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Abstract: This paper examines the relationship between export diversification, export margins and economic growth at the industry level using Thailand as a case study during 2002-16. Our results show that the effects of export diversification and margins on economic growth vary across industries. Export diversification helps boost growth only in some sectors, including electronics, automotive and chemicals, plastic and rubber; while in the processed food, and textiles and apparel industries, specialization matters more in promoting growth. In almost all industries, a non-linear relationship between diversification and economic growth is not revealed, except in textiles and apparel. The diversification is crucial in enhancing the impact of exports on growth only in the processed food and textiles and apparel industries. Expansion of intensive margins plays an important role in boosting growth in key industries within Thailand. The role of extensive margins, both in terms of new products and new market destinations, in promoting economic growth is limited. For extensive margins (new products), it is found to be significant in boosting economic growth only in processed food and textiles and apparel, while in the case of extensive margins (new market destinations), its significance in boosting growth is revealed only in the electronics sector.

JEL code: F14, O47, O53

Keyword: Export diversification, export margins, economic growth

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1. Introduction

After the global financial crisis, concerns about the impact of external shocks have been widely discussed and domestic-demand led growth has been proposed to be a viable policy option for Asian countries (e.g. ADB, 2009; Prasad, 2009). However, for many developing Asian economies including Thailand whose domestic market is relatively small and who have long been engaged with multinational enterprises, turning to domestic demand-led growth strategies is considerably challenging. In addition, a country potentially gains potent benefits from exporting, including realizing scale economies, foreign exchange earnings and productivity improvements as a result of global exposure (Fernandes, 2007; Bustos, 2011). For those countries, export-led growth models have continued to be implemented after the global financial crisis. Export diversification and upgrading has been proposed in policy circles as a compromise solution to relying on the export sector. In terms of export diversification, it is argued that diversification helps reduce export instability as it provides a hedge against price variations and shocks in specific product markets (Harding and Javorcik, 2007; Bertinelli et.al 2006). In addition, it is argued that countries/firms that can produce many products with their comparative advantages have a high capability of absorbing or adapting to foreign technologies, the accumulation of skills and the ability to conduct learning-by-doing. Thus, export diversification has the potential to have a positive impact on both productivity and growth.

However, in theory, role of export diversification on productivity and growth is unclear. The idea of export diversification tends to contradict traditional trade theory, particularly the Ricardian and/or Hecksher-Ohlin models, wherein countries should specialize and be actively concerned with factor accumulation, not diversification. However, new trade theory emphasizing firm heterogeneity tends to suggest a complex relationship between trade diversification and productivity (Cadot et.al., 2011). In addition, recent empirical studies (Imbs and Wacziarg, 2003; Cadot et.al., 2011 and Mohan, 2016) show the non-monotone pattern of export diversification and per capita income with initial diversification and subsequent re-specialization when income reaches a certain level. This could to some certain extent imply that the role of export diversification would become less relevant for growth when countries become richer and produce more complex products.

In addition, while export diversification/growth can emerge from both intensive and extensive margins, how these two margins contribute to economic growth is debatable.

Intensive margins refer to an increase in exports through expanding existing products (traditional products), while extensive margins refer to expanding exports through creating new products and/or developing new trading partners. On the one hand, Evenett and Venables (2002), Brenton and Newfarmer (2007); Cadot et.al. (2011) find that export diversification was mostly explained by intensive margins. However, expanding exports through such margins could create downside risks since a country/firm may overly rely on a fixed basket of export products, which may lead to a decline in export prices, along with an increase in volatility arising from exogenous shocks. On the other hand, Hummels and Klenow (2005), as well as Pham and Martin (2007), find that extensive margins (new products) are crucial in contributing to export growth/diversification. Hidalgo and Hausmann (2009); Hausmann, et.al. (2007); Hausmann and Klinger (2007) point out that for ensuring improvement in economic development, exports should be expanded into more complex of production. However, Brenton and Newfarmer (2007) show that extensive margins, in terms of expanding existing products to new geographical markets, are more crucial in explaining export growth than the discovery of new products.

With the unsolved debate, this study aims to contribute to the literature by examining the impact of export diversification and margins on economic growth. In contrast to most previous studies, which analyze such relationships using cross-country analysis, this study employs an in-depth analysis of Thai industries as a case study. The role of firm heterogeneity is, to a certain extent, better reflected through employing industry/firm-level analysis than cross-country analysis.[1] Diversifications are calculated by using export data from UNCOMTRADE at the 6 digits Harmonized System (HS) classification of 2002. Then we use product concordance, obtained from the World Integrated Trade Solution (WITS) to match the HS 2002 code with 4-digit International Standard Industrial Classification (ISIC) Rev 3 in examining the relationship between diversification and growth. Our analysis focuses on total industries, and five key sub-sectors, namely the processed food, chemicals, plastics and rubber, textiles and apparel, electronics and automotive sectors. Three alternatives are used to measure diversification, i.e. the Herfindahl index (*HHI*), the Gini coefficient index and Theil's entropy index.

In addition, there are two alternative measures of export margins, both intensive and extensive, used in this study in order to perform a robustness check. The first method involves

[1] Note that with data limitations in terms of firm-level data, our analysis is carried through industry-level data.

using the within and between group components of the Theil index to measure intensive and extensive margins, as proposed by Cadot et.al. (2011). However, such measures using a count of export lines to calculate the extensive margin, which may have the inherent disadvantage of treating low and high value products equally in calculating margins. In fact, the implications of margins arising from low- and high-value products on growth could be different (Hummels and Klenow, 2005). Thus, we use an alternative measure to represent the margins by calculating them as reflecting their own share of the world market.[2] Moreover, as extensive margins can refer to both exporting new products[3] and expanding new markets, which could have different implications on economic growth (Brenton and Newfarmer, 2007; Haddad et.al., 2013), this study employs both prospects in referring to the extensive margins.

The rest of the paper is organized as follows. The following section provides an analytical framework to lay down the ground work for analysing the impact of export diversification and margins on economic growth. Section 3 provides the methodology applied to calculate diversification and export margins. Trends and patterns within diversification and the margins of Thai industries are presented and compared with other Asian countries. Section 4 presents our empirical model, while the ensuing results are outlined in Section 5. The final section provides our conclusions and points out potential policy inferences.

2. Analytical Framework

Gains from trade in terms of productivity and output growth have been studied for several decades. Such research began with the standard neoclassical trade model, the Ricardian comparative advantage model and/or Hecksher-Ohlin-based comparative advantage. In the 1980s, the introduction of the monopolistic competition theory of international trade

[2] Note that we can define extensive margins in terms of world market share since, as mentioned in Cadot et.al. (2011), the opening of new export lines in developing countries tends to involve copying products from developed countries, not making genuine innovations (inside-the-frontier innovations).

[3] It is noteworthy that extensive margin in terms of new products according to Cadot et.al (2011) and Hummels and Klenow (2005) refers to expanding exports through creating new products, which could be either high-value added products or low-value added ones. Recent empirical studies, e.g. Hidalgo and Hausmann (2009), Filipe et.al (2012) and Krishna and Levchenko (2013) show that more developed and wealthier countries are likely to produce and export higher value-added/complex products. While income per capita in Thailand has increased over the past decades, exports in higher value-added products have become evident. However, Filipe et.al (2012) show that among 124 countries, Thailand was still ranked at 59th, lower than Singapore, Malaysia and China. Thus, this would imply that the extensive margin referred to in this study could include both high and low value-added exports, though it tends to move towards the former overtime. Its impact on economic growth is, therefore, still unclear and worth examining.

(Krugman, 1979 and Helpman and Krugman, 1985) highlighted that the origins of gains from trade had shifted more to intra-industry trade. Since then the assumption of representative firms has been relaxed and the literature of firm heterogeneity has been growing (Melitz, 2003, and Bernard and Jensen, 2004). International trade allows better-performing firms to expand their product lines into larger markets, while resources are re-allocated from less productive to more productive firms. This, therefore, leads to improvements in both industry efficiency and overall productivity. The effect of international trade on productivity and then economic growth has also been highlighted in the new/endogenous growth theory.[4] Amiti and Konings (2017) show that due to learning-by-exporting, firms who participate in foreign markets are more likely to experience productivity gains as opposed to non-exporters. The former receives new information about technological progress, product designs and quality of goods from their foreign exposure, leading to productivity/growth promotion. Nonetheless, it is of note that doubts upon the positive impact of trade liberalization on productivity and growth are still voiced in the literature (see e.g. Rodriguez and Rodrik 2001; Vamvakidis 2002; Lee and Kim 2009). Some studies show that export/trade alone does not cause growth, depending on certain structural characteristics, such as financial depth, inflation stabilization, public infrastructure, governance, labor market flexibility, ease of firm entry, and ease of firm exit (Chang et.al., 2009; Calderón and Poggioa, 2010).

In recent years, the literature on trade and growth has paid attention to export diversification and margins in affecting growth. It is argued that the diversification of export products provides a hedge against price variations and shocks in specific product markets (Harding and Javorcik, 2007; Bertinelli et.al 2006). Volatility of exchange rate, which retards productivity and economic growth in the tradable sector, is reduced under diversified export structures (Agosin, 2006). Countries that produce a large number of products with their comparative advantages need to have high capabilities in terms of absorbing or adapting to foreign technologies, accumulating skills and developing the ability to conduct learning-by-doing. Thus, export diversification has the potential to have a positive impact on productivity and growth. Note that the ideas within export diversification tend to differ from those of traditional trade theory, particularly the Ricardian and/or Hecksher-Ohlin models, wherein countries should specialize and emphasize factor accumulation, not diversification. However, new trade theory, concerned with firm heterogeneity, as mentioned above, tends to suggest a

[4] See for example Aw and Hwang (1995); Bernard and Wagner (1997); Fernandes (2007); Bustos (2011).

complex relationship between trade diversification and productivity. Agosin (2006), using a sample of Asian and Latin American countries during the period 1980-2003, revealed that export growth alone does not matter in affecting growth. Export growth together with diversification matters more in promoting economic growth. Feenstra and Kee (2008), applying the monopolistic competition model to heterogeneous firms across 48 countries from 1980 to 2000, showed that export variety can lead to productivity improvements. Calderon and Schmidt-Hebbel (2008), who examine openness and growth volatility using a sample of 82 countries during the period 1975-2005, concluded that output fluctuations stabilize when trade openness is associated with well-diversified trade structures.

In terms of export margins, such ideas are founded on the fact that generally, exports can expand through (1) increasing traditional exports and (2) exporting new/higher quality products and/or developing new trading partners. The first channel, i.e. increasing exports through existing products (traditional products), is called *intensive margins*. This occurs when a country is making use of its comparative advantages, exploiting economies of scale and becoming more efficient. However, expanding exports through this channel could create downside risks since the country would overly rely on a fixed basket of export products, which may lead to a decline in export prices along with an increase in volatility arising from exogenous shocks. Krishna and Levchenko (2013) using industry-level data of 459 manufacturing sectors during 1970-1997, pointed out that in less developed countries, trade leads to specialization in low complexity products. These products are prone to world demand and supply shocks.

