# Firm Level Competitiveness or MNC Networking? The Source of Indonesian Automotives Sector's Performance

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# Firm Level Competitiveness or MNC Networking? The Source of Indonesian Automotives Sector's Performance

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## ABSTRACT

This paper describes and analysis the unique condition of Indonesian automotive sector. Indonesian automotive sector has been enjoying rapid annual export growth after the economic crisis at the end of 90s. Actually, the import's value has been always higher than the export value. As almost of the automotive are located in Jakarta area and they have strong relationship with each other, those firms can be recognized as an industrial cluster namely Jakarta Automotive Cluster. The Systemic Quad cluster approach was used to explain the condition of the cluster. Beside, Firm level technological capabilities considered as an important factor above condition. The survey was conducted to examine the influence of firm level competitiveness and MNC networking on the economic performance of Indonesia automotive firms. Due to the different nature of the foreign firms compare to local firms. The paper examine the nature for all firms also for foreign and local firms respectively.The results show that foreign firms have superior network cohesion and global networking also enjoy superior economic performance compare to local firms namely export incidence productivity and export percentage. The Two-tail t statistic also shows that foreign firms provide higher wage for day employees and firms also have greater number of employees. Export percentage of Indonesian Automotive Cluster influenced by high tech infrastructure, global networking and technological capabilities. Especially for local firms, their export percentage mainly influenced by high tech infrastructure. Interestingly for export incidence, global networking presents strong influence constantly for foreign firms as well as local firms. It proves that global networking

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and technological capabilities have the most influence to economic performance than other variables. But in export incidence global networking has more influences rather than firm level competitiveness.

Keywords : Firm Level Competitiveness, Technological capabilities, Economic performance

## INTRODUCTION

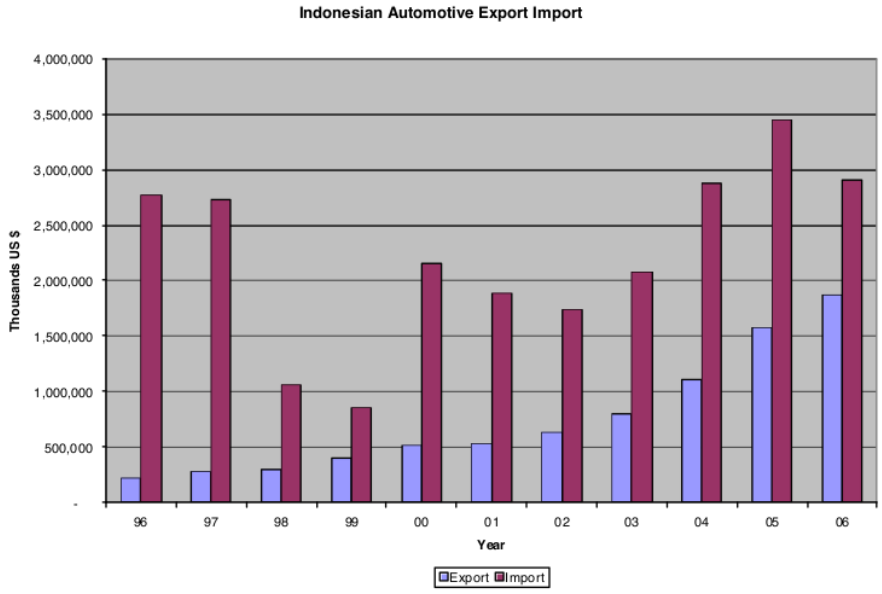
Policy makers in many developing and transition economies striving to attract foreign direct investment (FDI) on their agenda, expecting FDI inflows bring much needed capital, new machines, new technologies and sciences, marketing techniques and management skills. All those potential benefits of FDI are expected increasing the productivity and competitiveness of the domestic industry. It is often expected that technology transfer resulting from FDI will go beyond actual projects undertaken by foreign investors, and through knowledge spill over will benefit local firms.

Transition economies offered some incentives for foreign company to invest in the countries such as tax reduction, easy land ownership, investment procedure etc. and domestic market access, cheap labour. Yet, there is no clear evidence whether the foreign investment can improve the productivity and competitiveness of that positive by conducting transfer technology to domestic firm only taking the benefit from government's incentives.

Indonesian automotive industries has been enjoying FDI inflows since the beginning 70s, when the Ministry of Industry and the Ministry of Trade launched the decree to introduce the important of vehicles, both completely built up (CBU) and Completely Knock Down. The decree was demanding the foreign firms to invest for local assembly and manufacture facilities, by providing lower tariff rates for semi-knockdown (SKD) and completely knocked down (CKD) kits as compared to completely built up units (CBU).

Since that period, the Indonesian automotive sector has been experiencing fluctuation condition. Figure 1 shows the value of export and import of Indonesian automotive sector. It is not clear what factor influence the conditions.

Drawing on sample of 93 automotive firms in Indonesia, the paper seeks to examine : (1) differences in support for the development of industry from industrial cluster development approach namely basic infrastructure support, high tech infrastructure support, network cohesion support and global networking support, between foreign and local firms (2) The differences in economic performance such as export percentage, export incidence and productivity between foreign and local firms. (3) The differences other critical variables namely age and number of employee between foreign and local firms. (4) Statistical relationship involving economic performance, quad system pillar, firm level technological capabilities and other critical variables for all firms, and also for foreign and local firms respectively. (5) the influence of multinational company networking and firm level technological capabilities. Our paper is organized as follows. In the following section we provide of the overview of the Indonesian automotive sector. Section 3 presents methodology and data. Section 4 examines the statistical differences between foreign and local firms from cluster development perspectives namely the quad system pillars. And this section also tries to explain the differences of the economic performances of the foreign firms as well as local firms. In this section also, the correlation between economic performances are explained, and eventually in this section, the influences of the pillars of the quad system on particular economic performance are examined. Section 5 presents the conclusion.




## 2. LITERATURE REVIEW.

### 2.1. The Development of Indonesian Automotive Sectors

One of Indonesia's oldest manufacturing activities is the automotive industry, dating back to the establishment in 1928 of a General Motors (GM) assembly plant in Tanjung Priuk, Jakarta. For the following 40 years, the industry experienced little sustaining growth, owing to the Great depression, war, the independence struggle and uncertain post independence business climate. Some attempts has been made to develop the industry as part of the 1950s Benteng industrialization program, but these were half hearted and amounted to little. (Aswicahyono, 2000).

By the late 1960, Hansen (1971) found the industry was small and technologically primitive. The annual market size was 10,000-15,000 units, far below the level needed to support just one plant of efficient size. The supplier base was extremely limited: There was no international quality stamping plant, foundries could

not meet acceptable quality control standard, high-quality steel production was not available. There was no industrial paint work capacity, and very few electronic components were produced locally, including tyre and battery. However, Indonesian government has tried to manage systemic development since 1971. Yet, it did not always produce expected result.

