts to upgrade the production processes and products. The estimated parameters have the expected sign and are

[7] Median summary statistics are not provided here due to space constraints but can be provided upon requests.

statistically significant. However, in contrast to the expectation that host-site institutional support would positively influence the technological capabilities of firms, the results suggest otherwise. The estimated coefficient of host-site institutional support has the right sign but is statistically insignificant, while direct government is not only insignificant it also has a wrong sign. We also do not find a significant statistical relationship between regional production linkages with ASEAN countries and technological capabilities. These results either show the nascent state of automotive development in Viet Nam or that institutional change is still very much in its infancy since transition began.

Table 2: Summary of statistics of variables used in analysis

Description	All observations					Suppliers					Assemblers				
	Obs.	Mean	Std. Dev.	Min	Max	Obs.	Mean	Std. Dev.	Min	Max	Obs.	Mean	Std. Dev.	Min	Max
Technological Capability	40	1.73	0.72	0	2.88	34	1.73	0.71	0.13	2.88	6	1.70	0.88	0	2.48
Number of professionals and technical personnel/workforce	35	0.21	0.20	0	1	30	0.20	0.19	0.04	1	5	0.29	0.25	0	0.68
Infrastructure environment	40	1.97	1.03	0	3.75	34	1.93	1.026	0	3.75	6	2.25	1.13	0.33	3.75
Number of years in operation	40	15.38	11.95	3	53	34	15.12	12.75	3	53	6	16.83	6.18	5	23
% of imports from ASEAN countries	40	0.11	0.22	0	0.83	34	0.08	0.16	0	0.6	6	0.26	0.41	0	0.83
% foreign equity in total equity	40	0.58	0.48	0	1	34	0.58	0.49	0	1	6	0.59	0.47	0	1
Technical upgrading efforts	40	0.78	0.42	0	1	34	0.76	0.43	0	1	6	0.83	0.41	0	1
Support from the government	40	0.18	0.38	0	1	34	0.21	0.41	0	1	6	0.00	0.00	0	0

Note: TC – technological capability; RLim – regional production linkages with ASEAN countries; HC – human capital; FO – foreign ownership; TechUp – initiative in technological upgrading; infras – infrastructure environment; type – type of firms as assemblers or suppliers; size – SMEs or larger firms; age – years in operation; supportGov – firms enjoyed supports from government's program

Source: Calculated by authors from authors' survey (2013).

Table 3: Relationship between Technological capabilities, Institutional Support and Regional Production Linkages, Automotive Firms, Viet Nam, 2011

Variables	Baseline model	Baseline model with regional network	Suppliers only	Suppliers with regional network
Human capital	2.074***	2.079***	1.816***	1.810***
	(0.42)	(0.41)	(0.48)	(0.47)
Tech Upgrading efforts	0.781***	0.807***	0.679***	0.717***
	(0.21)	(0.21)	(0.23)	(0.23)
Infrastructure environment	0.0443	0.036	0.0813	0.0631
	(0.08)	(0.08)	(0.09)	(0.09)
Direct gov. support	-0.108	-0.106	-0.102	-0.0845
	(0.29)	(0.29)	(0.31)	(0.30)
Firm size	0.335*	0.328*	0.275	0.224
	(0.20)	(0.19)	(0.21)	(0.22)
Firm age	0.0105	0.0112	0.01	0.0111
	(0.01)	(0.01)	(0.01)	(0.01)
Foreign equity	-0.0312	0.00717	-0.105	-0.0508
	(0.20)	(0.20)	(0.22)	(0.22)
Type of firms	-0.435*	-0.362		
	(0.25)	(0.26)		
Regional production linkage		-0.373		-0.57
		(0.39)		(0.583)
Constant	0.464	0.459	0.583*	0.602*
	(0.29)	(0.28)	(0.30)	(0.30)
Pseudo R2	0.3630	0.3730	0.3090	0.3221
N	40	40	34	34

Note: *, **, and *** refer to statistical significance at 10%, 5%, and 1% respectively
Source: Compiled from authors' survey (2013).