The second channels, i.e. expanding exports through creating new/higher quality products and developing new trading partners, is called *extensive margins*. Hidalgo and Hausmann (2009); Hausmann, et.al. (2007); Hausmann and Klinger (2007) point out that for ensuring improvement in economic development, exports should be expanded into more complex forms of production. Hausmann, et.al, (2007) showed that countries that produce high-productivity goods tend to grow faster than those producing low-productivity goods. The transfer of resources from low to higher productivity goods with the presence of the elastic demand of these goods in export markets generates higher economic growth. However, due to the entrepreneurial cost discovery process, firms tend to invest at a suboptimal level of innovation, so governments should play an important role in creating the right incentives for firms to invest in a new range of activities (Hausmann and Rodrik, 2003; Hausmann, et.al., 2007). Hausmann and Klinger (2007) highlight that speed of structural transformation depends on current export

goods being closely located to other goods of greater levels of sophistication and higher value. It is desirable for a country to have a high density of product space near its productive capabilities. Amin Gutierrez de Pineres and Ferrantino (2000) point out that export diversification allows countries to acquire the skills, which is relevant for producing goods in the nearby production space. Knowledge spillover or increasing returns to scale also potentially occur as a result of export diversification.

It is noteworthy that the research on export diversification also distinguishes its evolution into representing the role of both intensive and extensive margins.[5] With intensive margins diversification arises due to the existence of more equality among the shares of active export lines, commonly traded over the period while diversification concerning extensive margins occurs due to the rising number of active export lines. Evenett and Venables (2002), Brenton and Newfarmer (2007); Cadot et.al. (2011) found that export diversification was mostly explained by intensive margins. Brenton and Newfarmer (2007) using results presented in a panel data-setting from 1995–2004 also suggested that exporting existing products to new geographical markets carries higher weight in explaining export growth than the discovery of new products. By contrast, both Hummels and Klenow (2005) and Pham and Martin (2007) employed cross-sectional analyses to find that most of the rising exports are driven by growth in extensive margins. In particular, Hummels and Klenow (2005) propose an alternative definition of extensive (as well as intensive) margins by taking into account their importance in the world market instead of simply counting the number of active export lines, as conducted in the studies of Evenett and Venables (2002) and Cadot et.al. (2011). In contrast to Brenton and Newfarmer (2007), Haddad et.al (2013), using an unbalanced panel of 77 developing and developed countries over the period 1976-2005, revealed that product diversification is more crucial in reducing volatility than market diversification.

However, some empirical studies show that when countries produce more complex products, the role of export diversification becomes less relevant in terms of growth. Imbs and Wacziarg (2003) investigated the relationship between sectoral concentration and per capita income and found a U shape relationship between these two variables. This implies that

[5] In some studies (Ali et.al., 1991 and Agosin, 2006), diversification is divided into vertical and horizontal. Vertical diversification is related to the move between different categories of goods, through value-added mechanisms, while horizontal diversification implies expanding the export basket by diversifying into goods within the same broad category of goods.

diversification is found in the early stages of development, while higher income level countries become more specialized. This finding was subsequently reconfirmed by other studies, e.g. Cadot et.al., 2011 and Mohan, 2016. Filipe et.al (2012), using 5107 products and 124 countries, showed that the major exporters of the more complex products are high-income countries, while low-income countries export less complex products. The export shares of the more complex products tend to increase with income. Japan, Germany, and Sweden represent the most complex economies, while Cambodia, Papua New Guinea, and Nigeria produce the least complex products. Krishna and Levchenko (2013) argued that less developed countries tend to specialize in low product complexity and are prone to exogenous shocks, which shows that developed and wealthier countries are likely to specialize in complex goods, which are subject to less world demand and supply shocks.

All in all, the literature on trade and growth in recent years has paid attention to export diversification and margins in affecting growth. However, from the literature, it seems that there is still no clear evidence showing how these two aspects contribute to economic growth. In addition, most previous studies tend to examine these two aspects separately and employ cross-country analyses, which is unable to satisfactorily reflect the role of firm heterogeneity, concerned within new trade theory. This paper aims to contribute to the existing literature in two ways. First, it analyzes the role of export diversification and export margins simultaneously. Three alternatives are used to measure diversification, and two measures are chosen to proxy export margins in order to perform a robustness check. Second, this study employs industry-level analysis, which to some certain extent, is able to reflect the role of firm heterogeneity better than analyzing through cross-country analysis.

3. Diversification and the Margins of Thai Exports

3.1 Measuring diversification and margins

Basing on Cadot et.al. (2011, 2013), three indices are applied to measure export diversification in Thailand, namely the Herfindahl, Gini and Theil's Entropy indices. The Herfindahl index (*HHI*) is the most popular index for measuring diversification and the formula is as in equation (1);

$$HHI_j = \frac{\sum_{i=1}^{n}\left(S_{ij}\right)^2 - 1/n}{1-1/n} \quad (1)$$

where S_{ij} is the share of export line i of country j, where $S_{ij} = X_{ij} / \sum_i X_{ij}$; X_{ij} is the export line i of country j; and n is the number of export lines. The index is normalized to range between zero and one where zero represents perfect diversification and one perfect specialization.

With the Gini coefficient (*Gini*), the value also ranges between zero and one where zero is perfect diversification. To calculate Gini, first we need to calculate export share (i.e. $S_{ij} = X_{ij} / \sum_i X_{ij}$) and then sort values in ascending order, i.e. $S_{ij,t} < S_{ij,t+1}$ to calculate cumulative exports, $X_{ij} = \sum_{l=1}^{i} S_{lj}$. The Gini coefficient is calculated by weighting cumulative export shares by number of goods, as shown in equation (2):

$$Gini_j = 1 - \sum_{i=1}^{n} \frac{\left(X_{ij} + X_{i-1,j}\right)}{n} \quad (2)$$

The Theil's entropy index (Theil) of country j is calculated by

$$Theil_j = \frac{1}{n}\sum_{i=1}^{n} \frac{X_{ij}}{\mu} \ln\left(\frac{X_{ij}}{\mu}\right) \quad (3)$$

where $\mu = \sum_{i=1}^{n}\left(X_{ij} / n\right)$. The greater the index, the less diversified a country's exports.

According to Cadot et.al (2011), the Theil index can be decomposed into within- and between-group components to represent *intensive* and *extensive* margins. Within group components (*Theil*^{W}) measure diversification in traditional products, called *intensive* margins, while between-group components (*Theil*^{B}) measures diversification between the group of traditional and new products, called *extensive* margins. The formula of both within- and between-group[6] is as follows;

[6] See Cadot et.al (2011 and 2013) for details.

$$Theil_j = Theil_j^W + Theil_j^B$$

$$Theil_j^W = \sum_{k=0}^{1} \frac{n_k}{n} \frac{\mu_k}{\mu} Theil_{k,j} = \sum_{k=1}^{1} \frac{n_k}{n} \frac{\mu_k}{\mu} \left\{ \frac{1}{n_k} \sum_{i \in k} \frac{X_{ij}}{\mu_k} \ln\left(\frac{X_{ij}}{\mu_k} \right) \right\} \quad (4)$$

$$Theil_j^B = \sum_{k=0}^{1} \frac{n_k}{n} \frac{\mu_k}{\mu} \ln\left(\frac{\mu_k}{\mu} \right)$$

where *k* stands for sub-group, which is 0 (inactive export lines) and 1 (active export lines). It is noteworthy that from equation (4) extensive margins, which measure diversification between the groups of traditional and new products, can be calculated by looking at increases and decreases in the number of products exported. To determine new export products, we use the definition of Klinger and Lederman (2006), who defined 'discoveries' by comparing exports between two periods using a three-year average as a benchmark. In other words, 'discoveries' occur when products are not exported in the previous period, e.g. 2002-04, but are exported in the latter period, i.e. 2005-07. We also use another definition outlined by Cadot et.al. (2011), who define 'discoveries' as export lines that were inactive for the previous two years, but become active and remain active for the subsequent two years.[7]

Interestingly, using count measures as mentioned earlier has limitations, especially in terms of treating different value of products equally. In fact, the implications of margins arising from low- and high-value products on (long-term) growth could be different (Hummels and Klenow, 2005). In addition, it is likely that the number of export lines defined as extensive margin are far lower than those defined as intensive margin, but such extensive margins may be significant economically. To take this information into account, alternative definitions of intensive (IN_j) and extensive (EX_j) margins are applied as follows;

$$IN_j = \frac{\sum_{i \in G_1^i} X_{ij}}{\sum_{i \in G_1^i} X_{iW}} \quad \text{and} \quad EX_j = \frac{\sum_{i \in G_2^i} X_{ij}}{\sum_{i \in G_2^i} X_{iW}} \quad (5)$$

[7] Note that the results of the discoveries uncovered by Klinger and Lederman (2006) and Cadot et.al. (2011) are similar. We did not apply the findings of Besedes and Prusa (2006) which defines discoveries as export lines that were not exported in the preceding year but were exported the following year (one-year cut off) due to sustainability concerns related to the products.

where X_{ij} is the value of country j's exports of good i, X_{iW} is the world's exports of good i, G_1^i and G_2^i stand for the group of traditional products and new products, respectively. From equation (5), the country's j intensive (extensive) margin is its world market share in traditional (new) products.[8] Noted that we can define extensive margin in terms of world market share since, as mentioned in Cadot et.al. (2011), opening new export lines in developing countries tends to entail copying products from developed countries, not genuine innovation. Klinger and Lederman (2006) called an increase in export lines such as this 'inside-the-frontier innovation'.

In addition, our study examines extensive margins in terms of new export destinations for a particular product, which could have implications on economic growth (see Brenton and Newfarmer, 2007).[9] Suppose $g_k^{j,d}$ is the exports of product *k* from country *j* to new destination country *d*. m_k^d is the imports of product *k* by destination country *d* from any origin. The index to measure the importance of new destinations in country j is as follows;

$$EXM_j = \frac{\sum_{d=1}^{X}\sum_{k=1}^{n} g_k^{j,d}}{\sum_{d=1}^{X}\sum_{k=1}^{n} m_k^d} \qquad (6)$$

To calculate export diversifications, data from UNCOMTRADE is applied. We use data under the Harmonized System (HS) classification 2002 at 6 digits, which covers approximately 5,000 products and 200 export destinations during 2002-2017. Note that we analyse diversifications using HHI, Gini, Theil and intensive and extensive margins, as mentioned in equations (1)-(6) in the following section for all export products, agricultural exports (HS 0-21), manufacturing exports (HS 28-98) and key export sectors in Thailand, which cover more than

[8] Note that intensive and extensive margins defined as in equation (5) are slightly different from Hummels and Klenow (2005). In Hummels and Klenow (2005), intensive margins, which are calculated as the market share of exports, includes all active export lines (both traditional and new exports) while extensive margins measure the importance of all active export lines, i.e. how much the goods which the country exports count in terms of world trade. In equation (5), we clearly divide exports into traditional and new products and look at the importance of each product relative to corresponding world exports.

[9] Note that the index in equation (6) is slightly different from Brenton and Newfarmer (2007). In Brenton and Newfarmer (2007), the index measures the importance of each market destination for active product lines of a country j (or country i in Brenton and Newfarmer (2007)). In equation (6), we consider only the importance of new market destinations for active product lines and do not separate importance with respect to each market destination.

80 percent of total exports, including fish and crustaceans (HS03), edible vegetables and fruits (HS07-08), preparations of meat, fish and crustaceans (HS16), preparation of vegetables and fruits (HS20), products of chemicals (HS28-38), plastics and rubber (HS39-40), textiles (HS50-60), apparel and clothing (HS61-62), electrical machinery and equipment (HS84-85), vehicles (HS87).