In order to support the development of the industries, Indonesian Government had launched some regulations and incentives that were designed to overcome the threat that were faced by automotive industry in those periods. Generally, the development periods of Indonesian automotive industries, can be divided into four periods, such as:

- First Period (1969 – 1979)
- Second Period (1980 – 1989)
- Third Period (1990 – 1998)
- Fourth Period (1999 – present)

### 2.1.1. First Period (1969 – 1979)

This period was started when The Minister of Industry and the Minister of Trade issued a joint ministerial decree to introduce the importation of vehicles, both completely-built-up (CBU) and completely-knocked-down (CKD). Also the decree included the regulation of the establishment of assembling plants and sole agents in the country.

This decree has succeeded to increase assembly plants and supporting industries, such as those manufacturing tires, paint, and batteries. Local companies also have participated in this era by involving in designing jigs and fixtures and also supporting certain processes, like painting, welding, trimming, and metal finishing.

In order to develop local automotive industries, in 1974, the government banned the import of CBU vehicles. The import activities can be conducted only by sole agents, and the automotive could only be imported in CKD form, which then should be assembled by the sole agents.

In 1976, the government issued a Deletion Program. The program was known as deletion program since the program asked the companies to delete some components

from the imported components list. It meant the companies were demanded to produce those components domestically. The purpose of the program also was to attract local company in automotive sector. The government applied high import duties to vehicles that did not use locally produced stamping parts. At that period, the government also prioritized the development of vans/minibuses by imposing higher taxes on sedans, but at the same time applied the lower taxes on vans/minibuses. This program has also succeeded to attract local automotive industries. General component plants blossomed and started to produce radiators, seats, exhaust pipes, shock absorbers, wheel discs, seats and interiors, wiring systems gaskets, plastic parts, chassis frames, stamping parts, rubber parts and jigs. Also the Parts manufacturing companies generated not only original equipment for manufacture (OEM) components but also spare parts for after sale service. Annual sales went up slowly to 72,000 units in 1976 and 103,000 units in 1979.

### 2.1.2. Second Period (1980 – 1989)

In 1983, the government issued the second part of the Deletion Program. In the program, government asked the companies to produce main component locally. The high import duties were then applied to imported main components. The program had succeeded to push the supporting industries started to produce main components, such as transmissions, clutches, power trains (including engines), brake systems, cast and forged parts, and windows regulators.

### 2.1.3. Third Period (1990 – 1998)

In 1993, the government replaced the Deletion Program with the Incentive Program, known as the 1993 Automotive Policy Package. Automobile manufacturers were allowed to choose the components that would use local products and were granted discounts on import duties. The Automotive could conduct local content self assessment. As they achieved higher percentage of local component, they enjoyed higher discount on import duties. The program succeeds to boost engine plants,

transmission plants and propeller shaft plants grew. It had succeeded to fulfill either domestic market or international market.

In 1996, the government launched program which expected to speed up the Incentive Program and introduced the National Car Program. In order to get an exemption of import duties, companies had to reach 20 percent, 40 percent and 60 percent local content in the first, second, and third years of production. The Government had selected PT. Timor Putra National, partnering with South Korea's KIA Motors, to the first company which awarded import duty exemption under this program.

In 1997**,** Massive monetary crisis occurred in Asia regional, and Indonesia suffered the worst. It caused many companies collapsed as their foreign debts more than quadrupled. This also effected to automotive sector. For example: after jumping to a record high of 392,000 units in 1997, car sales nose-dived to 58,000 units in 1998.

Before the crisis, mostly the share's majority of Indonesian automotive company was owned by local investor. In order to expand the industries, the companies owed some money from various sources mainly from foreign institutions. Due to the crisis, the company could not pay the credit. Therefore they offered their strategic partner to buy-out the credit replaced by the share. Since that period, the share's majority of the Indonesian automotive industry owned by foreign investment/parents companies has been increasing. From that period until now, the foreign investor having the right o make all strategic decisions.

### 2.1.4. Fourth Period (1999 – present)

In 1999 Indonesian government issued Automotive Policy Package, which aimed to stimulating the export of automotive products, driving the post-crisis domestic market and strengthening the sector's structure by developing the parts manufacturing industry. The Incentive Program was removed and import duties were lowered by more than half on average. It caused the competition got tougher as local products had to compete with imported ones. This condition pushed the local producer to improve the quality and productivity of their production processes. In

order to attract the development of the local industries, the government offered very low or zero duties for imported material for automotive components. The program had succeeded to increase the competitiveness of local automotive components producer.

Sales of automotive had been increasing significantly since 1999 – 2005, but suddenly in 2006, the sales went down as it reached 319.000 units. At 2006, period, Indonesian government reduced the subsidizes of the fuel, which has caused an increasing of the fuel price. The increasing of the fuel price affected to the increasing of the price of other goods, which eventually decreasing the purchasing power of Indonesian.

### 2.2. Industrial Cluster

Industrial clusters, which Porter (2000:254) defines as "a geographically proximate group of inter-connected companies and associated institutions in a particular field, linked by commonalities and complementarities", have long attracted the attention of researchers and policy makers for the growth prospects they offer small and medium sized enterprises (SMEs).

Clusters matter because geographical agglomeration can potentially help small firms overcome constraints associated with size, promote technological development, and enhance their ability to compete in local and global markets. The gains of clustering include localized external economies, particularly economies of scale and scope as small firms specialize and engage in a division of labour.

Geographical proximity also creates possibilities for local cooperation, between firms and through local institutions. Schmitz (1995) captures these clustering advantages in the concept of collective efficiency, distinguishing between passively acquired benefits that arise from specialized agglomeration-of skills, inputs and knowledge and actively generated gains that accrue from the joint action of clustered actors. Thus, cluster-based producers and workers can be potentially better off than they would be if they were operating in isolation. In addition, clusters are also said to be marked by a strong sense of common social identity. This is often based on shared norms or common notions of community that lie in ethnic, religious, regional or

cultural identities. This can result in local social capital that strengthens cluster ties, fosters trust between local actors and promotes local cooperation and support.

Clusters are also considered particularly relevant to developing countries (Nad. Schmitz, 1999) motivating significant policy initiatives within industrial development gies (see UNIDO, 2001, 2002; UNIDO 1999).The potential networking gains for clustered enterprises has led to the view that clusters offer a specific path of regional industrial and economic development, as well as the possibilities of technical innovation and growth. This has fostered a growing academic literature on Clusters (Markusen, 1996; Malmberg, 1996, 1997; Scott, 1996; Malmberg and 2002).

