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THE IMPACT OF SUPPORTING INDUSTRIES ON ELECTRONIC INDUSTRY: THE CASE OF VIETNAM ENTERPRISE SURVEY

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Abstract:

This paper used the Vietnamese enterprise survey and GMM method to estimate the impact of supporting industries on eclectronic industry. The results show that, supporting industry development is one of the important factors affecting the development and promoting the competitiveness of the Vietnamese electronics industry. The findings of study suggest that, it is necessary to promote the development of supporting industries through the formulation and completion of policies on science and technology; It is also necessary to have policies to attract experts from countries with development support industries to Vietnam to advise, train and improve the level of science and technology and the quality of human resources.

JEL Classification Code: E44, F31, F37, G15

1. Introduction:

Electronic industry is one of the fast-growing sectors in East Asia, creating a strong production network in the region as well as the entire world with many giant electronic groups. In Vietnam, the industry is also experiencing rapid development, making considerable contributions to the export value of electronic sector in particular and export turnover of the country in general. Vietnam's exports of electronic products and components increased by nearly

36.5% in 2015 and 21.5% in 2016. The development of supporting industries is of great significance in promoting the development of domestic electronic industry as it provides intermediate commodities for the production of electronic industry products, thereby reducing production costs, raising competitiveness and added values of the electronic industry in the economy.

According to the Ministry of Industry and Trade (2018), the number of supporting industry(SI) enterprises in Vietnam is still at a low rate, the whole country has only about 2,000 domestic SI enterprises, of which about 300 enterprises are participating in multinational coorperations, but it is still difficult to look for the source of the production chain. According to statistics of Supporting Industry EnterpriseDevelopment Center (SIDEC) (2017),there were about 610 enterprises which produced electrical - electronic components and the average growth in the number of enterprises in the period 2011-2016 reached at 13.66%,developing rapidly, the proportion of enterprises producing components/total electronics enterprises accounted for about 53.28%.In theory, if a manufacturing industry develops,the number of enterprises supplying components and spare parts must be much higher than the number of enterprises that assembles, so the proportion of enterprises producing electronics components made up just over half of the total number of enterprises in the whole industry. It can be seen that the Vietnamese electronic industry has not really developed yet.

2. Literature review:

Supporting industries:

The term ‘supporting industries’ has been widely used across the globe, especially popularly in East Asian countries such as Japan, South Korea, ASEAN nations, etc. However, the scale of supporting industries is quite open and there has not yet a widely-accepted definition.

In their broad senses, supporting industries consist of all industries that provide inputs for industrial production in general, including the raw materials, components, spare parts and related services in serve for the production process of intermediate commodities and finished products (Kyoshiro, 2004;Hoang, 2014;Ryuichiro, 2018;Junichi, 2005).

In more narrow senses, supporting industries are associated with providing materials, components, spare parts and devices to certain industries (Nham, 2016;Nham, P.T., 2010;Truong, 2010;Hoang, 2010;Nguyen, 2007;Ratana, 1999).Access to definitions of supporting industries in a broad or narrow sense depends on the research objectives in different research projects. However, in general, there is not a unified definition of supporting industries in previous studies; This causes many difficulties in assessing the current status of supporting industry development; as well as quantifying its impacts on the development of major industries.

In the scope of this study,to assess the impact of supporting industries on enhancing the competitiveness of major electronics industries, supporting industries are understood in narrow senses; accordingly, supporting industries are industries that produce fundamental materials, components, spare parts, semi-products to supply to assembly industries such as automobiles, motorbikes, electricity, electronics, etc. In particular, products of supporting industries to assembly industry include basic materials such as plastic, rubber, metal; components such as plastic – rubber components, metal components, electric components (like pin, batteries, wire), electronic components, etc.

Supporting industries to electronic sector:

Electronic supporting industry are industries that produce fundamental materials, components, spare parts, semi-products to supply to electronic sector.