3.2 Diversification and margins within Thai exports: first look

Three alternatives, i.e. HHI, Gini and Theil, measuring export diversifications in Thailand during 2002-17 show a similar pattern. Exports tended to be more concentrated in Thailand during 2002-08 and then declined after the global financial crisis. However, after 2014, export concentration tended to be evident again, especially when the concentration is measured by Gini and Theil (Figure 1). The early upward trend in export concentration in Thailand was mainly driven by the increasing importance of hard disk drives (HDD), accounting for 10 per cent of total exports. However, the severe flooding in 2011 caused significant adverse effects on factories representing major HDD producers (e.g. Seagate, Western Digital and Toshiba) as opposed to other manufacturing exports. As a result, the dominant role of HDDs dropped and product concentration declined. The re-concentration of exports after 2014 was mainly a result of a re-concentration of manufacturing exports, especially electrical appliances and electronics.

Insert Figure 1 here

Note that when we compare the export concentration of Thailand with other East and Southeast Asian countries, including South Korea, China, Malaysia, the Philippines, Indonesia, Singapore and Vietnam, we found Thailand tends to have more broad-based production than the others, except China. This is reflected by lower concentration indices (Figure 2). China was the only country whose concentration indices are lower than those of Thailand. In South Korea and Malaysia exports have become more concentrated after the global financial crisis, especially when measured by HHI. As argued in Athukorala (2014, 2017), Malaysia played a fundamental role in global production networks, especially semi-conductors, which crucially explains the increase in export concentration in Malaysia. South Korea's experience is more or less the same as that of Malaysia. In particular, Samsung Electronics, which is the world's largest producer of DRAM accounting for more than 45 per cent of global DRAM production,

supplies its products from three factories (one in the US and the other two in South Korea)[10] (Forbes, 2017). Regarding Vietnam, concentration indices dropped noticeably between 2002 and 2012 before slightly picking up after 2013. This reflected the fact that Vietnam was a latecomer in terms of the global integration that began in the mid-1980s, i.e. Doi Moi (Renovation), a sudden reversal of the Communist Party approach to adapt to a Socialist-oriented market economy (Freeman, 1996).[11] Direct investment, mostly in terms of export-oriented initiatives, began flooding into the country. Later on, the liberalization efforts undertaken through various Free Trade Agreements (FTAs) further caused changes in production structure. The country now is an important export platform for particular products, including electrical appliances (e.g. TV sets-HS852520) and processed shrimps, of leading multinationals.

Insert Figure 2 here

Total exports are disaggregated into agriculture (HS 0-21) and manufacturing (HS28-98) products and three measures are applied to examine their diversification. The three measures yield similar patterns, as shown in Figure 1. Product concentration in agricultural products increased between 2002 and 2010. The observed rise was largely due to the rapid expansion of natural rubber plantations as a result of oil price hikes that caused the prices of other related products, including natural rubber, to inflate remarkably. Since the sub-prime crisis, the price of natural rubber gradually dropped, which partly led to more diversification in the agricultural sector. Interestingly, when we investigate the diversification of food products, especially processed food (HS16), frozen fruits and vegetables (HS07 and 08) and frozen meats (HS03), in which Thailand is one of the key exporters in the world market, their exports have become more concentrated (Figure 3). For processed food (HS 16), two main products are dominant, i.e. processed shrimps (HS 160232) and canned tuna (HS160520), which accounted for 38 percent and 30 percent of total exports, respectively, in 2016. For frozen fruits and vegetables (HS 07 and 08), the observed increase was explained by the growing importance of frozen durian, whose share in total frozen fruits and vegetables increased from 13 percent in 2011 to

[10] Information is from the official website of Samsung Electronics available at http://www.samsung.com/semiconductor/foundry/manufacturing/

[11] Freeman, D. (1996). Doi Moi Policy and the Small-Enterprise Boom in Ho Chi Minh City, Vietnam, Geogra*phical Review, 86*(2), 178-197.

30 percent in 2016. With frozen meats (HS03), the concentration began just after 2015 due to the revival of frozen shrimp exports. From 2013 to 2015, as a result of several pandemics, including early mortality syndrome (EMS), frozen shrimps, the major product in this export category, dropped noticeably, which resulted in lowered export concentration (i.e. a decline in diversification measures).

Insert Figure 3 here

In terms of the manufacturing sector, the pattern of export concentration was similar to that of total exports (Figure 1). Such a pattern is mostly explained by changes in the exports of electrical appliances and electronics (HS84-85), which are the key products within manufacturing exports. An increase in product concentration was observed in electrical appliances and electronics from 2002 to 2009, and then a reversal ensued (Figure 3). The decreasing importance of HDD exports was the prime reason for the observed diversification. Its export share dropped from 25 per cent in 2009 to 20 per cent in 2015-16. By contrast, (digital) integrated circuits maintained their relative importance in exports and even became more crucial after 2015. In addition, in electrical appliances, Thailand tends to specialize in certain products, including refrigerators, air conditioning units, washing machines and compressors. A concentration of textiles (HS50-60) and apparel and clothing (HS61-62) exports was evident, especially after 2014. After the abolition of export quotas governed by multi-fiber arrangements (MFA) in 2000, there were many new players operating in clothing exports, including China, Sri Lanka, Bangladesh, Vietnam and Cambodia. Hence, competitive pressure in global trade has noticeably increased. Each country has shifted to focus on certain product lines where they remain competitive. In Thailand, sportswear, babywear, lingerie and outerwear are gaining share in total clothing exports at the expense of woven products. Interestingly, in chemicals, plastics and rubber products, product concentration has become less pronounced after the Sub-prime crisis (Figure 3). This is partly explained by technological advances in polymerization that have widened the applications of plastic and rubber products. Export diversification is also observed in the automotive sector (HS87). This is not unexpected as over the past decade Thailand has expanded exports to encompass many modules of small-to-medium passenger vehicles, instead of exporting only pickups.

Figures 4(A)-4(C) show intensive and extensive margins in Thailand classified in line with Cadot et.al (2011, 2013). The diversification/concentration of exports in Thailand is mostly explained by intensive margins, while extensive margins have a relatively limited effect, though this slightly increased after 2014. The importance of intensive margins is found both in agriculture and manufacturing and their sub-sectors (Figure 4 (B) and (C)). The importance of intensive margins is evident in other Asian countries, as shown in Figure 4 (D), while extensive margins tend to be relatively higher in countries where exports are growing in the world market, including Vietnam, Indonesia and the Philippines.

Insert Figures 4 here

When the implications of margins arising from the different values of products are considered, the role of extensive margins tends to be more crucial, but on average still remains relatively lower than that of intensive margin (see Tables 1 and 2). The share of intensive margin in total exports continued to grow during 2005-16 (Table 1). Both agriculture and manufacturing, i.e. vehicles, electronics, frozen and processed fruits, contributed to such an increase in intensive margin. For extensive margin, the world market share of new products tended to fluctuate during 2005-16, reaching 3.5 percent in 2011-13, but declined to 0.3 percent in 2014-16 (Table 2).[12] The share of extensive margin arose mainly from the manufacturing sector, especially in chemicals, textiles and electronics. The new products of Thailand were exported not only in Asia, especially CLMV countries in Southeast Asia, but also in Africa (e.g. Ethiopia and South Africa) and Latin America (e.g. Chile, Costa Rica, El Salvador and Brazil) (Table 2). In Southeast Asian countries, the new products were present in many sectors, including chemicals, plastics and rubber, textiles, apparel and electronics. In Latin America, the new products were mostly confined to the agriculture sector, while in Africa, the new products

[12] It is interesting to note that when a number of new products in all markets are considered (Appendix I) instead of their share in the world market, the picture remains the same, i.e. extensive margin remains relatively lower than that of intensive margin and tends to fluctuate during 2005-16. A number of new products in all market were only 437 out of 5,300 export products in 2011-2013 and declined to 111 from around 5,300 products in 2014-16. However, in some specific products, such as chemicals and textile, using a number of new products and their share in the world market yield different picture (Table 2 and Appendix I). For example, for Chemical products (HS28-38), a number of new products in 2011-13 were far higher than those of textile, i.e. 161 products for chemicals and 49 products for textile, but when their share in world market is analyzed, the values associated with those two products were close. i.e. 10.79 for chemical products and 10.78 for textile. This implies that new products in chemical sector has low value in the world market than those in textile. Thus, as mentioned by Hummels and Klenow (2005) using count measures to analyse extensive margin *per se* would have some limitations.

were found in both agriculture and manufacturing, especially in the electronics sector. The new products were also exported to developed countries, such as EU28 and USA, but their share was relatively low (Table 2). This might, to some certain extent, imply that the new products exported from Thailand were still relatively low value-added goods since only a small proportion of such new products reached developed countries.

Insert Tables 1 and 2 here

Interestingly, extensive margin in terms of new market destinations (equation 6) tended to be more pronounced than that observed in terms of new products. For example, in 2014-16, the world market share of extensive margin (new markets) was around 3.4 percent, while that of extensive margin (new products) was only 0.3 percent (Table 1). Both agriculture and manufacturing products tended to expand more through exporting to new market destinations than to exporting new products, especially in preparations of meats, fish and crustaceans (HS03, HS16), textiles (HS50-60), and vehicles (HS 87). The new markets were mostly located in Southeast Asia and Africa (Table 3). In Asia, during 2005-13, the new markets expanded within Southeast Asian countries, especially CLMV, but after 2014, Middle East countries, such as Iraq and Kuwait, became new market destinations for many (existing) products of Thailand, including chemicals, electronics and vehicles. In Africa, both agriculture and manufacturing, such as plastics and rubber, apparel and preparations of meats, fish and crustaceans, were exported to new markets in many countries, including Ethiopia, Morocco, Solomon Island, and Sierra Leone.

Insert Tables 3 here

4. Empirical Model, Variable Measurement and Econometric Procedure

This section investigates the importance of export diversification and export margins, both intensive and extensive, on economic growth at the industry level in Thailand during 2002-2016. A growth equation, basing on an extended version of the neoclassical growth model, is

applied (Barro and Sala-i-Martin, 1995). First, the importance of exports is analysed in the growth equation along with export diversification as follows;

$$g_{it} = c_0 + c_1 Y_{i,t-1} + c_2 X_{it} + c_3 Diver_{it} + c_4 C_{it} + \eta_i + \varepsilon_{it} \quad (7)$$

where g_{it} is economic growth (real GDP) of sector i at time t. In our empirical analysis, real GDP at the industry level is classified at 4-digit International Standard of Industrial Classification (ISIC) Rev 3. The data is obtained from the Office of the National Economic and Social Development Board (NESDB). We use three-year periods to calculate real GDP growth, rather than calculating on a yearly basis to reduce the business cycle fluctuations associated with (annual) data series and to match effectively with (extensive) margins, which is defined by comparing exports between two periods using a three-year average as a benchmark.