Industrial clusters can make a potentially important contribution to development of industry. They can promote sustainable employment and incomes and thus better the situation for the working and also they enhance the ability of small firms to compete in global markets. Industrial cluster development has been developed by Porter namely Porter's Diamond. The essence of Porter's (1990) model of competitive advantage is the diamond, viz., one, factor conditions; two, firm strategy, structure and rivalry; three, demand conditions; and four, related and supporting industries. National competitive advantage is achieved when particular industries meet the four ingredients above. Because critical technologies (core competence) drive Porter's competitive clusters, specialization in particular goods and services are the drivers.

In contrast, Best (2002) provided different industrial cluster development model. Best provided idea three factors which drive the Industrial growth from the capabilities and innovation perspective, namely business model, production capability and skills formation. In addition Best argued that techno-diversity was a crucial element of dynamic cluster as it impulse the creation of new technology and new firms on one side, and differentiation and division of the labour on the other side.

Best includes the capacity of a network and institution to drive differentiation and division of labour and new firm creation in his cluster's definition which leads to the amplification of network cohesion. As Best focuses on horizontal integration and reintegration, all firms in cluster must participate innovation. He emphasized the differentiation and division of labour and creation of new firms as central for the long term growth of the clusters.

It can be seen that the critical focus of Best emphasizes more on the business model and production capability to drive differentiation and division of labour while Porter has been on the agglomeration effects of clusters led by a critical mass of firms specializing in a key competency,. Both approaches explain how mature networked regions enjoy synergies but lack focus on how underdeveloped regions can be transformed to such regions. Both approaches do not identify exhaustively the critical pillars government should focus on. They tend to obfuscate the boundaries between firm-level strategies and government policy.

Best connected the concept of geographic cluster and emphasized the necessity of knowledge flow and its diffusion among the economic agent in the clusters.

Piore and Sabel (1984) and Rasiah (1999,2002, 2004) emphasized the significant of the presence of intermediary organizations which coordinated through the operation of the markets, government and trust loyalty. It could strengthened interdependence relationship between economic agents to resolve collective problem and coordinate effectively the allocation and performance of public and private goods provider. Hence, in the cluster, the synergy between buyer and seller offer better result rather than simple interaction between buyer and seller only.

Clusters in this paper is defined as a regionally networked set of economic agents (firms and institutions) that refer to localized systems connecting all critical economic agents necessary to drive learning, innovation and competitiveness. Clusters here are considered to produce the most synergies when all requisite institutions to drive learning, innovation and competitiveness and economic agents are horizontally connected (interdependent interface is important). Clusters can generate an egalitarian network if all participants are effectively networked so that all views are equally embodied in policy formulations. Governments in developing economies tend to accept the former because of the interest on growth not realizing that the effective pursuance of the latter is pertinent for balanced development.

Frontier clusters (high tech clusters in Porter's notion and any dynamic cluster in Best's definition) are characterized by innovation. The focal point of innovation in a dynamic cluster is essentially the interdependent and interactive flow of knowledge and information among people, enterprises and institutions. It must

obviously include coordination between the critical economic and technological agents across value chains who are needed in order to turn an idea into a process, product or service on the market.

Lall (2001) was to assert that economies that failed to develop their technological capabilities become losers in globalization process. Central to the failure of EPZs and industrial estates in developing economies has been the lack of development of an effective enabling environment for technological upgrading, differentiation and division of labour, and new firm and industry creation. Figure 5.1 identifies the critical pillars that drive dynamic clustering.

A strong role by governments is the first central pillar of a dynamic cluster to provide stability (macroeconomic, political and security) and efficient basic infrastructure.

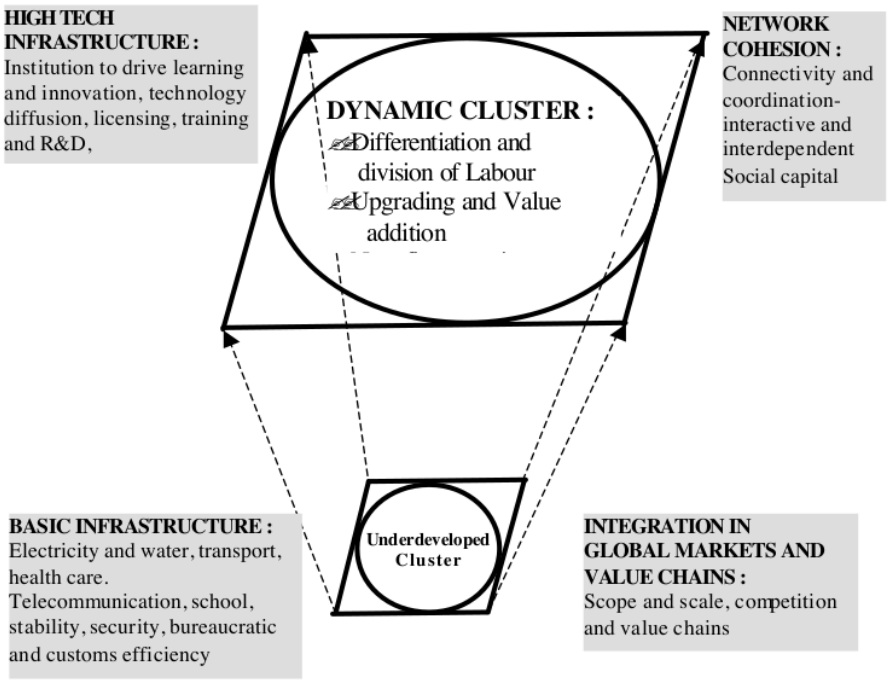
The second is vital for the continuous evolution of technological capabilities in the cluster. It is the environment where the institutions coordinating learning and innovation evolve effectively to stimulate technology acquisition through learning by doing, licensing, adaptation, training, standards appraisal mechanisms, a strong intellectual property right framework to prevent moral hazard problems facing innovators and research and development..

The third requires that the cluster be globally connected - markets and value chains. Global markets provide the economies of scale and scope and the competitive pressure to innovate. Global value chains assist economic agents in the cluster to orientate their strategies to the critical dynamics that determine upgrading and value addition (see Gerrefi 2002; Gerrefi, Humphrey and Sturgeon 2005). Examples of such changes include the introduction of cutting edge just in time and flexible specialization techniques in electronics, and the proliferation of software technology in the use of cad-cam machines and the interface between firms assembly activities and the major markets abroad. In Indonesia for example, Texmaco which is located in an EPZ in the outskirts of Jakarta responded to the changing nature of global value chains in the garment industry by integration assembly, fashion design, packaging and logistics to supply brand-name holders. Lacking in institutional support - both basic and high tech infrastructure - Texmaco

has managed to compete globally despite facing tremendous transactions costs in Indonesia.