To shed more light on our findings, we conducted a series of in-depth interviews with experts from the automotive industry to explore the following questions:

- Is there any evidence of technological upgrading in the automobile industry? If so, how has this developed?
- What are the host-site institutional barriers to industrial upgrading for Viet Nam's automobile industry, especially among automotive parts and component suppliers?

5.1. Technological Upgrading

The interviews show that the automotive industry is experiencing gradual technological upgrading. Viet Nam now has a number of domestic automobile assemblers who can either provide assembly services on their own or to undertake original equipment manufacturing (OEM) services for other firms, such as, Hyundai. Their own brand names include Vinaxuki and Thanh Cong, which are assembled by either national private firms on jointly with state owned firms (SOE). There are also a number of parts and components suppliers in Viet Nam, such as, Kumho and Da Nang Rubber Company (tires), Dap Cau Glass (windshields) and Dong Nai Battery Company (batteries).

However, local firms are still languishing in the low value added segment of the automotive industry suggesting that the policy of localization is a failure. Also, the linkages between automobile assemblers and automotive parts and components firms is very loose. For example, despite the fact that Dap Cau Glass has the capacity to produce automobile windshields, the company is unable to secure contracts from national assemblers. National assemblers have preferred to source their windshields from high-duty imported reinforced glasses. In addition, although some Vietnamese firms can assemble vehicles under their brand names and produce prototypes (e.g. Vinaxuki), their technological capabilities are too low so that the domestic market is dominated by foreign brand names. Finally, we argue that there is some sort of "technological downgrading" in Viet Nam where firms, either foreign or national, produce sub-standard products for the domestic market.

5.2. Host-site Institutional Support

Although the government launched an ambitious master plan to develop the industry,[13] it has lacked an effective action plan. Despite its good intentions, the poor implementation has affected technological upgrading among national firms.

Firstly, the government's policies did not reflect a good understanding of economies of scale when promoting FDI inflows in the automotive industry. Despite spectacular economic growth recorded in the 1990s, Viet Nam was still an extremely poor with a very small market for automobiles. Despite this reality, between 1991 and 1995, the government approved investment licenses to the setting up as many as 11 automobile joint ventures between foreign auto makers and domestic firms. Hence, the small market and the high incentives FDI auto makers sought to internalize costs associated with sourcing parts and components from national firms' limited the linkages established with local automotive parts and component producers. On the one hand, the government forced on local content requirements on joint-venture assemblers. On the other hand, by allowing so many joint-ventures against the few competitive nascent suppliers in the country the government effectively made it impossible for the assemblers to access sufficient supply of automotive components and parts. This contradiction actually forced the government to abandon this policy, which also coincided with accession to the WTO.

Secondly, the lack of scale and the high excise taxes and registration fees raised the price of automobiles, which lowered the effective demand for cars and essentially put a cap on the production capacity of assemblers. Without a meaningful minimum efficiency scale assemblers found it uneconomic to outsource part of their work to national firms, thus limiting the technological learning and upgrading opportunities of national suppliers. Faced with a fragmented and small market, and taking advantage of the lower tariffs on parts and components than CBUs, pure economic calculation would suggest that the best strategy for the joint-ventures is to invest in assembly rather than on manufacturing in Viet

[13] Decision No. 117/2004/QĐ-TTg by Prime Minister on the Master Plan of Vietnam Automobile industry until 2010 and vision to 2020. According to this Master plan, local value added for trucks, vans and cars shall reach 60 percent (50 percent for engines and 90 percent for gears and shifting) and the industry would meet 80 percent of domestic demand.