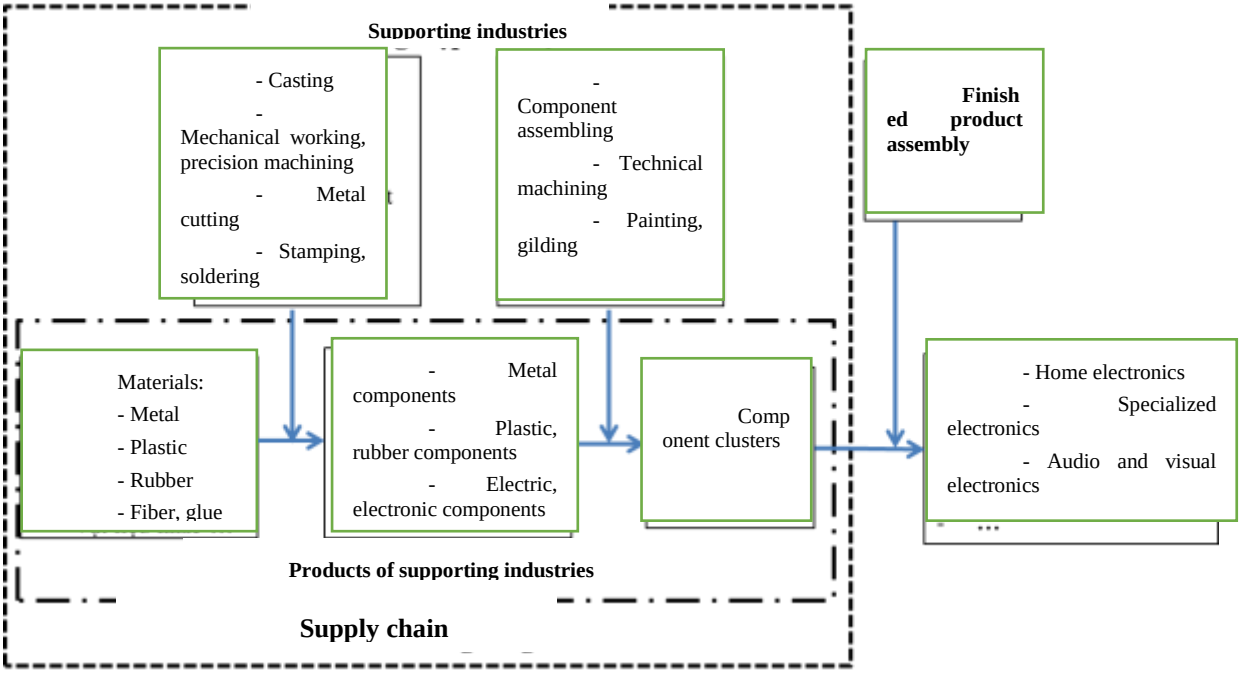

Figure 1: Scope of electronic supporting industry

Source: Authors' proposal

According to the research of Hoang(2010), supporting industries have 4 main features as follows:Firstly, multi-level. Enterprises participating in supporting industries lie in different positions of the value chain to create the final products. Secondly, links in production procedures, regions and dependence on the main industries. Thirdly, diversity in technology and production levels. Fourthly, attracting a large number of enterprises, especially small and medium ones.

Besides, given the distinctive features of electronic industry, besides the general features of supporting industries, electronic supporting industry has the additional typical features as follows:

Firstly, the life cycle of electronic products is short, especially in home electronics, audio-visual electronics, etc., products are highly fashionable and replacable, so demand for products in electronic supporting industry changes rapidly.

Secondly, production of electronic supporting industry depends largely on the development of science and technology, especially in electronic component production. Electronic products are constructed by components with high level of precision as a minor defect in components may largely affect the functions of the final products. Therefore, on the one hand, production in electronic supporting industry requires the application of advanced technology; on the other hand, it requires high labor skills of manual production, maintenance and repaires of tools (such as casting and pressing) so as to cut costs and shorten time for contracts.