$Y_{i,t-1}$ is the initial real GDP of sector i at time t,

X_{it} is the export of sector i as a share of GDP at time t,

$Diver_{it}$ is the export diversification of sector i at time t. As mentioned in the previous section, export diversification is measured using three alternatives, i.e. *HHI, Gini* and *Theil*. We use these three alternatives to ensure the robustness of the results. Diversification is calculated using export data from UNCOMTRADE at 6 digits Harmonized System (HS) classification 2002. Then we use product concordance, obtained from the World Integrated Trade Solution (WITS) to match HS 2002 code with ISIC Rev 3.[13] Three-year average is applied with these three alternatives to match efficiently with economic growth data.[14]

C_{it} is the control variable. Based on data availability, the imports of sector i as a share of GDP is included in the model.[15] η_i is an unobserved industry-specific effect and ε_{it} is the error term

[13] See product concordance from https://wits.worldbank.org/product_concordance.html.
[14] As mentioned earlier, we also use another definition defined by Cadot et.al. (2011), who define 'discoveries' as export lines that were inactive for the previous two years, but become active and remain active for a subsequent two years. The results of discoveries are quite similar to those applying three-year average.
[15] In fact, it would be more appropriate to include variables such as FDI, human resources and capital stocks as control variables. However, there is no data for these variables at 4-digit ISIC. To redress any

Equation (7) is extended to examine whether diversification helps enhance exports in generating economic growth. The interaction term between exports and diversification (all three alternatives), i.e. $X_{it} \cdot Diver_{it}$ is introduced, as in equation (8). As mentioned in section 2, some empirical studies, e.g. Agosin (2006); Calderon and Schmidt-Hebbel (2008), show that export growth together with diversification is the crucial factor in promoting economic growth. In addition, the non-linear relationship between diversification ($Diver_{it}^2$) and economic growth is investigated, as the empirical study of Imbs and Wacziarg (2003) implies that the role of export specialization becomes more relevant for growth when countries reach a certain level of income.

$$g_{it} = c_0 + c_1 Y_{i,t-1} + c_2 X_{it} + c_3 Diver_{it} + c_4 X_{it} \cdot Diver_{it} + c_5 C_{it} + \eta_i + \varepsilon_{it} \quad (8)$$

$$g_{it} = c_0 + c_1 Y_{i,t-1} + c_2 X_{it} + c_3 Diver_{it} + c_4 Diver_{it}^2 + c_5 C_{it} + \eta_i + \varepsilon_{it}$$

In addition to diversification, we also investigate the importance of export margins in affecting growth at the industry level in Thailand. Equation (7) is modified to include export margins as follows;

$$g_{it} = c_0 + c_1 Y_{i,t-1} + c_2 X_{it} + c_3 intensive_{it} + c_4 extensive_{it} + c_5 C_{it} + \eta_i + \varepsilon_{it} \quad (9)$$

where $intensive_{it}$ measures the diversification emerging from traditional products (existing export products). It is defined as within group components of the Theil index developed by Cadot et.al (2011);

$extensive_{it}$ measures diversification emerging from exporting new products. The between-group components of Theil developed by Cadot et.al (2011) is used to represent extensive margins, as shown in equation (4).

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possible bias that may arise from omitted variables, we include industrial dummy variables in the model when we perform Blundell and Bond (1998), panel system *Generalized Method of Moments* (GMM) regression while for Arellano and Bond (1991), the fixed effect is already applied.

However, as mentioned in the previous section, measuring intensive and extensive margins as in equation (4) would not effectively capture the differences between low and high value products in the margins, which could have implications on economic growth (Hummels and Klenow, 2005). We use alternative intensive and extensive margins as in equation (5), which defines intensive (extensive) margin as its world market share in traditional (new) products. Thus, $intensive_{it}$ and $extensive_{it}$ in equation (9) are replaced by IN_{it} and EX_{it}. In addition, while extensive margin could be defined as expanding exports (traditional/ new products) into new trading partners, and it could have different implications on economic growth (Brenton and Newfarmer, 2007), we redefine equation (9) to include prospects of extensive margins in terms of new trading partners (EXM_{it}) (see equation 6) as follows:

$$g_{it} = c_0 + c_1 Y_{i,t-1} + c_2 X_{it} + c_3 IN_{it} + c_4 EX_{it} + c_5 EXM_{it} + c_7 C_{it} + \eta_i + \varepsilon_{it} \qquad (10)$$

To estimate the growth equation, we use Blundell and Bond (1998), panel system *Generalized Method of Moments* (GMM) regression. Blundell and Bond (1998) proposed a system estimation in which first difference is estimated together with one in level, instead of estimating only equations in first differences and using lagged levels as instruments. The instruments for the regression in difference are its own lagged levels, as proposed by Arellano and Bond (1991), while the instruments for the regression in level are its own lagged first differences of the variable. The appropriateness of the latter is based on the assumption that the first differences are uncorrelated with the error term and unobservable heterogeneity. The GMM regression under Blundell and Bond tries to redress the shortcomings that tend to arise from Arellano and Bond (1991): panel system *Generalized Method of Moments* (GMM) regression. Under Arellano and Bond, the difference estimator has been found to have poor finite sample properties when the lagged levels of the series are only weakly correlated with subsequent first differences. This has been found to be the case when the explanatory variables have large autoregressive parameters, as in our case. Blundell and Bond (1998) clearly showed that weak instruments could cause large finite-sample biases when using the first-differenced GMM method. However, note that to check the robustness of our results, Arellano and Bond (1991): panel system *Generalized Method of Moments* (GMM) regression is also applied. Our analysis extends through total industries (ISIC 1511-3699), processed food (ISIC 1511- 1549), chemicals, plastics and rubber (ISIC 2320-2695), textiles and apparel (ISIC 1711-1911), electronics (ISIC 2911-3312) and motor vehicles 3410-30 and ISIC 3591). Note

that to analyze the effects of export diversifications and margins on economic growth in each sector, industrial dummy variables controlled for industrial-specific factors in our panel system GMM are interacted with diversification variables. The results are reassembled with those when each sector is examined separately (see Appendix II). However, a multicollinearity problem occurs when intensive margin, extensive margin (new products) and extensive margins (new markets) (equation 10) for the five key sectors are interacted with their industry dummy variables. Thus, our analysis below is based on running separate regressions for each sector.[16] See the data used in our analysis in Tables 4.

5. Results

Tables 5 - 10 provide the regression results based on Blundell and Bond (1998), panel system *Generalized Method of Moments* where columns A, D, G consider the impacts of export diversification, measured by HHI, Gini and Theil indices, respectively on economic growth at the 4-digit industry level in Thailand, while columns B, E, H present results when non-linear of three diversification measures are considered, while columns C, F, I show the impact of export diversification, as well as its interaction terms between exports and export diversifications.[17] Column J present the results when diversification measured by Theil is divided into intensive and extensive margins, according to Cadot et.al (2011). The impact of intensive and extensive margins, which are measured as their share in world markets both in terms of new products and new market destination, on economic growth are in Column K.

Insert Table 5 - 10 here

[16] Note that our observations under ISIC 4 digits are not enough to analyse motor vehicles (ISIC 3410, 3420, 3430, 3591) per se. The diversification and margins of the automotive sector is analysed by comparing results when motor vehicles are included together with electronics and when only the electronics sector is analysed.

[17] As a robustness check, when the Arellano and Bond (1991) panel system *Generalized Method of Moments* is applied, results are similar to those under Blundell and Bond (1998) , panel system *Generalized Method of Moments*. Note that these results are based on treating exports and imports as a share of GDP as endogenous variables in the model. We also treat diversification indices and intensive and extensive margins as endogenous variables. However, the results are robust regardless of treating these variables as endogenous or exogenous variables in the model.

When overall industries are considered, our results show that industry, which has a higher degree of export diversification, tends to have a greater economic growth than those with a higher degree of concentration (i.e. less diversification), particularly when diversification is measured by Gini and Theil. The coefficients associated with these two measures are negative and significant (Table 5: column D, G). Our findings tend to support most previous studies (Ghosh and Ostry, 1994; Amin Gutierrez de Pineres and Ferrantino, 2000), which show export diversification tends to promote economic growth. However, when the non-linearity of diversification indices (*Diver*^{2}) and interaction terms between exports and diversification indices ($X_{it} \cdot Diver_{it}$) are included in the model, the coefficients associated with these variables are statistically insignificant (Table 5: columns B-C, E-F, H-I). While the coefficient associated with exports is positive and significant, the insignificance of the interaction term ($X_{it} \cdot Diver_{it}$) reflects the fact that the diversification/concentration structure of exports does not help enhance the role of exports in boosting economic growth. Our result is in contrast with some previous studies (e.g. Calderon and Schmidt-Hebbel, 2008; Haddad et.al., 2013), which use cross-country analysis and long-time span examples and show the diversification of exports to be crucial in enhancing the impact of exports on economic growth.

Interestingly, when the sub-sectors of exports are examined, export diversification tends to promote economic growth in three industries, namely electronics, automotive, and chemicals, plastics and rubber (Tables 7, 9, 10 Columns A, D, G) where the coefficients associated with diversification indices in these three industries are negative and significant. For electronics, the coefficients associated with Gini and Theil are mildly significant. However, for processed food and textiles and apparel, the coefficients associated with diversification indices are positive and significant, implying specialization tends to promote higher economic growth in these two industries. Specifically, in terms of processed food industries, positive and significant coefficients are found when the interaction terms between exports and diversification indices are included (Table 6: columns C, F, I). In textiles and apparel, a positive coefficient is found when the non-linear relationship of diversification measures (Table 8: columns B, E, H) and interaction terms between exports and concentration indices are included (Table 8: columns C, F, I). The significance of the interaction term in these two industries shows that specialization also helps enhance exports in stimulating economic growth in such industries. Based on figure 3, all three diversification indices (HHI, Gini and Theil) show an increasing trend, i.e. more concentration, across these two industries. As mentioned earlier, for processed food, exports are concentrated

in the preparations of meats, fish and crustaceans, especially processed shrimps and canned tuna. For textiles and apparel, competitive pressures in global trade and higher labor costs have led Thailand to produce higher-value products and to specialize in certain product lines, e.g. sportswear, babywear and outerwear. From our regression analysis, it seems that such specialization benefits their economic growth.

In both industries, when we analyze further by disaggregating the diversification index measured by Theil into intensive and extensive margins according to Cardot et.al (2011), we found the coefficients associated with intensive to be positive in both sectors and statistically significant in the case of the processed food industry. This result shows that an increase in Theil arising from intensive margins helps stimulate economic growth. In other words, it shows that specialization in traditional products tends to promote economic growth in these industries (Tables 6 and 8: columns J). Interestingly, the coefficient associated with extensive margins is negative, and statistically significant in processed food industry. The negative sign tends to reflect that a decline in Theil arising from extensive margins (new products) encourages industrial growth. In other word, exporting new products, leading to more export diversification, help stimulate growth, especially in the processed food industry.

The importance of intensive margins in stimulating growth in these two industries is also evident when intensive margins are measured as their share in the world market. The coefficients associated with intensive margins (lnintensive, IN_{it}) are positive and significant in both processed food and the textiles and apparel industries. This shows that exporting traditional products in these two industries would stimulate growth, i.e. product groups in these industries that have a higher share of traditional exports in the world market tend to grow faster (Tables 6 and 8: Column K). The expansion of such intensive products arises when firms in an industry make use of comparative advantages and exploit economies of scale in the process of becoming more efficient. Concerns about a decline in export prices in these two industries, along with an increase in volatility arising from the exogenous shocks associated with the expansion of intensive margins tend to be limited. With the processed food industry, an ability to maintain a high market share in the world market (Table 1) reflects the fact that the decline in prices would arise more from process innovation, especially more efficient factory management, making the costs of production decline noticeably, than by any expansion of volume *per se*. In the case of textiles and apparel, as mentioned earlier, intense competition in the world market made firms in Thailand move to produce more sophisticated products and specialize in particular segments. With such increasingly sophisticated production, concerns about a decline

in export prices arising from expansion in traditional exports could be minimal. In addition, our study shows the coefficients associated with extensive margins in terms of new products (lnextensive_product, EX_{it}) to be positive and significant in both industries. This result reflects the fact that an increase in the share of new products in the world market matters in promoting industrial growth in these industries. However, compared to traditional products, the coefficient associated with new products is still far lower than with traditional (Tables 6 and 8: Column K).