Nam. Also, the corollary of the small market size also affected the national suppliers who had to face the same diseconomies of scale.[14]

Thirdly, as outlined in section 2 above, most if not all of protection measures and incentives were targeted at joint-venture automobile assemblers (e.g. tariffs and non-tariff protection to meet local content requirements). The automotive parts and component suppliers were neglected as reflected in their underdevelopment.

6. Conclusions

The population of 90 million people and high economic growth, which made Viet Nam a potentially large market for automobile production and sales led the government to target the industry as strategic one when launching the automobile industry development plan 2004. However, the automobile industry has failed to achieve the goals set out in the master plan. It is this context that this article sought to investigate the reasons for this failure. Our statistical analysis shows that institutional support in the country does not support technological upgrading of national firms. In addition to a lack of coherence between industry requirements and what the government has done with the supporting institutions, we found further shortcomings through interviews with both firms' officials and policy makers and implementers. Among the fundamental shortcomings, include the lack of coordination between the approval of licenses to start assembly operations and the growth in scale. On the one hand, the lack of economies of scale discouraged assemblers from sourcing extensively from national suppliers since the 1990s. On the other hand, the lack of economies of scale also discouraged the growth of national suppliers. Hence, although Viet Nam's automotive industry has evolved to produce its own national brands, the national firms are confined to low value added activities with little ability to compete in export markets.

Viet Nam is no longer able to implement local content policies due to its membership of the WTO, while it is required to lower import tariffs to zero percent on imported cars by 2018 due to its commitment under the ASEAN Free Trade Agreement. Hence, Viet Nam has little fiscal instruments at its disposal to stimulate technological upgrading of its

[14] To put things into perspective, Vietnam has a vibrant motorcycle industry with a lot of technological upgrading in local firms, and the linkages between foreign firms and local suppliers is very strong, which is a consequence of economies of scale achieved from Vietnam's large market.

national firms beyond the provision of financial incentives and grants? We recommend the government to go complement further the deregulation processes by gradually lowering the excise taxes to increase market size, which will attract foreign investors seeking economies of scale to expand further operations. This will then stimulate growth in demand for components in Viet Nam, which can then boost the national automotive parts and components industry. In addition, policies should target national automotive parts and components producers rather than at the joint-venture assemblers.

Appendix 1. List of automobile assemblers as members of VAMA

	Company	Brand	Year Est.	Equity[1]	Capacity	Ownership
1	Toyota Viet Nam	Toyota	1995	89.6	34,500	JV
2	Ford Viet Nam	Ford	1995	102	14,000	JV
3	Vinastar	Mitsubishi	1994	53	5,000	JV
4	Isuzu Viet Nam	Isuzu	1995	50		JV
5	Viet Nam Suzuki (Visuco)	Suzuki	1995	34,2	4,000	JV
6	Viet Nam Daewoo (Vidamco)	Daewoo, GM-Daewoo	1993	32	10,000	JV
7	Mercedez-Benz Viet Nam	Mercedez-Benz	1995		4,000	JV
8	Honda Viet Nam	Honda	1996	209	10,000	JV
9	Viet Nam Motor Company (VMC)	Kia, Mazda, BMW	1991	58	24,000	JV
10	Hino Motors Viet Nam	Hino	1996	8,1		JV
11	VEAM	VEAM	2005	35	30,000	JV
12	Mekong Auto	Fiat, Iveco, Ssanyong.	1991	35,9		JV
13	SanYang Auto Viet Nam (SMV)	SYM	2005	70	10,000	FDI
14	Samco	Samco	2004	50		SOE
15	Vinamotor	Vinamotor, Transico	2003			SOE
16	Vinacomin Motor	Kamaz, Kraz	2004	5	1,500	SOE
17	Vinaxuki	Vinaxuki	2004		30,000	Private
18	Thaco	Kia, Daewoo, Foton, Thaco	1997	90	20,000	Private

Notes: The list includes only firms which are members of VAMA.

[1] in US$ million

JV- joint-venture firms; FDI – foreign direct invested firms; SOE – state owned enterprises

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