The fourth distinguishes a cohesively networked cluster from others defined by truncated operations. Lundvall (1988) expanded the elements of interdependence and interactiveness by articulating the role of producer-user relations in innovation. The nature of interface and coordination between vertically connected economic agents is vital in the horizontal evolution of innovation activities. Connectivity and coordination is critical for knowledge flows - beyond simply codified information that markets can coordinate. Intermediary organizations such as industry-government coordination councils and chambers of commerce play an important role to increase connectivity and coordination in dynamic clusters. The appropriation of knowledge through rubbing off effect as humans employed by the critical economic agents in the cluster meet and interact, and the movement of tacit knowledge embodied in humans to start new firms rises as trust-loyalty (social capital) becomes a critical coordination mode.

Economies that managed to strengthen the four pillars of the systemic quad have managed to sustain several decades of rapid growth and employment absorption, value addition and sustained exports (e.g. Singapore, Taiwan Province of China, Hong Kong, Ireland and Israel). On the other hand, economies that simply focused on providing basic infrastructure, political stability and security at least in EPZs and industrial estates have failed to enjoy sustained growth and employment absorption, value addition, sustained exports (e.g. Brazil, Indonesia and Philippines). Whereas sustained value addition, differentiation and division of labour, and wage increase has helped raise sharply standards of living human development in the successful economies.


HIGH TECH INFRASTRUCTURE : Institution to drive learning and innovation, technology diffusion, licensing, training and R&D,
DYNAMIC CLUSTER :
Differentiation and division of Labour
Upgrading and Value addition
NETWORK COHESION : Connectivity and coordination- interactive and interdependent Social capital
Underdeveloped Cluster
BASIC INFRASTRUCTURE : Electricity and water, transport, health care. Telecommunication, school, stability, security, bureaucratic and customs efficiency
INTEGRATION IN GLOBAL MARKETS AND VALUE CHAINS : Scope and scale, competition and value chains

### 2.3. Technological capabilities at the firm level

Hayami and Ruttan (1972) classified categories of technological capabilities. They rather intended to distinguish between "phase" of international transfer of technology to developing countries than to classify local capabilities. Differences in capabilities in the technology-importing countries were described somewhat incidentally as the correlates of difference in the phases/types of international transfer.

In developing this framework, Hayami and Ruttan envisaged a trajectory of progress (or at least potential progress) running from using given (and imported) technologies through their local reproduction to their adaptation and improvement. It is interesting that this framework of the early 1970 did not trajectory of potential technological learning beyond the level of adaptation and improvement of prototypes that were generated in the advanced technology.

In 1987, Katz with a network of Latin American scholar made the systematic studies of technical and innovation in industrial firms in developing countries. In doing so, they highlighted (a) the importance of several key technological functions in firm, together with (b) ideas about the sequences in which firms built up capabilities in the functional areas. The basic finding was that many firms went beyond simply operating "fixed" technologies that they had acquired from suppliers. They implemented various adaptation and improvement, hence they undertook:"technological search activities with the purpose of generating incremental unit of technical information within the plant".

Dahlman and Westhal (1982) and Dahlman, Ross-Larses and Westphal (1987) emphasized the underlying concept of trajectory of deepening capability that moved from the technology-using production capabilities to innovation capabilities (Dahlman and Westphal, 1982). They developed sequence of capabilities running from production capability, via investment capability to innovation capability.

Amseden (2001) used a framework that was broadly the same as that of Dahlman and Westphal in that it centers on different stages in the industrial project cycle.As With Dahlman and Westphal, Amsden sets these stages within a dynamic perspective that sees firms "building up" capabilities as they move trough time

between the categories; from production function through project execution capabilities to innovation capabilities.

Lall (1987,1992) developed a framework that more clearly distinguished between function and levels of capability. He did so in two steps. First, in his 1987 book on Learning to Industrialize: The acquisition of technological capability by India, he took a significant step forward in emphasizing the importance of distinguishing capabilities in particular technological function such as process engineering, product engineering and project execution. He then also elaborated a set of differences in capabilities within each of these kinds of function

- First, He retained the functional categories as the main columns in his framework though he slightly re-arranged the six categories.
- Second, he identified 'levels' capability much more clearly as the main dimension of difference reflected in the row cutting across these functions. The rows were explicitly ordered in term of a degree of complexity. Running from Basic through Intermediate to Advances, and these categories were associated with types of activity like adaptive duplicative or innovative that were reminiscent of the spectrum of rising capability level outlined earlier by Hatami and Ruttan.
- Third, he also distinguished between stages in the industrial project cycle by associating group of the functions with particular stages; the investment stage consisted of functions (1) and (2), and the production stage included functions (3) – (6.)

Bell and Pavit (1985) modified the Lall framework in order to meet their own particular emphases. They considered making clearer the very basic distinction between capabilities to imitate/use/operate technology and capability to change/create it. They therefore added a Basic Production Capabilities row to the Lall framework. They also incorporated several minor adaptations such as re-arranging some of the functional categories-for example emphasizing the importance capabilities of the facility user (owner-operator) to take decision about and exercise control over the main features of investment projects.

### 3. Methodology and data

The research approach in this study will be primarily based on empirical data. The primary data will be collected through a structured questionnaire survey of automotive firm in Indonesia. The survey was conducted in Jakarta cluster which encompassed Jakarta, Bekasi, Karawang and Purwakarta. 93 firms have responded for the survey, submitting the fulfilled structured questionnaire which was designed to explore deeply the nature of the firms in the cluster. The Jakarta Cluster area covers more than 79 per cent number of automotive industries, and also covers almost 90 per cent of the employment absorbent, production and exports of Indonesian automotive industries respectively (Gaikindo, 2006).

The research applies the quad system cluster development approach to explore the nature of Jakarta automotive clusters. Rajah (2004, 2007) has applied this approach to explain the nature of Electronics Industries in Penang, Johor Bahru, Batam. In addition, the research uses a methodology that measures technological capabilities assigning indexes normalized from related proxies. The use of indexes in examining the technological capability of firms can be traced to Lall (1992), Bell and Pavitt (1995), Westphal *et al*. (19 90), Wignaraja (2002) and Rasiah (2004, 2007). Wignaraja adapted the Ernst *et al*. (1998) taxonomy of capabilities to fit the narrow range of data available to examine upgrading in Mauritius' firms.