With electronics, as mentioned earlier, export diversification helps promote growth in this industry (Table 9: Columns A, D, G), but there is no evidence of a non-linear relationship between exports and export diversification as the coefficients associated with $Diver^2$ for all diversification measures is statistically insignificant. In addition, the interaction term between exports and diversification ($X_{it} \cdot Diver_{it}$) is statically insignificant for all three indices (Table 9: Column C, F, I). This implies that in electronics, the effect of exports in promoting its growth is not conditional on the diversification/concentration structure of the exports.

When the source of diversification measured by Theil is divided into intensive and extensive margins, our results show that only the coefficient associated with intensive margins is mildly significant and has a negative sign (Table 9: Column J). This reflects that diversification from traditional exports is the crucial element in promoting growth in the electronics sector, while diversification arising from new products is not strong enough to promote its industrial growth. The importance of intensive margins in promoting economic growth in the electronics sector is also evident when intensive margins are measured by their own share in the world market, as reflected by the positive and significant coefficient of the intensive variable (lnintensive, IN_{it}) while extensive margins in terms of new products (lnextensive_product, EX_{it}) are statistically insignificant. Concerns about an increase in volatility arising from the exogenous shocks associated with expansion in intensive margins in this sector could be redressed by expanding production into new market destinations. Our study reveals that the coefficient associated with extensive margins in terms of new market destinations (EXM_{it}) is positive and significant, reflecting its ability to stimulate its industrial growth in the electronics sector. In addition, from Table 1, an increase in the market share of the electronics sector in the world market over the past decade could, to some certain extent, reflect the ability of firms to upgrade their traditional products or/and apply process innovations. However, the insignificance of extensive margins (new products) would lead to some disquiet about elevating

Thailand into another level of income since the electronics sector plays an important part in Thailand's export sector; within which in 2015-16 it accounted for around 31% of total exports.

When the data from the automotive sector is combined with that of the electronics sector, our results show an increasing robustness of export diversification in promoting economic growth. The coefficients associated with all three diversification indices are negative and strongly significant (Table 10: Columns A, D, G). The significance of these indices is found, even when non-linear relationships and interaction terms between diversification and exports are included (Table 10: Columns B-C, E-F, H-I). These results underline the fact that export diversification helps promote economic growth more in the automotive sector than in electronics. It seems that the expansion of exports to encompass many modules of small-to-medium passenger vehicles over the past decade has helped to boost economic growth in the automotive sector.

Our study shows that the negative coefficient associated with the intensive margin, measured by Theil, becomes even more significant when the automotive sector is included in the analysis (Table 10: Column J). This implies diversification arising from exporting traditional products is even more crucial in boosting growth in the automotive sector. The importance of traditional exports in terms of the automotive sector is confirmed when intensive margins are measured by their share in the world market (Table 10: Column K). As in the electronics sector, with higher competition in the automotive sector, the ability of Thailand to increase its world market share of traditional exports (see Table 1) implies the existence of product upgrading and/or conducting process innovations in the industry (Hill and Kohpaiboon, 2017). However, extensive margins in terms of both new products and new markets are statistically insignificant in the automotive sector (Table 10: Column K). Such statistical insignificance, especially in terms of new markets, shows that the expansion of exports into new markets tends to significantly benefit economic growth only in the electronics sector, not the automotive sector.

Export diversification helps promote economic growth in chemicals, plastics and rubber, as shown by the negative coefficients associated with all three diversification indices (Table 7: Columns A, D, G). As in the case of the automotive sector, diversification indices are statistically significant even when non-linear relationships and interaction terms between diversification and exports are included (Table 7: Columns B-C, E-F, H-I). As mentioned earlier, such diversification partly arises from the technological advances in polymerization that have

widened the scope of applications of plastic and rubber products. In this industry, our results also show that diversification emerged by both intensive and extensive margins, helping to promote economic growth in the sector. This is shown by the negative and statistical significance of coefficient associated with $intensive_{it}$(Theil) and $extensive_{it}$(Theil) variables (Table 7: Column J). However, when intensive and extensive margins are measured in terms of their share in the world market, their statistical significance becomes weaker (Table 7: Column K). This may reflect a situation wherein the share of products, especially new goods, that Thailand exports in the world market in chemicals, plastics and rubber industries is still rather small and fluctuating, so their ability to stimulate growth remains limited.

All in all, our results reveal that industrial heterogeneity is important in analysing the impact of export diversification and export margins on economic growth. As in the case of Thailand, it seems that export diversification matters in promoting economic growth, but only in some industries, i.e. electronics, automotive and chemicals, plastics and rubber. Meanwhile, the expansion of intensive margins still plays an important role in boosting economic growth in many industries, e.g. the electronics and automotive sectors, while the importance of extensive margins is found only in some sectors.

6. Conclusions and Policy Inferences

The purpose of this paper is to examine the relationship between export diversification, export margins and economic growth at the industry level during 2002-16 using Thailand as a case study. Three alternatives are used to measure diversification, namely the Herfindahl index (*HHI*), Gini coefficient (*Gini*), and the Theil's entropy index (Theil). The diversification measured by Theil's entropy index is further divided into diversification arising from intensive (exports of traditional products) and extensive (new products) margins as proposed by Cadot et.al (2011, 2013). Our study also employs alternative measures of intensive and extensive margins, by looking at their relative shares in the world market, to help consider the different implications of the low- and high-value products of the margins. In addition, extensive margins examined in this study are considered not only in terms of new products, but also of new market destinations. To calculate export diversification and margins, data from UNCOMTRADE under the Harmonized System (HS) classification 2002 at 6 digits, which covers approximately 5,000 products and 200 export destinations is applied. To examine the impact of such diversification and margins on economic growth, product concordance, obtained from the World Integrated

Trade Solution (WITS), is applied to match HS 2002 code with ISIC Rev 3. Our analysis extends through total industries, and five key sub-sectors, namely the processed food, chemicals, plastics and rubber, textiles and apparel, electronics and automotive sectors.

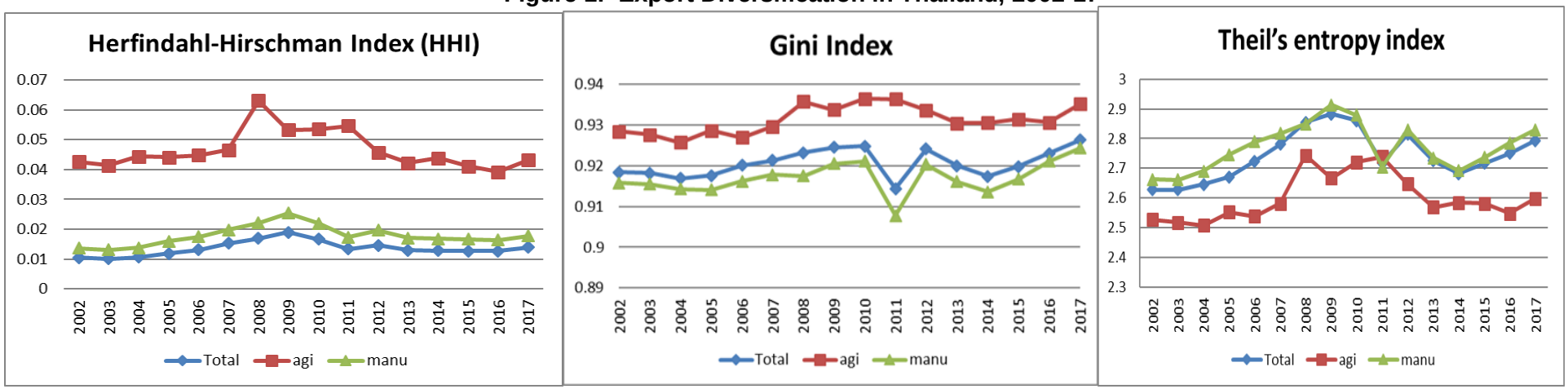
Our data analysis shows that Thailand possesses a broad-based production base and export products are more diversified than other countries in the region, except China, as shown by the relatively low diversification indices observed. Exports tended to be more concentrated in Thailand during 2002-08 as shown by the initial upward trend in diversification measures, before declining after the global financial crisis. After 2014, exports tended to be more concentrated, especially when such concentration is measured by Gini and Theil. The re-concentration of exports in Thailand after 2014 was derived from both the agriculture and manufacturing sectors, including processed food and textiles and apparel. Based on the decomposition of Theil's entropy index, the diversification/concentration of exports in Thailand is mostly explained by intensive margins, while the impact of extensive margins is still limited, with a slightly increase after 2014. The importance of intensive margins is also found both in agriculture and manufacturing and their sub-sectors. Interestingly, when the implications of low- and high-value products are considered in calculating the margins, the role of extensive margins becomes more important in terms of Thailand's exports. However, it seems that extensive margins fluctuated somewhat and on average their share was still relatively lower than that of intensive margins. Lastly, extensive margins in terms of new markets tended to be more important than those in new products, as reflected by the higher share of such margins in the world market.

Our results also show that industrial heterogeneity is important in analysing the impact of export diversification and export margins on economic growth. It seems that export diversification helps boost economic growth only in some industries, i.e. electronics, automotive and chemicals, plastics and rubber, while in processed food and textiles and apparel, specialization matters in promoting growth. In almost all industries, non-linear relationships between diversification and economic growth are not revealed, except in textiles and apparel. Diversification of exports is crucial in stimulating the impact of exports on economic growth only in the processed food and textiles and apparel industries. Meanwhile, the expansion of intensive margins still plays an important role in boosting economic growth in key industries within Thailand. Growth in electronics, automotive, processed food and textiles and apparel is

still driven by the exports of intensive margins, i.e. traditional products. Extensive margins, both in terms of new products and new market destinations, is able to promote economic growth only in some sectors. Extensive margins (new products) are found to be significant in promoting economic growth only in processed food and textiles and apparel, while extensive margins (new market destinations) reveals a significance in boosting growth only in the electronics sector.

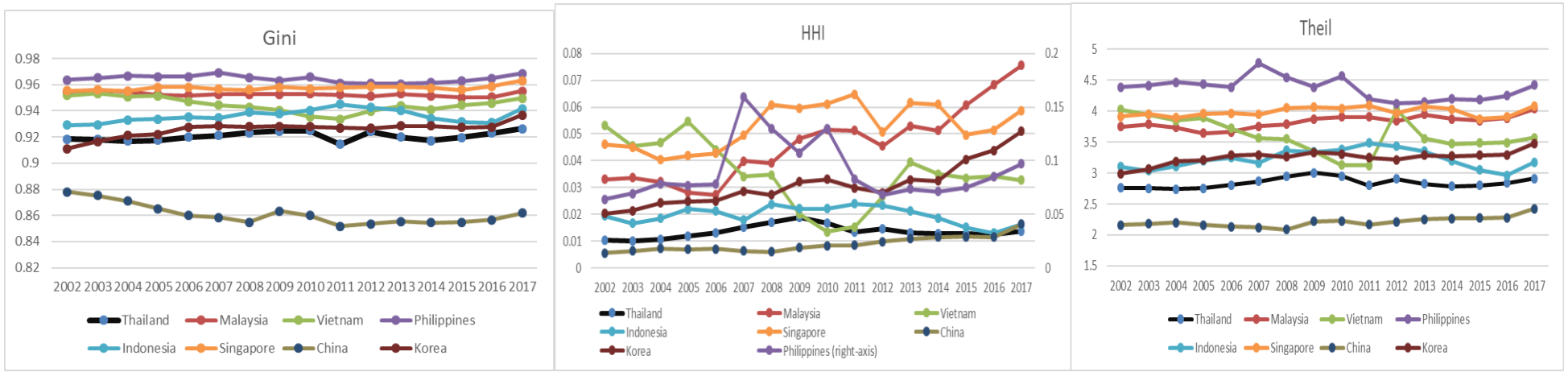
Such findings point to the danger of overemphasizing extensive margins, especially in terms of new products, in promoting economic growth in developing countries like Thailand as our study shows that intensive margins still play an important role in promoting economic growth in many industries. However, continuing to rely on expanding the export volume of traditional products is dangerous as a country/industry would face a decline in terms of trade and an increase in the volatility arising from the exogenous shocks associated with an expansion in intensive margins. Nevertheless, such problems could be redressed when firms upgrade their traditional products and/or conduct process innovations. From our analysis, Thailand tends to apply such strategies, as reflected by their enviable record in terms of world market share in many industries. Expanding the new market destinations of traditional products is another way to promoting economic growth and redressing the volatility arising from the exogenous shocks associated with expansion in intensive margins. However, our analysis shows that the positive effect of extensive margins (new market) is still limited and found only in some industries. Economic growth driven by extensive margins in terms of new products is also necessary to move Thailand to another level of income, but the significant impact of the margin is still realized only in some industries. Extensive margins should be promoted simultaneously with improving traditional products. Particularly, excess profit as a result of enhancing competitiveness in traditional products could form the core internal financial resource to drive ventures into new products, especially in high value-added exports, new markets or both.