Thirdly, in the production of electronic components and parts, components can be categorized into two groups: (i) small components, such as chip boards, semi conductors,

electronic chips, circuit boards, consume fewer materials, integrate high technology and can be transported from production places to assembly factories all over the world; (ii) and big machine components, such as covers of washing machines, covers TV, plastic components in TV, plastic boxes in fridges, carton packages, etc., consume more materials, storage, basic technical standards and can be produced or outsourced right in the countries with assemly plants or countries of consumption.

Supporting industry and Competitiveness:

This research approach the concept of competitiveness under the view of MichaelPorter (2012), accordingly, competitiveness is factors that create wealth and increase economic efficiency. As such, competitiveness under Porter's approach has close link with productivity, where productivity is measured by added values created by one unit of labor (or one unit of capital) in a unit of time.

According to Michael (2012), there are 4 characteristics of a country that shape a competitive environment for domestic enterprise that encourage or discourage the establishment of competitiveness; they are: (i) Factors of production; (ii) Factors of demand; (iii) supporting industries and related industries; and (iv) corporate strategies, domestic structure and competition. As such, supporting industries are one of the four core factors that creat competitiveness of a country or industry/enterprise. To electronic industry, supporting industries create competitive advantages thanks to the constant collaboration in machines and input elements. Owing to the availability of inputs provided by supporting industries, one industry can make profits effective, rapidly and gain advantages.

The roles of supporting industry in raising competitiveness of the electronic industry:

Table 1: Summary of roles of supporting industries with enhancing the competitiveness of the electronics industry

	The direction of impact	
	Cut production costs; create stable supplies of inputs with high quality	Michael, 2012; Le (2021); Taguchi, Pham (2019)
	The development of supporting industries facilitates technology transfer	Michael, 2012; Le (2021)
	The development of supporting industries lays the foundation for organizational reforms	Ha, Antonio, & Ming, 2013; Michael, 2012; Le (2021)
	The development of supporting industries attracts and draws investment flow, especially FDI.	Junichi, 2005; Le (2021), Wang (2016)

Source: synthesis of the authors

Firstly, the development of supporting industries will help to cut production costs as it can raise the rate of domesticalization and help FDI-invested assembly plants to expand their production; create stable supplies of inputs with high quality, thereby ensuring enterprises of the capacity to deliver products to enterprises in electronic sector.

Secondly, the development of supporting industries facilitates technology transfer. One characteristic of electronics supporting industry is it depends largely on the development of science and technology, especially in the production of electronic components and spare parts, so a developed supporting industry will boost technology transfer and fast applications of modern technology in the production of electronic products. Besides, experiences in production management, human resource training can also be learned along the process of production and business cooperation with giant economic groups and foreign investors.

Thirdly, the development of supporting industries lays the foundation for organizational reforms. According to Ha, Antonio & Ming(2013), productivity growth in the past two decades have been driven not only by technological innovations but alo organizational changes, which mostly stem from industrial production sectors. Supporting industries promote reforms and innovations via close relationships between suppliers of supporting products and producers of electronic products (Michael, 2012).

Fourthly, the development of supporting industries attracts and draws investment flow, especially FDI. The concentration of component industry attracts foreign assemblers. A country with competitive supporting industries can maintain FDI capital for assembly industry for longer than a country without competitive supporting industries (Junichi, 2005). Therefore, a developed supporting industry will help the main electronic industry to develop more rapidly and sustainably.

So, supporting industries are both direct and indirect driving force to create added values to electronic industry, raising the competitiveness of electronic products and accelerate the industrialization and modernization process. Supporting industries are foundations and backgrounds for electronic industry to develop more strongly. The quality of final products of electronic industry depends on the quality of components and spare parts provided by supporting industry; therefore, if supporting industries do not develop well, the main electronic industry will lack competitiveness and its development will slow down.

3. Methodology:

3.1. Model specification:

To generally analyze the development of the electronics industry, the author uses qualitative research methods such as statistical synthesis, comparative analysis, inference method, in combination with tables and graphs, to clarify the evolution in development and limitations that exist in the electronics supporting industry and to make judgments about opportunities and challenges in the context of industrial revolution 4.0.