The secondary data will be collected from various institution either government institutions such as Ministry of Industry, Ministry of Trade and Statistic Center Agency or non government institutions namely GAIKINDO, GIAMM and HKI etc. Based on primary data, the research will examine proposition which represent the objective of the research.

#### 3.1 Specification of variables

The variables which are used in this paper can be shown in Table 1. The table also contains the components of variables, method of variables measurement and source of data. As mentioned above, the pillars of systemic quad were measured using

data from questionnaire. For example, first pillar of systemic quad namely basic infrastructure was measured by averaging the respond of the firm concerning the quality, availability and delivery of transportation facilities, power, water, telecommunication, health service, basic government service, access to capital, primary school and training institution. More detail can bee seen in table 1.

On the other hand, the research recognizes technological capabilities of the firms as a source of firm level competitiveness, and subsequently technological capabilities were computed by estimating the strength or value of human resource, process technology and R&D activities.

From preliminary calculation, the research no strong correlation between export percentage and export incidence with productivity and log productivity. Therefore the research applied those indicators namely export percentage, export incidence and log productivity as economic performance indicators of Indonesia automotive sector. More detailed concerning variables used for the research can be found as follows.

Table 1. Variables, proxies, Acronym, and measure

| Variabes and proxies | Acronym | Measures |
|---|---|---|
| Productivity | PROD | [Total Output -Total input]/employees |
| Logarithm Productivity | LPROD | Log Productivity |
| Export Percentage | X | Export/Total Sales |
| Export Incidence | EI | Export > 0 ⇙ 1 |
| Basic Infrastructure | BI | 1/9[$TRANS_i$, $POWER_i$, $WATER_i$, $TELCOMM_i$, $HEALTH_i$, $BASICGOV_i$, $CAPTLACCES_i$, $PRIMARYSCHO_i$, $TRAININST_i$] |
| High Technology Infrastructure | HTI | 1/9[$UNIVEDU_i$ $RDSCIENT_i$, $RDINCENT_i$, $RDGRANT_i$, $RDINST_i$, $TESTFAC_i$,$IPR_i$, $ICT_i$,$VENCAP_i$]. |
| Network Cohesion | NC | 1/11 [$RDREL_i$, $FINANREL_i$, $DISTREL_i$, $SUPPLREL_i$, $CUSTREL_i$, $TECHREL_i$, $BUSSREL_i$, $ASSOCREL_i$,$ALLIANREL_i$, $LABORGREL_i$,$ENVORGREL_i$] |
| Global Networking | GN | ¼ *{$ALLIACT_i$, $JITINV_i$, $MRKTRES_i$, $OVSEAPROM_i$] |
| Technological Capabilities | TC | $HR_i + PPT_i + RD_i$. |
| Human resource capabilities | $HR_i$ | 1/3 [TM,TE,CHR] |
| Process and Product Technoloy capabilities | $PPT_i$ | ½[Proc,Prod] |
| Research Development capabilities | $RD_i$. | ½[RDexp,RDemp] |
| Training Mode | TM | |
| Training Expense | TE | % in payroll |
| Cutting edge HR practices | CHR | |
| Process advancement | PROC | |
| Product advancement | PRODUCT | |

| | | |
|---|---|---|
| Foreign Ownership | OWN | |
| Age | AGE | |
| Numbers of Employees | EMP | |
| Wage | WAGE | Payroll/employees |

### 3.1.1. The Systemic Quad pillars

*3.1.1.1 Basic infrastructure*. Basic infrastructure was expected to show a positive relationship with economic performance. BI was calculated using the formula:

$$BI_i=1/9[TRANS_i, POWER_i, WATER_i, TELCOMM_i, HEALTH_i, BASICGOV_i, CAPTLACCES_i, PRIMARYSCHO_i, TRAININST_i]. \quad (1)$$

$TRANS_i$,$POWER_i$,$WATER_i$,$TELCOMM_i$,$HEALTH_i$, $BASICGOV_i$, $CAPTLACCES_i$, $PRIMARYSCHO_i$ and $TRAININST_i$ refer to the quality transport services, power supply, water supply, telecommunication network, public health facilities, basic government institution, access to capital, primary schools and Technical training institutions. Likert scale scores ranging from 1 to 5 (weak to strong) were used to measure above factors. The proxies were normalized using the following formula :

$$\text{Normalization score} = \frac{X_i - X_{min}}{X_{max} - X_{min}} \quad (2)$$

$X_i$, $X_{min}$ and $X_{max}$ refer to the ith, minimum and maximum values of the proxy. Caution must be taken when extreme data appear as result of survey. Also, it sould be aware while interpreting the normalized data since that procedure generate the highest observation of each proxy to one, and lowest one to zero.

*3.1.1.2. High Tech Infrastructure*. High technology infrastructure was expected to show a positive relationship with economic performance. HTI was calculated using the formula:

$$HTI = 1/9[UNIVEDU_i\ RDSCIENT_i, RDINCENT_i, RDGRANT_i, RDINST_i, TESTFAC_i, IPR_i, ICT_i, VENCAP_i]. \quad (3)$$

$UNIVEDU_i$ $RDSCIENT_i$, $RDINCENT_i$, $RDGRANT_i$, $RDINST_i$, $TESTFAC_i$,$IPR_i$, $ICT_i$ and $VENCAP_i$ refer to the quality of University education, R&D scientists and engineers Incentives for R&D activities R&D grants R&D institutions Testing and

quality evaluation facilities IPR governance Quality of ICT services. Likert scale scores ranging from 1 to 5 (weak to strong) were used to measure above factors. The proxies were normalized using the above formula.

*3.1.1.3. Network Cohesion*. Network Cohesion was expected to show a positive relationship with economic performance. NC was calculated using the formula:

$$NC = 1/11\ [RDREL_i, FINANREL_i, DISTREL_i, SUPPLREL_i, CUSTREL_i, TECHREL_i, BUSSREL_i, ASSOCREL_i, ALLIANREL_i, LABORGREL_i, ENVORGREL_i] \quad (4)$$

$RDREL_i$, $FINANREL_i$, $DISTREL_i$, $SUPPLREL_i$, $CUSTREL_i$, $TECHREL_i$, $BUSSREL_i$, $ASSOCREL_i$, $ALLIANREL_i$, $LABORGREL_i$ and $ENVORGREL_i$ refer to R&D organizations (labs, Universities), financial services institutions (bank,etc), distributors, supplier of materials and components, sustomer / end user, technical service providers, business service providers, relationship in industry associations, strength of strategic alliances, labour organizations (including unions) and environment organizations (inc. NGOs). Likert scale scores ranging from 1 to 5 (weak to strong) were used to measure above fictors. The proxies were normalized using the above formula.