Figure 1: Export Diversification in Thailand, 2002-17



Note: HHI, Gini and Theil's entropy index are calculated using UNCOMTRADE data, under the Harmonized System (HS) classification 2002 at 6 digits, which covers approximately 5,000 products and 200 export destinations. Agriculture exports refer to (HS 0-21), manufacturing exports (HS 28-98).
Source: Author's calculation

Figure 2: Comparison of Export Diversification in Thailand and other Asian Countries, 2002-17



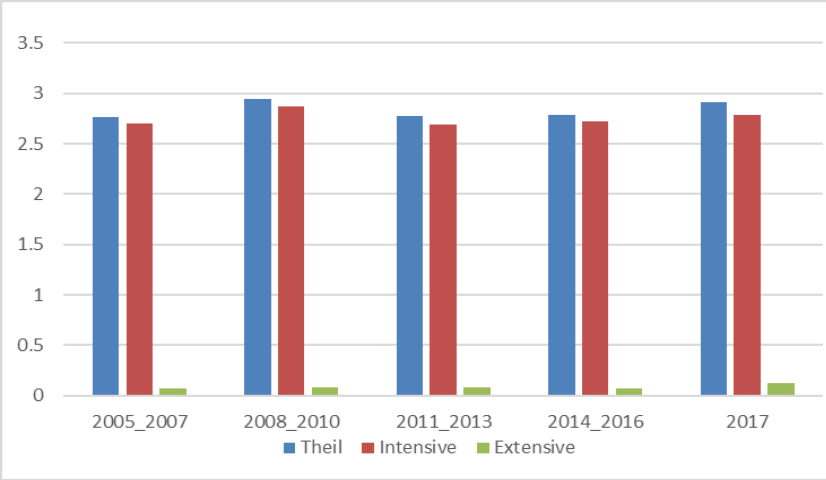
Source: Author's calculation

Figure 3: Export Diversification across Sectors in Thailand, 2002-17

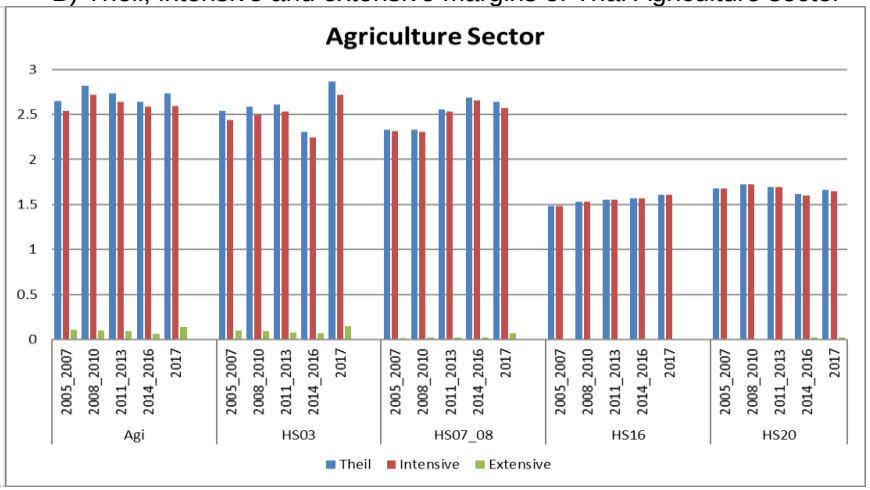
Note: HS codes refer to the products as follows; fish and crustaceans (HS03), edible vegetables and fruits (HS07-08), preparations of meat, fish and crustaceans (HS16), preparation of vegetables and fruits (HS20), products of chemicals (HS28-38), plastics and rubber (HS39-40), textiles (HS50-60), apparel and clothing (HS61-62), electrical machinery and equipment (HS84-85), Vehicles (HS87).
Source: Author's calculation

Figure 4: Theil's Entropy Index, Intensive and Extensive Margins, 2005-2017

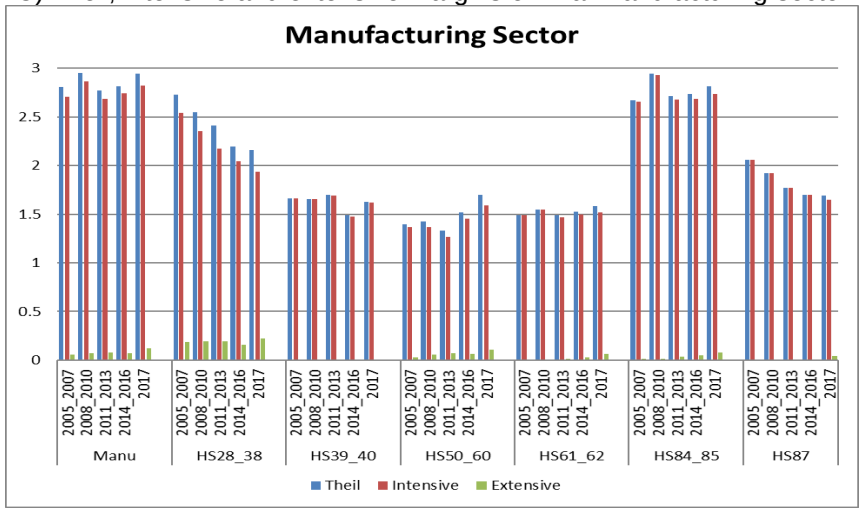
A) Theil, intensive and extensive margins of Thailand



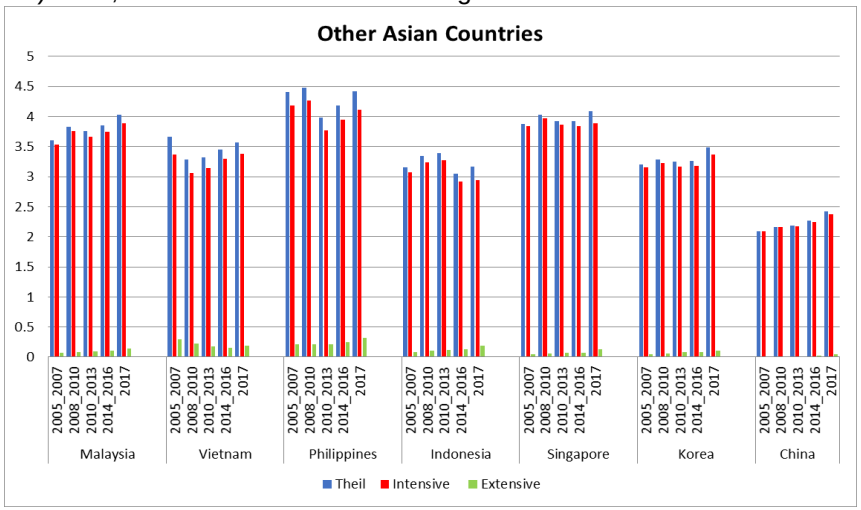
B) Theil, intensive and extensive margins of Thai Agriculture sector



C) Theil, intensive and extensive margins of Thai Manufacturing sector



D) Theil, intensive and extensive margins of other Asian countries



Note: HS codes refer to the products as follows; fish and crustaceans (HS03), edible vegetables and fruits (HS07-08), preparations of meat, fish and crustaceans (HS16), preparation of vegetables and fruits (HS20), products of chemicals (HS28-38), plastics and rubber (HS39-40), textiles (HS50-60), apparel and clothing (HS61-62), electrical machinery and equipment (HS84-85), Vehicles (HS87).
Source: Author's calculation

Table 1: Intensive and Extensive (new products and new markets) Margins in Thailand, 2005-16

	Intensive margin			Extensive margin (Product)			Extensive margin (Market)		
	2005_ 2007	2011_ 2013	2014_ 2016	2005_ 2007	2011_ 2013	2014_ 2016	2005_ 2007	2011_ 2013	2014_ 2016
Total	1.68	1.87	1.91	0.46	2.75	0.25	2.70	7.79	3.39
Agriculture (HS 0-21)	4.23	4.53	4.50	0.09	0.31	0.06	9.34	13.48	4.41
Manufacturing (HS 28-98)	1.63	1.87	1.86	0.53	3.47	0.27	2.21	7.33	3.24
Fish and crustaceans (HS03)	5.12	4.55	2.94	2.62	0.03	0.06	2.27	10.97	7.97
Edigible vegetables and fruits (HS0708)	2.73	3.99	4.21	0.18	0.06	0.00	0.83	12.94	0.11
Preparations of meats, fish and crustaceans (HS16)	17.83	20.60	18.72	0.00	0.00	0.00	36.17	33.12	34.13
Preparations of vegetables, Fruits (HS20)	4.75	4.64	4.92	0.00	0.00	0.00	5.39	16.57	0.64
Products of Chemicals (HS 28-38)	0.89	1.25	1.11	0.21	10.79	0.12	2.01	7.90	0.03
Plastics and rubber (HS39-40)	3.25	4.53	3.91	0.00	0.00	5.35	3.19	12.53	4.16
Textile (HS 50_60)	1.71	2.29	1.84	0.15	10.78	2.00	3.87	4.31	3.65
Apparel andclothing accessories (HS 61-62)	1.42	1.01	0.88	0.00	0.00	57.92	1.20	2.14	4.42
Electronics (HS 84-85)	2.01	2.10	2.14	0.05	3.78	0.83	1.60	6.07	1.89
Vehicles (HS 87)	1.21	2.33	2.39	0.00	0.00	0.00	4.77	31.88	11.84

Note: Intensive and extensive margins are defined in terms of their share in the world market.
Source: Author's calculation.