To analyse the impacts of supporting industry development on the improved competitiveness of electronic industry amid the fourth industrial revolution, the study uses production equation of Cobb-douglas and supplements some independent variables reflecting the development of electronic supporting industry: revenue of electronic component production industry (industry code: 26100,according to Vietnam Standard Industrial Classification System 2018) and revenue of other supporting industries. The independent variable of the equation showing the productivity of electronic industry is the industry revenue by labor and capital.

As the revenues of final-product industry and intermediate-product industry have close two-way relationships, to avoid the endogenous variables, the study builds up regression model using business-level data for dependent variables (revenue of electronic industry) and province-

level aggregate data for independent variables (such as revenues of electronic component industry and revenues of other supporting industries).

Besides, to improve the appropriateness of the model, the study supplements some control variables such as variables reflecting market scale (shown by provincial GDP, exports), variables reflecting institution environment and policies (shown by Provincial Competitive Index PCI), variables reflecting labor quality (shown by components indexes of labor training in PCI), variables reflecting characteristics of enterprises (labor, capital, business scale, etc.).

Based on the overal research and factors affecting the electronics industry, the author builds the model to evaluate the impacts of supporting industries on the development of electronic industry is formulated as follows:

$$\begin{aligned}\text{lnrevComponent}_{it} &= c + \alpha_1 \text{lncapital\_EComponent}_{it} + \alpha_2 \text{lkl}_{it} + \alpha_3 \text{tfp}_{it} + \alpha_4 \text{FDIshare}_{it} + \alpha_5 \text{hhi}_{it} \\ &+ \alpha_6 \text{lnrevenueEI\_provin}_{it} + \alpha_7 \text{lnreotherSI\_prov}_{it} + \alpha_8 \text{pci}_{it} + \alpha_9 \text{open}_{it} + e_{it}\end{aligned}$$

Where: $e_{it} = c_i + v_{it}$, c_i is the residual variating according to i (variating to province/enterprises), v_{it} is the residual variating according to i and t (variating to both province/enterprises and time).

3.2. Data collection:

To analyze the real development of Vietnam's electronic industry, this study employs secondary data from Comtrade.org, General Statistics Office, Centre for Developing Supporting industries – Ministry of Industry and Trade (SIDEC).

Explanation for variables:

Variable	**Explanation**	Sources
Lnrev Component		Vietnam Enterprises Survey, GSO
lncapital_E Component		Vietnam Enterprises Survey, GSO
Lkl	Logarithm of (Capita/labor)	Vietnam Enterprises Survey, GSO
Tfp	Total factor productivity	Vietnam Enterprises Survey, GSO
FDI share	FDI capital/total capital	Vietnam Enterprises Survey, GSO
Hhi	Herfindahl-Hirschman Index	Vietnam Enterprises Survey, GSO
lnrevenueEI_provin	Logarithm of electronic component revenue by provinces	Vietnam Enterprises Survey, GSO
lnreotherSI_prov	Logarithm of revenue of other supporting products by provinces	Vietnam Enterprises Survey, GSO
Pci	The Provincial Competitiveness Index	VCCI
Open	Dummy variable of enterprises with/without	Vietnam Enterprises

	imports-exports	Survey, GSO

To quantify the impacts of supporting industries on electronic industry, the study uses the set of data from Vietnam Enterprises Survey (General Statistics Office) for the 2010 – 2018 period. This is a survey conducted annually by the General Statistics Office with surveyed subjects including businesses, cooperatives, and establishments affiliated to enterprises that are subject to the survey within the nationwide, operating in all sectors specified in the Vietnamese economic system (VSIC). However, according to each period, the purpose of the survey may change, leading to the adjustment of information and data from year to year. In the scope of this article, the authors only focus on the period 2010 - 2018, to ensure the consistency in the product sub-sector and ensure that the control variables in the model are fully statistic over the years.