*3.1.1.4. Global Networking*. Global Network was expected to show a positive relationship with economic performance. GN was calculated using the formula:

$$GN = ¼ *\{ALLIACT_i, JITINV_i, MRKTRES_i, OVSEAPROM_i] \quad (5)$$

$ALLIACT_i$, $JITINV_i$, $MRKTRES_i$ and $OVSEAPROM_i$ refer to number of foreign alliances activities, Just In Time involvement, market research activities, overseas and promotion intensty, respectively, of firm i. $ALLIACT_i$ was computed as number of foreign alliances activities in the fields of marketing, production and R&D. $ALLIACT_i$ is zero if no activities of strategic alliances, and is three if the alliaces conduct all three activities. JITINVi was measure whether the firm involved in JIT

chain (JITINVi = 1 zero if the firm involved, JITNVi = 0 otherwise). $MRKTRES_i$ and $OVSEAPROM_i$ were measured as the intensity of market research and overseas promotion activities conducted by the firm. Likert scale scores ranging from 1 to 5 (never to frequently) were used to measure two factors above.

### 3.1.2. Firm Level Technological capabilities

The overall Technological Capabilities (TC) was measured by averaging the variables of HR (technology embodied in humans), PPT (technology embodied in machinery and equipment and intangible processes) and RD (technology development focus embodied in products, processes and humans). TC was measured as:

$$TC = HR_i + PPT_i + RD_i. \quad (6)$$

The use of TC will help in the estimation of differences in overall technological cpabilities between foreign and local firms, and in establishing its impact on export incidence. TC is expected to show strong and positive relationship with export percentage, exprt incidence and log productivity.

3.1.2.1. *Human Resource capability*. Human Resource (HR) capability was measured as:

$$HRi = 1/3[TMi, TEi, CHRi] \quad (7)$$

where TM, TE and CHR refer to training mode, training expense as a share of payroll and cutting-edge human resource practices used. TM was measured as a multinomial logistic variable of 1 when staff are sent out to external organisations for training, 2 when external staff are used to train employees, 3 when staff with training responsibilities are on payroll, 4 when a separate training department is used, 5 when a separate training centre is used and 0 when no formal training is undertaken. CHR was measured by a score of one for each of the practices and divided by the total number of practices. The firms were asked if it was their policy to encourage team-working, small group activities to improve company performance, multi-skilling, interaction with marketing, customer service and R&D department, life-long learning

and upward mobility. The proxies were normalized using equation (2) .

*3.1.2.2. Process and Product Technology capability.* Data on three proxies facilitated the computation of PT, which was calculated using the formula:

$$PT = 1/3[EMi, ITCi, QCi] \quad (8)$$

where EM, ITC and QC refer to equipment and machinery, information technology components and quality control instruments. EM was computed as multinomial logistic variables with an average age of over five years = 0, 3–5 years = 1, two to less than three years = 2 and less than two years = 3. Likert scale scores ranging from 1–5 (least to strong) was used to measure ITC. QC was measured as a multinomial logistic variable (QC = 2 if cutting-edge methods were used, QC = 1 if older quality control methods were used and QC = 0 if no quality control methods were used).

*3.1.2.3. R&D capability.* The learning process leads firms to eventually participate in new product development. While beginners mostly learn and absorb, more established firms typically learn and develop new products. With the exception of funding of public labs and universities, firms seldom participate in basic research. Hence, firm-level R&D is largely focused on process technology and product development – especially diversification of use and proliferation. Given its underdeveloped institutional and systemic facilities and the preponderance of labour-intensive assembly and processing operations, R&D is unlikely to produce statistically meaningful results involving exports and human resource. The data collected enabled the computation of two R&D proxies, viz., R&D expenditure as a percentage of sales and R&D personnel as a share of employment. Because of the inability to differentiate R&D personnel involved between product and process technology, this proxy was measured to relate to both product and process R&D and was measured as:

$$RDi = 1/2[Rdexpi, Rdempi] \quad (9)$$

where RDexp and RDemp refer to percentage share of R&D expenditure as a share of sales and R&D personnel in the workforce, respectively, of firm i.

3.1.3. **Economic Performance**

Three alternatives proxies were used to represent the economic performance indicators such as Export Percentage, Export Incidence, Productivity and Log Productivity. The export percentage represents the ability of the firm to compete in global market. Export incidence represents the performance of the firm introducing itself to the gobal market, especially for the local firms which have no strong foreign partnership. Firm's productivity represents the ability of the firm to operate in an efficient way to produce the profit. Since many factors involved in export and productivity indicators, no strong relationship between those indicators exist.

#### 3.1.3.1. Export Percentage

Exported percentage was measured by following formula

$$\text{Experct} = \frac{Exportsales}{TotalSales} \qquad (10)$$

#### 3.1.3.2. Export Incidence

Export incidence was calculated as

Xi= 1 if the firm has export experience; Xi=0 if otherwise (11)

#### 3.1.2.3. Productivity

$$\text{Productivity} = \frac{Valueadded}{employeenumbers} ? \frac{Totaloutput ? totalinput}{employeenumbers} \qquad (12)$$

3.1.3.4. Log Productivity

Log Productivity = Log Producivity (13)

### 3.1.4. Other critical firm level variables

#### 3.1.4.1. Ownership.

Some scholar found that foreign ownership have proved their superior performance in various indicators. But there is also finding that no differences in term of economic of foreign ompany compare to local one. Ownership was measured as :

OWNi = 1 if foreign equity ownership of the firm i was above 50%,
OWN = 0 otherwise. (14)

#### 3.1.3.2. Age.

Firm which has longer experience in operating the facilities were considered enjoy longer experience and tacit knowledge. However, new firms in particular country do not represent zero experience in operating the facilities, since in other country especially foreign firm may had experienced similar facilities. The absolute of the firm is used as an independence variable and since the survey using 2006 data, then the measurement use below formula.

Ai = years in operation of firm i, = (2006-year of establish of firm i) (15)

#### 3.1.3.3. Number of Employee,

As economist recognizes the minimum scale economic, some scholars convinced that the larger number of employee, the better, the performance of the firm. In this paper number of employee was used.

$EMP_i$ = number of employee of firm i (16)

**3.1. 3.4. Wage.** Wage can be used as the benefit received by society. For instance, Average annually salary were used and were measured as

$WAGE_i = P/Empl$ (17)

Where W, P and Empl refer to annual wages per worker, annual payroll and number of employees respectively of firm i..

### 3.2. Statistical Model

The following basic model was specified to estimate the statistical determinants of export percentage. Due to no strong correlation between export and productivity, this paper will also examine the statistical influence above variables on productivity. As the mean value of firm's productivity is 261.39 millions which is much bigger the value of economic performance, This paper uses log productivity to represent alternative economic performance to avoid bias result.