Table 2: Extensive Margin in terms of New Products (share in the world market)

	Total			Asia			East Asia			Southeast Asia			South Asia		
	2005_2007	2011_2013	2014_2016	2005_2007	2011_2013	2014_2016	2005_2007	2011_2013	2014_2016	2005_2007	2011_2013	2014_2016	2005_2007	2011_2013	2014_2016
Total	0.46	2.75	0.25	1.01	4.27	0.38	0.30	5.14	0.02	1.43	4.41	2.14	0.69	0.82	1.19
Agriculture (HS 0-21)	0.09	0.31	0.06	0.08	8.70	0.04	0.81	1.67	0.00	0.04	10.95	1.41	0.79	1.96	0.00
Manufacturing (HS 28-98)	0.53	3.47	0.27	1.32	4.21	0.41	0.27	5.14	0.02	2.66	3.78	2.15	0.69	0.81	1.19
Fish and crustaceans (HS03)	2.62	0.03	0.06	78.35	5.67	17.29	0.00	0.00	0.00	0.00	0.71	0.00	1.84	74.55	0.00
Edigible vegetables and fruits (HS0708)	0.18	0.06	0.00	14.33	0.13	0.00	55.94	0.13	0.00	0.00	0.00	0.00	1.44	0.46	0.00
Preparations of meats, fish and crustaceans (HS16)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Preparations of vegetables, Fruits (HS20)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Products of Chemicals (HS 28-38)	0.21	10.79	0.12	0.21	18.27	2.22	0.20	23.09	0.0001	0.09	6.52	2.87	0.15	1.00	0.00
Plastics and rubber (HS39-40)	0.00	0.00	5.35	0.00	0.00	5.35	0.00	0.00	0.00	0.00	0.00	5.35	0.00	0.00	0.00
Textile (HS 50-60)	0.15	10.78	2.00	0.13	13.53	2.00	0.10	0.16	0.00	1.38	24.73	2.00	0.00	25.10	0.00
Apparel andclothing accessories (HS 61-62)	0.00	0.00	57.92	0.00	0.00	57.92	0.00	0.00	0.00	0.00	0.00	57.92	0.00	0.00	0.00
Electronics (HS 84-85)	0.05	3.78	0.83	0.38	1.65	0.79	4.79	0.00	0.00	0.35	1.65	0.79	0.62	0.00	0.00
Vehicles (HS 87)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

	EU28			USA			Latin			Africa			Others		
	2005_2007	2011_2013	2014_2016	2005_2007	2011_2013	2014_2016	2005_2007	2011_2013	2014_2016	2005_2007	2011_2013	2014_2016	2005_2007	2011_2013	2014_2016
Total	0.05	0.08	0.005	0.13	0.21	1.64	0.10	2.77	4.27	11.30	0.80	1.98	0.21	11.86	0.02
Agriculture (HS 0-21)	0.03	0.00	0.003	0.39	0.00	0.00	0.06	15.12	4.27	7.15	0.38	3.67	0.71	0.02	0.00003
Manufacturing (HS 28-98)	0.06	0.19	0.01	0.13	0.21	1.64	0.10	2.76	0.00	11.30	0.80	1.84	0.09	12.14	0.07
Fish and crustaceans (HS03)	0.00	0.01	0.0002	4.05	0.00	0.00	0.00	0.00	0.00	100.00	0.00	0.00	1.36	0.00	0.00
Edigible vegetables and fruits (HS0708)	0.09	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.37	0.00	0.00	0.00	0.00
Preparations of meats, fish and crustaceans (HS16)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Preparations of vegetables, Fruits (HS20)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Products of Chemicals (HS 28-38)	0.14	0.35	0.00004	1.16	0.23	0.00	0.09	2.76	0.00	5.14	0.62	0.00	0.49	17.31	0.00
Plastics and rubber (HS39-40)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Textile (HS 50-60)	0.90	0.45	2.80	0.00	0.13	0.00	0.00	0.00	0.00	0.00	0.32	1.18	4.21	1.63	0.00
Apparel andclothing accessories (HS 61-62)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Electronics (HS 84-85)	0.01	22.89	0.00	0.01	0.00	0.00	0.00	0.00	0.00	16.08	0.26	2.41	2.01	0.00	3.17
Vehicles (HS 87)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Source: Author's calculation.

Table 3: Extensive Margin in terms of New Market (share in the world market)

	Total			Asia			East Asia			Southeast Asia		
	2005_2007	2011_2013	2014_2016	2005_2007	2011_2013	2014_2016	2005_2007	2011_2013	2014_2016	2005_2007	2011_2013	2014_2016
Total	2.70	7.79	3.39	3.18	7.92	3.72	0	1.86	0	5.21	8.15	0
Agriculture (HS 0-21)	9.34	13.48	4.41	6.81	13.68	4.40	0	12.70	0	12.93	14.10	0
Manufacturing (HS 28-98)	2.21	7.33	3.24	2.91	7.46	3.63	0	1.07	0	4.79	7.69	0
Fish and crustaceans (HS03)	2.27	10.97	7.97	2.98	11.07	7.97	0	7.07	0	0.72	11.54	0
Edigible vegetables and fruits (HS0708)	0.83	12.94	0.11	0.86	12.95	0.10	0	2.30	0	1.96	13.01	0
Preparations of meats, fish and crustaceans (HS16)	36.17	33.12	34.13	37.27	32.99	5.30	0	2.45	0	12.46	27.25	0
Preparations of vegetables, Fruits (HS20)	5.39	16.57	0.64	5.74	22.21	0.55	0	4.57	0	11.38	17.48	0
Products of Chemicals (HS 28-38)	2.01	7.90	0.03	3.15	8.00	0.01	0	1.16	0	6.76	8.11	0
Plastics and rubber (HS39-40)	3.19	12.53	4.16	3.88	12.76	1.21	0	1.53	0	9.15	13.58	0
Textile (HS 50-60)	3.87	4.31	3.65	5.31	4.30	3.25	0	1.19	0	5.61	4.36	0
Apparel andclothing accessories (HS 61-62)	1.20	2.14	4.42	2.03	2.54	4.55	0	1.44	0	6.04	2.56	0
Electronics (HS 84-85)	1.60	6.07	1.89	2.12	6.19	1.79	0	1.23	0	2.68	6.51	0
Vehicles (HS 87)	4.77	31.88	11.84	7.98	33.98	11.91	0	1.77	0	40.11	35.69	0

	South Asia			Latin			Africa			Others		
	2005_2007	2011_2013	2014_2016	2005_2007	2011_2013	2014_2016	2005_2007	2011_2013	2014_2016	2005_2007	2011_2013	2014_2016
Total	2.23	0	0	0.61	0	0	4.01	3.96	1.16	1.34	3.89	3.40
Agriculture (HS 0-21)	0.41	0	0	3.78	0	0	17.96	8.19	5.04	6.38	11.13	3.43
Manufacturing (HS 28-98)	2.79	0	0	0.56	0	0	1.78	1.30	0.62	1.10	2.99	3.39
Fish and crustaceans (HS03)	1.15	0	0	1.01	0	0	0.76	0	0	1.28	2.38	0.00
Edigible vegetables and fruits (HS0708)	0.89	0	0	0.05	0	0	2.61	61.82	0	0.65	1.20	5.20
Preparations of meats, fish and crustaceans (HS16)	2.05	0	0	35.36	0	0	37.23	0.50	4.17	33.67	33.60	57.90
Preparations of vegetables, Fruits (HS20)	3.26	0	0	2.75	0	0	2.14	6.42	0	6.99	6.35	3.75
Products of Chemicals (HS 28-38)	1.07	0	0	0.45	0	0	0.77	0.98	0.11	0.15	1.61	1.03
Plastics and rubber (HS39-40)	5.59	0	0	1.33	0	0	3.53	12.92	8.08	2.32	3.72	4.44
Textile (HS 50-60)	12.85	0	0	1.63	0	0	3.21	3.51	6	1.18	5.33	2.19
Apparel andclothing accessories (HS 61-62)	16.28	0	0	0.17	0	0	1.72	0.67	3.01	0.63	0.05	5.65
Electronics (HS 84-85)	4.20	0	0	0.25	0	0	0.56	0.26	0.63	1.04	1.98	5.11
Vehicles (HS 87)	3.73	0	0	0.92	0	0	2.15	0.17	0.03	2.64	4.64	8.18

Note: Intensive defined in terms of their share in the world market.
Source: Author's calculation.

Table 4: Data for Econometric Analysis, 2002-2016

Total	Obs	Mean	Std. Dev.	Min	Max	Textile and Apparel	Obs	Mean	Std. Dev.	Min	Max
lnGDPgrowth	555	0.04	0.13	-0.28	2.06	lnGDPgrowth	45	-0.01	0.08	-0.23	0.25
lnGini	535	-0.33	0.25	-2.15	-0.03	lnGini	40	-0.30	0.12	-0.66	-0.11
lnHHI	535	-1.68	0.81	-4.39	0.00	lnHHI	40	-2.62	0.85	-4.39	-1.34
lnTheil	535	0.11	0.58	-3.49	1.27	lnTheil	40	0.11	0.32	-0.74	0.72
lnintensive (Theil)	428	0.08	0.69	-4.94	1.26	lnintensive (Theil)	32	0.10	0.32	-0.65	0.69
lnextensive (Theil)	428	0.03	0.07	0.00	0.47	lnextensive (Theil)	32	0.02	0.03	0.00	0.09
lninitialincome	555	8.85	1.78	1.10	12.51	lninitialincome	45	9.22	1.33	7.40	11.69
lnintensive (share in the world market)	432	-4.48	1.22	-9.43	-1.61	lnintensive (share in the world market)	32	-4.13	0.53	-5.10	-3.09
lnextensive_product (share in the world market)	432	-1.17	2.44	-10.81	0.00	lnextensive_product (share in the world market)	32	-1.32	2.28	-7.25	0.00
lnextensive_market (share in the world market)	432	-4.16	2.05	-11.21	0.00	lnextensive_market (share in the world market)	32	-3.62	1.70	-9.73	0.00
lnexports (share in GDP)	555	-0.98	1.62	-7.83	5.84	lnexports (share in GDP)	40	-0.79	0.67	-1.94	0.32
lnimports (share in GDP)	555	-1.11	2.05	-7.88	6.52	lnimports (share in GDP)	40	-1.72	1.19	-4.30	0.16
Processed food						**Electronics**					
lnGDPgrowth	65	0.03	0.10	-0.17	0.70	lnGDPgrowth	130	0.06	0.10	-0.28	0.34
lnGini	65	-0.29	0.31	-1.37	-0.03	lnGini	130	-0.30	0.19	-0.94	-0.05
lnHHI	65	-1.15	0.52	-2.05	-0.21	lnHHI	130	-1.73	0.61	-2.96	-0.32
lnTheil	65	0.28	0.72	-1.99	1.27	lnTheil	130	0.19	0.49	-1.31	1.04
lnintensive (Theil)	52	0.27	0.74	-1.99	1.26	lnintensive (Theil)	104	0.17	0.53	-1.44	1.09
lnextensive (Theil)	52	0.04	0.08	0.00	0.28	lnextensive (Theil)	104	0.02	0.07	0.00	0.44
lninitialincome	65	9.55	0.91	6.74	10.89	lninitialincome	130	8.20	2.21	1.10	12.51
lnintensive (share in the world market)	52	-3.29	1.03	-4.95	-1.61	lnintensive (share in the world market)	104	-4.56	0.91	-8.41	-2.99
lnextensive_product (share in the world market)	52	-1.82	2.89	-9.04	0.00	lnextensive_product (share in the world market)	104	-0.98	2.37	-10.81	0.00
lnextensive_market (share in the world market)	52	-3.72	1.90	-8.25	0.00	lnextensive_market (share in the world market)	104	-4.53	1.95	-9.91	0.00
lnexports (share in GDP)	65	-1.27	0.80	-2.97	-0.11	lnexports (share in GDP)	130	-0.11	1.40	-3.42	5.84
lnimports (share in GDP)	65	-2.71	1.68	-7.88	-0.27	lnimports (share in GDP)	130	0.35	1.60	-3.04	5.81
Chemical, plastic and rubber						**Electronics and Motor Vehicles**					
lnGDPgrowth	80	0.03	0.06	-0.11	0.24	lnGDPgrowth	150	0.06	0.11	-0.28	0.60
lnGini	80	-0.29	0.16	-0.85	-0.06	lnGini	150	-0.32	0.20	-0.94	-0.05
lnHHI	80	-1.99	0.73	-3.42	-0.46	lnHHI	150	-1.73	0.59	-2.96	-0.32
lnTheil	80	0.19	0.44	-1.13	1.08	lnTheil	150	0.13	0.51	-1.31	1.04
lnintensive (Theil)	64	0.17	0.46	-1.15	1.08	lnintensive (Theil)	120	0.11	0.55	-1.44	1.09
lnextensive (Theil)	64	0.05	0.09	0.00	0.32	lnextensive (Theil)	120	0.02	0.07	0.00	0.44
lninitialincome	80	9.89	0.84	8.03	11.69	lninitialincome	150	8.44	2.20	1.10	12.51
lnintensive (share in the world market)	64	-4.11	1.02	-6.82	-1.92	lnintensive (share in the world market)	120	-4.51	0.94	-8.41	-2.38
lnextensive_product (share in the world market)	64	-1.50	2.64	-9.52	0.00	lnextensive_product (share in the world market)	120	-0.85	2.23	-10.81	0.00
lnextensive_market (share in the world market)	64	-4.29	2.18	-11.21	0.00	lnextensive_market (share in the world market)	120	-4.40	2.04	-9.91	0.00
lnexports (share in GDP)	75	-1.23	1.04	-3.53	0.44	lnexports (share in GDP)	150	-0.23	1.45	-3.86	5.84
lnimports (share in GDP)	75	-1.42	1.99	-6.73	2.06	lnimports (share in GDP)	150	0.10	1.75	-3.43	5.81