Codes of sectors used in regression model

No.	Codes of sectors	Names of sectors
1	26	Production of electronic, computing and optic products
2	26100	Production of electronic components
3	17021	Production of paper and carton packaging
4	22120	Production of other products from rubber
5	22201	Production of packaging from plastic
6	22209	Production of other products from plastic
7	25110	Production of metal elements
8	25910	Forging, stamping, pressing, rolling of metals
9	25920	Mechanical machining, processing and coating of metals
10	27200	Production of pins and batteries
11	27310	Production of optic fiber and cable
12	27320	Production of cables, electric and electronic wire

Source: collected by authors

3.3. Calculatoion TFP:

The semi-parametric approach proposed by James Levinsohn and Amil Petrin (2003), developed based on Olley - Pakes technique (1996) will be use to calculate TFP for firms in Vietnam's eclectronic industry.

Consider the following equation :

$$y_{it}^{j} = \alpha + \beta_l l_{it}^{j} + \beta_m m_{it}^{j} + \beta_k k_{it}^{j} + \omega_{it}^{j} + \varepsilon_{it}^{j} \quad (2)$$

Where y_{it}^{j} is output, l_{it}^{j} is labor, m_{it}^{j} intermediate inputs (raw materials), k_{it}^{j} is capital. Error term ω_{it}^{j} and ε_{it}^{j} are a standard, uniform, and independent distribution component.

The term of ω_{it}^{j} is not observable, but the plant manager knows and it influences the plant's decision rules. The term of ε_{it}^{j} has no effect on plant decisions, denoting unpredictable shocks with a zero average on performance after input is selected.

The indices i, j and t indicate firm i, industry j and year t, respectively.

Levison – Petrin (2003) show thay TFP in equation (2) is defined as: $TFP_{it} = \omega_{it} + \varepsilon_{it}$.

So,

$$TFP_{it} = y_{it} - \hat{\beta}_l l_{it} - \hat{\beta}_m m_{it} - \hat{\beta}_k k_{it}$$

In this paper we estimate TFP based on semi-parametric approach (Vincenzo Mollisi and Gabriele Rovigatti, 2017) with estimated method of Wooldridge (2009).

3.4 Estimation techniques:

To estimate the above model, the author estimated the method of random effects and fixed effects. Then, the author used the Hausman test to select a suitable model from the results obtained from the random effects model and the fixed effects model.

However, the above model can have endogenous phenomenon in the direction between the independent and dependent variables or between the independent variables and this can lead to optical similarity and variance in tissue.To overcome this phenomenon, the authors used the Generalized Method of Moments (GMM), proposed by rellano and Bond in 1991. In 1995, Rellano and Bond reintroduced the GMM estimation method and in 1998, Blundell and Bond developed more fully.

4. Results and discussion:

4.1. The real development of Vietnam's electronic supporting industry:

Number of enterprises: The number of electric – electronic component producing enterprises is 610, with average growth rate of 13.66% in number in the 2011 – 2016 period, the ratio of component producing enterprises over the total number of electronic enterprises is 53.28%. Theoretically, for a manufacturing and processing industry to develop, the number of enterprises supplying components and spare parts must be many times higher than the number of enterprises assembling final products. So given the fact that the number of electronic component producing enterprises only accounts for over half of the total number of enterprises, it can be said that Vietnam's electronic supporting industry is not well developed (SIDEC, 2017)

Scale of electronic supporting industry enterprises: Most supporting industry enterprises are of small and medium sizes, lacking capital, technology and high-quality human resources; besides the participation of Vietnamese supporting industry enterprises is modest, mostly limited to suppling simple components and spare parts such as packing, platic and metal moulds while sophisticated components such as electronic components are often supplied by FDI enterprises or imported from foreign countries.