OLS regression was used to explain the correlation between log productivity and independents variables. But for examining the correlation between Export intensity (X), Export Incidence (EI) and independent variables, this paper preferred Tobit and Logit regression respectively as some of dependent variable of the model has zero value and also binary value.

$LPROD = \beta_0 + \beta_1 BI + \beta_2 HTI + \beta_3 NC + \beta_4 GN + \beta_5 TC + \beta_6 AGE + \beta_7 EMP + \varepsilon$ (18)

Tobit $X = \beta_0 + \beta_1 BI + \beta_2 HTI + \beta_3 NC + \beta_4 GN + \beta_5 TC + \beta_6 AGE + \beta_7 EMP + \varepsilon$ (19)

Logit $EI = \beta_0 + \beta_1 BI + \beta_2 HTI + \beta_3 NC + \beta_4 GN + \beta_5 TC + \beta_6 AGE + \beta_7 EMP + \varepsilon$ (20)

Tobit : $TC = \beta_0 + \beta_1 BI + \beta_2 HTI + \beta_3 NC + \beta_4 GN + \beta_5 AGE + \beta_6 EMP + \varepsilon$ (21)

All the regression models above were repeated using foreign and local firms sample separately.

## 4. Statistical Analysis

At the beginning, this section compares the nature of foreign and local firms. Following by the comparison between foreign and local firms for their economic performance. Thereafter comparison of the quad system pillars of foreign and local firm's pillars then examined. The paper examined the pillars in quad system. Finally, this paper will examine the influence of quad system pillar on economic performance.

### 4.1. Statistical Differences

#### 4.1.1. The Quad system and technological capability

Two-tail *t* statistics were used to examine the statistical significance of The Quad system pillars of Indonesian automotive firms and technological capability.

Table 2. Two-tail test of The Quad system pillars, Foreign and local firms, 2006

| | All | Foreign | Local | t |
|---|---|---|---|---|
| Basic Infrastructure | 2.36 | 2.35 | 2.37 | -0.35 |
| High Tech Infrastructure | 2.23 | 2.25 | 2.18 | 1.79*** |
| Network Cohesion | 3.48 | 3.56 | 3.34 | 5.43* |
| Global Networking | 0.62 | 0.71 | 0.48 | 5.73* |
| **TC** | 1.07 | 1.07 | 1.07 | -0.08 |
| N | 93 | 58 | 35 | |

Significance level of *1%,**5% and 10%.

Source : Survey Indonesia Automotive firms 2006, computed by SPSS 11.50

As expected, the superior of the foreign firms are strongly reflected in Network Cohesion and Global Networking. Moreover, the foreign firms also experiencing slight better high tech infrastructure (see table 2). On the other hand, the mean of basic infrastructure and its technological capability of local firms are similar to the foreign one.

4.1.2. Economic performance

Statistical differences between foreign and local firms in economic performance, namely export percentage and productivity are analyzed using two-tail t-tests of means.

Table3. Two-tail test of economic performance, Foreign and local firms, 2006

| | All | Foreign | Local | t |
|---|---|---|---|---|
| Export percentage | 0.1916 | .2252 | .1360 | 1.762*** |
| Export incidence | 0.8280 | 0.9828 | 0.5714 | 5.931* |
| Productivity (millions Rupiah) | 338.817 | 385.862 | 260.857 | 1.840* |
| Log Productivity | 8.36 | 8.45 | 8.21 | 2.81* |
| N | 93 | 58 | 35 | |

Significance level of *1%,**5% and 10%.

Source : Survey Indonesia Automotive firms 2006, computed by SPSS 11.50

As expected, foreign firms enjoying significant superior economic performance compare to local firms except for export percentage which has only slight better economic performance.

4.1.3. Other critical variables.

Two-tail *t* statistics were used to examine the statistical significance of difference of Age, Numbers of employee, Wage and Percentage of payroll, between foreign and local firms,

Table 4 Two-tail test of Age, Numbers of employee, Wage and Percentage of payroll, Foreign and local firms, 2006

| | All | Foreign | Local | t |
|---|---|---|---|---|
| Age | 19.3011 | 18.9138 | 19.9429 | -.509 |
| Numbers of Employee | 755.9677 | 894.7586 | 525.9714 | 1.717*** |
| Wage | 28,875,850 | 32,457,693 | 22,940,225 | 2.215** |

| | | | | |
|---|---|---|---|---|
| Percentage of Payroll | 0.0587 | .0554 | .0642 | -1.020* |
| N | 93 | 58 | 35 | |

Significance level of *1%,**5% and 10%.

Source : Survey Indonesia Automotive firms 2006, computed by SPSS 11.50

It is interesting, that the mean of local firm's age are older than foreign one, but the number of employee of foreign firms are greater than local one. It implies that the foreign firms have been developed better than local one.

The employee of foreign firms enjoying higher wage than local one, even the percentage of its payroll is lower than local one. The local firm provided relative higher percentage of payroll, but actually provide lower wage to their employee. Again, it shows the superiority of foreign firms in managing the firms.

## 4.2. Statistical Relationship

### 4.2.1. Statistical relationship between economic performance and The Quad system Pillars

Table 5 Statistical relationship involving economic performance, The Quad system pillars, technological capability and others critical variables

| | Export percentage | | | Export incidence | | | Log Productivity | | |
|---|---|---|---|---|---|---|---|---|---|
| | All | Foreign | Local | All | Foreign | Local | All | Foreign | Local |
| Constant | -0.760 (-3.873)* | 0.109 (0.411) | -1.862 (-5.967)* | -13.912 (-2.10)** | 0.649 (5.594)* | -1.976 (-4.441)* | 7.826 (32.30)* | 8.157 (23.52)* | 7.314 (14.897)* |
| BI | 0.130 (1.104) | 0.109 (0.779) | 0.366 (2.652)* | 3.856 (1.434) | -0.011 (-.184) | 0.531 (2.025)** | -0.001 (-0.009) | -0.076 (-0.414) | -0.020 (-0.065) |
| HTI | 0.551 (2.337)* | 0.237 (0.839) | 1.368 (3.955)* | 15.229 (1.917)** | 0.054 (0.436) | 2.634 (4.648)* | -0.290 (-0.881) | -0.591 (-1.608) | 0.149 (0.207) |
| NC | 0.254 (1.419) | -0.028 (-.121) | 0.447 (1.596) | 9.739 (1.589) | 0.053 (0.513) | -0.433 (-0.707) | 0.542 (2.13)** | 0.336 (1.077) | -0.627 (-0.790) |
| GN | 0.405 (2.157)* | -.222 (-.816) | 0.702 (2.218)** | 5.863 (2.107)** | 0.336 (2.823)* | 1.258 (2.700)* | 0.370 (1.560) | 0.292 (0.819) | -0.395 (-0.728) |
| TC | 0.887 (2.258)* | 0.547 (1.148) | 1.497 (2.427)** | 6.678 (0.857) | 0.3554 (1.692)*** | 1.275 (1.010) | 0.282 (0.505) | 0.655 (1.046) | 1.763 (1.036) |
| AGE | -0.001 | -0.003 | 0.003 | -0.012 | -0.002 | 0.002 | 0.009 | 0.002 | 0.029 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | (-0.357) | (-.853) | (0.881) | (-0.198) | (-1.408) | (0.246) | (1.975)*** | (0.383) | (3.136)* |
| EMP | -0.00005 | -.00004 | -.00005 | -.0001 | -.00003 | .0002 | -.00006 | -0.00004 | -.00007 |
| | (-1.613) | (-.516) | (0.899) | (-.867) | (-1.657) | (1.288) | (-1.137) | (-0.763) | (-0.370) |
| N | 93 | 58 | 35 | 93 | 58 | 35 | 93 | 58 | 35 |