Imports - Exports: Import – export turnover of Vietnam's components and spare parts has increased continuously since 2008. According to Centre for Developing Supporting industries – Research Institute for Industrial Policies (SIDEC) (2017), in 2015, the turnover reached USD21.1 billion, rising by 43% from 2014 with the average annual growth rate of 32.9% in the 2012 – 2015 period. Some electronic components with high export earnings were telephone components (code 851770), integrated electronic circuit (8542), camera components (900691), etc. However, to meet the domestic production demand, Vietnam's electronic sector still needs to import big volumes of components and spare parts. In 2015, the value of imported components to Vietnam was USD38.7 billion, increasing by 25% from 2014. This has resulted in trade deficits and low added value of the industry. Some electronic components with high import turnover are integrated electric circuits, telephone components, print circuit (8534), components for audio-visual broadcasting facilities (8529), semi-conductor diode (8541), etc. Most components are imported from China, South Korea, Japan and ASEAN countries. (SIDEC, 2017)

Supporting industry structure: The rate of domesticalization is low, components are mostly supplied by foreign producers. Most of the supporting industry products are produced by FDI or foreign enterprises. Components made by domestic enterprises have low quality, high prices (due to limited resources, backward production process, etc.), so they can just be consumed by domestic enterprises.

Table 3: Supply capacity of component producing industry to Vietnam's electronic sector

Low-stream industries	Domestic supply capacity (%)		
	Mechanical components	**Electric – electronic components**	**Plastic – rubber components**
Home appliance electronics	50%	30 – 35%	40%
Computing, telecommunication electronics	30%	15%	15%
High-tech industries	10%	5%	5%

Source: SIDEC, 2015

Technological innovations in supporting industry production: in general, supporting industry enterprises have made efforts to innovate technology to improve their production. However, as most of them are small and medium enterprises with prolonged lack of capital, the process of technological innovations often faces many difficulties.

A survey conducted with 183 producers of components and spare parts in Vietnam indicates that most enterprises use machinery and technology of Japan, Taiwan, China, Europe and some domestically-made machinery (SIDEC, 2017). Specifically: (i) In metal component production sector: technological level is at medium level, most machines are imported from Japan, including new and second-hand ones, together with facilities imported from China, Taiwan, Europe; (ii) In electric – electronic component production sector: most enterprises use machines imported from Japan, South Korea and China, technological level is at medium level, the number of enterprises with advanced production lines and clean plant system is limited; the production of electric components and spare parts develops quite fast, especially with labor-intensive products; (iii) In plastic and rubber component production sector: enterprises mostly

use technology from Japan, China, Tawain, injection moulding technology is used quite popularly, moulding machines with capacity of lower than 500 tons are common; injection moulds are produced and supplied effectively by domestic enterprises.

Production reforms: as assessed by SIDEC (2017), Vietnam's supporting industry enterprises have actively applied modern management tools and standards in their production activities. Some quality control standards such as ISO 9000, management tools such as 5S, Kaizen are used by quite a few enterprises. These are important requirements that FDI enterprises set on enterprises wishing to supply them components and spare parts in both domestic and international markets. However, most Vietnam's supporting industry enterprises face difficulties in reforming their organization, organizing and re-arranging production activities due to problems in human resources and capital inadequacy. The serious lack in both quality and quantity of human resources is also a reason why supporting industry enterprises cannot innovate their technology and access enterprises in the supply chains.

Links between supporting industry enterprises and customers and suppliers: The establishment of supporting industrial zones in Vietnam is one of the signs which reflect the links between enterprises in the supply chain of Vietnam. In 2009, the first supporting industrial zone of Vietnam was built in Bac Ninh with the supports of Japan. This was considered an important step in the development of supporting industries in Vietnam. In 2012, N&G Development – Investment Joint-stock Corporation and Shimizu Corp signed a cooperation agreement to build and develop the first supporting industrial zone in Hanoi with expected total capital of nearly USD1 billion. These are the initial steps showing the efforts of the Government and enterprises in promoting the establishment of supply chains, industrial link clusters to develop supporting industries.

However, the activities of these supporting industrial zones are just in infant stages, thus cannot attract the participation of many domestic investors and supporting industry enterprises. Besides the newly-founded supporting industrial zones, there are a number of other industrial zones which can provide necessary infrastructure and conditions for the development of the manufacturing and processing industries. Enterprises have been established and developed strongly in the industrial zones, with many enterprises invested by giant MNCs such as Hyosung, Samsung, LG (South Korea), etc., bringing them good opportunities to join the global value chains. (Ministry of Investment and Planning, 2017). The links in the industrial zones and clusters are still poor; industrial zones mostly develop as multi-sector zones, paying more attention to attracting secondary investors to fill in the leasing land; in the meantime, insufficient care is taken to the planning of the industrial zones to promote links between enterprises in the same supply chains or between regions and provinces, therefore advantages in geographical locations and infrastructure have not been utilized to develop production zones, clusters or chains.

4.2. Impacts of supporting industries on the development of electronic industry

VARIABLES	(1) RE	(2) FE	(3) GMM
lncapital_ECompo	1.002	0.998	0.8249***

nent	9***	2***	
	(0.0274)	(0.0422)	(0.0854)
lkl	-0.8137***	-0.9291***	-0.6207***
	(0.0292)	(0.0466)	(0.0750)
tfp	0.3074***	0.2610***	0.3474***
	(0.0215)	(0.0229)	(0.0499)
FDIshare	9.0080***	7.8494***	6.5403
	(1.8212)	(2.6937)	(4.6665)
hhi	-2.0588***	-1.3001	-0.0458
	(0.7927)	(0.8062)	(0.8469)
lnrevenueEI_provin	0.0810**	-	0.0730*
	(0.0411)		(0.0384)
lnreotherSI_prov	0.0501	-	0.0287
	(0.0328)		(0.0352)
pci	0.0011	0.0015	0.0050
	(0.0067)	(0.0070)	(0.0067)
open	1.4859***	1.5294***	1.0696***
	(0.3339)	(0.3548)	(0.3833)
Lag of lnre E Component			0.1591**
			(0.0803)
Constant	15.5706***	18.9919***	10.8259***
	(3.4318)	(3.6847)	(3.8145)

	Hausman test: chi2(6) = 19.3 Prob>chi2 = 0.0036		Arellano-Bond test for AR(2) in first differences: Z=-0.78 Pr>z=0.436 Hansen test of overid. restrictions: chi2(24) = 30.39 Prob > chi2= 0.172
Observations	834	834	445
R-squared		0.6759	
Number of id	342	342	182

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

The table above presents the analysis model estimation results of factors affecting the electronics industry according to RE, FE and GMM estimation methods. Using the test for two results according to estimation method RE and FE shows that the FE model is more suitable and selected for analysis. For the GMM estimation method, the estimation results shown in the table above show that the Sargan and Hansen tests show suitable instrumental variables while the AR (2) test accepts the hypothesis of order chain correlation 2. These results confirm the appropriateness of the estimation model. In particular, the number of instrument variables is smaller than the number of business groups to ensure that the Roodman (2006) rule is not violated.

The model's test results are detailed in the model's estimation results in the appendix. In which, the model's test results are appropriate is shown through the following criteria:

- The number of the model's tool variables is less than the number of groups used in the model,
- Arellano-Bond test for quadratic correlation having Pr> z are all greater than 0.005, rejecting the hypothesis H_0, so the model has no degree 2 correlation,
- Hansen test has Prob> chi2 values are all greater than 0.05, does not reject the hypothesis H_0, meaning that the instrumental variable constraint of the model is efficiency or strict exogenous instrumental variables, meaning incompatibility relative to error.

Tables 4 and 5 indicate the impacts of supporting industries on electronic industry. All the 4 models illustrate that the revenue of electronic component producing sector and revenues of other supporting product sectors have impacts on the competitiveness of the entire electronic industry. In (model 4) of Tables 4 and 5, regression coefficient χ=0,2529 means that other factors remain constant, if revenue of electronic components of the province increases by 1%, revenues by labor and capital of electronic industry enterprises increase by nearly 0.2529%.