Significance level of *1%,**5%

Source : Survey Indonesian Automotive firms 2006, computed by Eviews 5.0

This section examinees the statistical relationship involving economic performance and the quad system pillars. All the regression has passed the Whitney test for heteroskedacity, and the model fit (chi-square statistics) was also statistically significant. The result generally does not against the expectation.

For all firms, the export percentage is influenced significantly by high tech infrastructure, global networking and technological capabilities. But interestingly, there is no independent variable either from pillars in quad system and technological capabilities have influenced the export percentage of the foreign firms only. But on the other hand, for local firms, some variables such as basic infrastructure and high technology infrastructure have significant impact to the export percentage. followed by High technology and Global Networking pillars which show relative moderate influence on export percentage. The above condition shows that factors which influenced export percentage are different for foreign and local firms.

In terms of Export incidence, only two variables such as high technology infrastructure and global networking have moderate impact for all firms. For foreign firms, Global networking and technological capabilities has significant and moderate impact respectively on the export incidence. On the other hand, high technology infrastructure and global networking have significan influence in local firms. It is in line with what we expect that for local firms more rely on the advancement in high tech infrutrusture.

Due to the value of the productivity of the firms which has relatively much bigger than the value of the independent variables, which probably present bias result, this paper prefer to use log productivity rather than productivity to represent alternative economic performance. The result shows that the log productivity slightly influenced by network cohesion, and followed by age. It implies in Indonesia

automotive firms the longer operation of the firms the bigger growth of the productivity. This condition was significantly proved especially for local firms.

Table 6 Statistical relationship involving technological capability, The Quad system pillars, and others critical variables

| | TC (Tobit) | | |
|---|---|---|---|
| | All | Foreign | Local |
| Constant | 0.228<br>(5.974)* | 0.206<br>(3.052)* | 0.201<br>(5.737) |
| BI | 0.004<br>(0.129) | 0.028<br>(0.726) | -0.013<br>(-0.426) |
| HTI | 0.091<br>(1.508) | 0.141<br>(1.89)*** | 0.096<br>(1.378) |
| NC | 0.050<br>(1.057) | 0.133<br>(2.123)** | 0.245<br>(3.662)* |
| GN | 0.073<br>(1.684)*** | -0.002<br>(-0.02) | 0.218<br>5.562)* |
| AGE | 0.0002<br>(0.243) | -0.001<br>(-0.459) | -0.001<br>(-1.616) |
| EMP | .00003<br>(3.083)* | 0.0005<br>(3.048)* | -.000008<br>(-0.437) |
| N | 93 | | |

Significance level of *1%,**5%

Source : Survey Indonesian Automotive firms 2006, computed by Eviews 5.0

4.2.2 Statistical relationship between the other critical variables

Age has strong positive relationship number of employment and also it has slight positive relationship with productivity. The result provides expected relationship. Firms with longer operation time shows its development, and also the firms expected present tacit knowledge from its experience therefore could perform better productivity. But since, the age has negative relationship with percentage, it means older company provide smaller portion of its expenses for payroll.

Foreign firms provided better wage to the employee, and enjoying higher export incidence. Beside, foreign firms also have slight correlation with the number of employee, expert percentage and productivity.

Firms which have greater number of employee are able to perform higher productivity and provide greater wage to its employee compare to smaller one. I also support the nature of the industry which requires big company to achieve economic production scale.

Firms which perform better productivity are able to provide greater wage to its employee, but it is interesting that even they pay better wage to employee but its payroll decreasing. It proves that better productivity, they can also get bigger margin. It is in line with the characteristic of industry.

Bigger the wage, the firms give to their employee, the smaller portion the payroll of the firms. In This case we have to be careful, since this condition does not stand alone.

Table 6 Correlation matrix of other variables

| | AGE | EMPL | XPERCT | PROD | WAGE | PERCPAYR | XINC |
|---|---|---|---|---|---|---|---|
| AGE | 1 | | | | | | |
| EMPL | .309(*) | 1 | | | | | |
| XPERCT | -.039 | -.041 | 1 | | | | |
| PROD | .207(**) | .295(*) | -.135 | 1 | | | |
| WAGE | .139 | .285(*) | -.149 | .944(*) | 1 | | |
| PERCPAYR | -.303(*) | -.153 | 096 | -.388(*) | -.276(*) | 1 | |
| XINC | .002 | 116 | .367(*) | .151 | .154 | -.232(*) | 1 |

Significance level of *1%,**5% and ***10%.

Source : Survey Indonesian Automotive firms 2006, computed by Eviews 5.0

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## 5. Conclusion

Foreign firms in Automotive sector Indonesia enjoying significant superiority in various area such as network cohesion and global networking. Also they present moderate better infrastructure. Those superiorities tend to influence the superiority of foreign firms to the local firms in various economic performance indicators.

Foreign firms also have greater number of employee and an ability to provide better wage for their employee. But surprisingly, they could achieve the performance with lower percentage of the payroll to the sales. Especially for local firms, their export percentage mainly influenced by high tech infrastructure. Interestingly for export incidence, global networking presents strong influence constantly for foreign firms as well as local firms.

It proves that global networking and technological capabilities have the most influence to economic performance than other variables. But in export incidence global networking has more influences rather than firm level competitiveness.

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# Firm Level Competitiveness or MNC Networking? The Source of Indonesian Automotives Sector's Performance

ORIGINALITY REPORT

| 23% | 21% | 13% | 7% |
|---|---|---|---|
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