However, while the impact indicators of electronic component revenue are always positive figures, the impact indicators of revenues of other supporting industry products show differences in random model and fixed model. This indicates that except for electronic component producing sector, the producing sectors of other supporting industry products do not

show their positive roles in the development of the domestic electronic industry. This can be explained that the production activities of such supporting industry sectors as paper, plastic, moulds, metal, etc. do not focus on serving domestic electronic industry, therefore they cannot create the momentum for the development of this industry.

TFP is considered to be a variable representing the enterprise's technology level. The results showed that the coefficient of TFP is positive and statistically significant. Thus, the technology level of the enterprises has a positive impact on the development of enterprises in the electronics industry. In the context, Industry 4.0, the development of technology is relatively strong. Therefore, it is expected that in the coming time, Industry 4.0 will bring a breakthrough in technology of the enterprises and thereby help the development of enterprises in the electronics industry in Vietnam.

Taking the results of regression coefficients into consideration, it is noted that control variables supplemented to the models, including market scales have positive impacts on the increase in revenues of electronic industry; in the meantime, medium-sized electronic enterprises may have lower revenue growth rate than small-sized enterprises, the training quality of laborers in provices do not have positive impacts on the increase in revenues of electronic industry; private enterprises have lower revenue growth than state-owned enterprises.

So it can be seen that electronic supporting industries are just in the initial development stages in Vietnam; the number of component producing enterprises is small and not proportionate with the number of assembly enterprises; attracting investment capital, renovating technology and organization take place slowly, especially in domestic supporting industry enterprises. It is indicated that the development of supporting industries is of great significance to the development of electronic industry, especially in electronic component producing sector while sectors of other supporting products do not show their positive impacts on Vietnam’s electronic industry.

6. Conclusion and implications:

6.1 Conclusion:

So it can be seen that both theories and reality affirm the important roles of developing supporting industries in enhancing the competitiveness (via productivity) of Vietnam’s electronic industry. However, in recent time, Vietnam’s electronic industry has not well developed and contributed to the local electronic industry. Particularly, in the context that the fourth industrial revolution is coming nearer and will exert many impacts on the relationships between the development of supporting industries and the development of electronic industry, there should be enormous efforts from the Government and business community so as to take full advantages of opportunities brought by the revolution and promote the positive relationships between supporting industries and electronic industry in Vietnam in the coming time.

6.2. Implications:

Firstly, it is necessary to strengthen the enforcement of supporting policies in science and technology for supporting industry enterprises by issuing decrees and instructions to specify these policies; make policies applicable to enterprises via the operations of Supporting Centres, Sssociation of Supporting Industry Businesses such as exchanging information, assisting and consulting on necessary conditions so that enterprises can approach the policies.

Secondly, the government should complete and finalize policies on developing science and technology for supporting industries in close connection with the fourth industrial revolution, especially policies on encouraging the development of technology related to information systems, internet application in production, business management, customer seeking, etc; supplement and complete the contents on international cooperation to develop science and technology for supporting industries in the context of the fourth industrial revolution, promote links and information exchange between multi-national corporates with local supporting industry enterprises.

Thirdly, it is essential to create favorable conditions to welcome experts from countries with developed supporting industries such as Japan, South Koea, etc. to provide instructions and guidance on new technology and training to improve technological competence for business leaders. In the long term, supporting centres and associations should enhance their infrastructure as well as professional qualification to provide such services as product quality control for enterprises, modernize production technology and act as a bridge to attract investment in technology for local supporting industry enterprises.

Fourthly, it is important to develop human resources for supporting industries. It is necessary to attract experts from countries like Japan to help Vietnam build up supporting industries; policies should focus on training and developing human resources for local supporting industries to create the core labor force for the development of supporting industries to meet the demand of local assembly plants and participate in Industry 4.0.

Training and improving the quality of human resources for supporting industries should be undertaken by cooperating with giant multinational groups like Samsung; it is also necessary to strengthen the links between training entities and production enterprises, between local and foreign supporting industry enterprises, especially those from Japan, South Korea, etc.

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