Source: Author's compilation

Table 5: Results of Total Industries, 2002-16

Variables	A	B	C	D	E	F	G	H	I	J	K
lnGDPgrowt(t-1)	-0.165***	-0.164***	-0.164***	-0.162***	-0.162***	-0.163***	-0.164***	-0.164***	-0.161***	-0.163***	-0.166***
	(0.033)	(0.033)	(0.030)	(0.032)	(0.030)	(0.033)	(0.032)	(0.031)	(0.028)	(0.035)	(0.035)
lnexports (share in GDP)	0.093**	0.092**	0.068*	0.087***	0.095***	0.082**	0.091***	0.095***	0.102***	0.094***	0.138*
	(0.037)	(0.039)	(0.036)	(0.033)	(0.033)	(0.038)	(0.024)	(0.036)	(0.039)	(0.036)	(0.081)
lnimports (share in GDP)	-0.108***	-0.105***	-0.120***	-0.105***	-0.108***	-0.102***	-0.107***	-0.108***	-0.110***	-0.102***	-0.107***
	(0.037)	(0.030)	(0.037)	(0.035)	(0.037)	(0.0363)	(0.036)	(0.037)	(0.037)	(0.035)	(0.040)
lninitialincome	-0.320***	-0.317***	-0.319***	-0.318***	-0.317***	-0.318***	-0.319***	-0.318***	-0.313***	-0.320***	-0.308***
	(0.031)	(0.030)	(0.030)	(0.030)	(0.031)	(0.029)	(0.031)	(0.031)	(0.031)	(0.028)	(0.034)
lnHHI	-0.040	0.004	-0.057*								
	(0.030)	(0.049)	(0.034)								
lnHHI^2		0.013									
		(0.014)									
lnHHI_exports			-0.013								
			(0.014)								
lnGini				-0.173**	-0.350*	-0.119					
				(0.086)	(0.197)	(0.231)					
lnGini^2					-0.087						
					(0.062)						
lnGini_exports						0.014					
						(0.054)					
lnTheil							-0.079*	-0.096	-0.129**		
							(0.046)	(0.06)	(0.058)		
lnTheil^2								-0.009			
								(0.011)			
lnTheil_exports									-0.020		
									(0.016)		
lnintensive (Theil)										-0.031	
										(0.028)	
lnextensive (Theil)										-0.199*	
										(0.123)	
lnintensive (INit)											-0.056
											(0.059)
lnextensive_product (EXit)											0.002
											(0.003)
lnextensive_market (EXMit)											0.003
											(0.003)
constant	2.927***	2.935***	2.848***	2.927***	2.877***	2.943***	3.001***	3.004***	2.949***	3.014***	2.680***
	(0.274)	(0.278)	(0.254)	(0.277)	(0.276)	(0.258)	(0.289)	(0.291)	(0.282)	(0.293)	(0.3400)
Observations	424	424	424	424	424	424	424	424	424	424	428
Dummy year	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Dummy industry	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Wald chi2	314.740	333.250	345.36	317.240	310.920	356.03	313.68	301.97	317.76	295.31	301.97
Prob > chi2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
AR (2)	1.184	1.095	0.740	0.932	1.160	0.942	1.064	1.182	0.966	1.192	1.233
Prob > Z	0.236	0.273	0.459	0.351	0.246	0.346	0.287	0.237	0.334	0.233	0.218
Sargan test	17.930	17.598	24.251	19.703	19.033	23.249	18.648	18.328	22.213	17.978	13.712
Prob > chi2	0.266	0.284	0.231	0.184	0.212	0.079	0.230	0.246	0.329	0.264	0.548

Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1
Source: Author's estimations

Table 6: Results of Processed Food Industries, 2002-16

Variables	A	B	C	D	E	F	G	H	I	J	K
lnGDPgrowt(t-1)	-0.005	0.013	0.201	0.023	0.053	0.180	0.009	0.044	0.139	-0.002	0.053
	(0.192)	(0.195)	(0.1544)	(0.192)	(0.183)	(0.149)	(0.190)	(0.183)	(0.154)	(0.184)	(0.173)
lnexports (share in GDP)	0.033	0.036	0.591***	0.021	0.040	0.124	0.026	0.044	-0.039	0.012	-0.009
	(0.078)	(0.076)	(0.190)	(0.772)	(0.062)	(0.097)	(0.078)	(0.066)	(0.055)	(0.073)	(0.053)
lnimports (share in GDP)	0.044	0.045	-0.061	0.068	-0.017	0.086	0.055	-0.013	-0.021	-0.324***	0.010
	(0.169)	(0.154)	(0.944)	(0.164)	(0.102)	(0.146)	(0.173)	(0.115)	(0.077)	(0.107)	(0.150)
lninitialincome	-0.343***	-0.346***	-0.402***	-0.357***	-0.393***	-0.455***	-0.348***	0.386***	-0.432***		-0.368***
	(0.124)	(0.131)	(0.105)	(0.111)	(0.107)	(0.064)	(0.115)	(0.113)	(0.085)		(0.111)
lnHHI	0.033	0.276	0.553*								
	(0.115)	(0.370)	(0.181)								
lnHHI^2		0.099									
		(0.123)									
lnHHI_exports			0.337***								
			(0.115)								
lnGini				0.801	-0.040	2.032***					
				(0.544)	(1.094)	(0.455)					
lnGini^2					-0.591						
					(0.473)						
lnGini_exports						0.546***					
						(0.156)					
lnTheil							0.190	0.128	0.450*		
							(0.221)	(0.192)	(0.273)		
lnTheil^2								-0.144			
								(0.072)			
lnTheil_exports									0.116***		
									(0.031)		
lnintensive (Theil)										0.248*	
										(0.166)	
lnextensive (Theil)										-0.606**	
										(0.263)	
lnintensive (INit)											0.113***
											(0.059)
lnextensive_product (EXit)											0.013**
											(0.060)
lnextensive_market (EXMit)											-0.002
											(0.007)
constant	3.532***	3.660***	4.989***	4.148***	3.944***	5.556***	3.649***	3.820***	4.326***	3.493***	4.188***
	(1.415)	(1.113)	(1.258)	(1.325)	(1.292)	(0.783)	(1.184)	(1.420)	(1.306)	(1.018)	(1.277)
Observations	52	52	52	52	52	52	52	52	52	52	52
Dummy year	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Dummy industry	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Wald chi2	181.70	137.74	957.57	1670.78	852.77	865.39	499.94	161.32	3577.24	209.98	2744.40
Prob > chi2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
AR (2)	0.522	0.411	0.223	1.063	1.317	0.416	0.892	1.333	0.266	0.992	0.530
Prob > Z	0.602	0.681	0.8237	0.288	0.188	0.677	0.372	0.183	0.790	0.321	0.596
Sargan test	17.704	16.611	12.029	18.516	19.787	15.274	18.094	18.998	20.540	18.212	16.695
Prob > chi2	0.279	0.343	0.677	0.237	0.180	0.432	0.257	0.213	0.718	0.252	0.337

Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1
Source: Author's estimations

Table 7: Results of Chemicals, Plastics and Rubber, 2002-16

Variables	A	B	C	D	E	F	G	H	I	J	K
lnGDPgrowt(t-1)	-0.192	-0.229	-0.227**	-0.381***	-0.368**	-0.384**	-0.332**	-0.317**	-0.336**	-0.243**	-0.393*
	(0.140)	(0.148)	(0.115)	(0.147)	(0.162)	(0.155)	(0.150)	(0.158)	(0.160)	(0.109)	(0.209)
lnexports (share in GDP)	0.140	0.162	0.286**	0.227***	0.232**	0.220***	0.249**	0.240**	0.257**	0.147**	0.093
	(0.121)	(0.137)	(0.139)	(0.087)	(0.101)	(0.075)	(0.108)	(0.118)	(0.115)	(0.061)	(0.122)
lnimports (share in GDP)	-0.034	-0.036	-0.081**	-0.174***	-0.157***	-0.166***	-0.128**	-0.120**	-0.123**	-0.085***	-0.180**
	(0.056)	(0.050)	(0.037)	(0.059)	(0.058)	(0.057)	(0.053)	(0.493)	(0.048)	(0.024)	(0.080)
lninitialincome	-0.503***	-0.477***	-0.475***	-0.508***	-0.498***	-0.505***	-0.526***	-0.527***	-0.525***	-0.413***	-0.450***
	(0.100)	(0.079)	(0.962)	(0.093)	(0.087)	(0.089)	(0.953)	(0.094)	(0.094)	(0.079)	(0.123)
lnHHI	-0.191**	-0.223	-0.125**								
	(0.083)	(0.226)	(0.058)								
lnHHI^2		-0.007									
		(0.036)									
lnHHI_exports			-0.053**								
			(0.026)								
lnGini				-1.264***	-2.031**	-1.512**					
				(0.367)	(1.012)	(0.640)					
lnGini^2					-0.663						
					(0.637)						
lnGini_exports						-0.067					
						(0.139)					
lnTheil							-0.524***	-0.524***	-0.560***		
							(0.154)	(0.179)	(0.207)		
lnTheil^2								-0.015			
								(0.058)			
lnTheil_exports									-0.014		
									(0.041)		
lnintensive (Theil)										-0.308***	
										(0.081)	
lnextensive (Theil)										-1.159***	
										(0.213)	
lnintensive (INit)											-0.027
											(0.079)
lnextensive_product (EXit)											0.001
											(0.004)
lnextensive_market (EXMit)											-0.009**
											(0.004)
constant	4.848***	5.090***	4.598***	4.411***	4.318***	4.603***	5.153***	5.315***	5.144***	4.104***	4.093***
	(0.720)	(1.000)	(0.882)	(0.804)	(0.792)	(0.889)	(1.058)	(0.851)	(1.049)	(0.766)	(0.879)
Observations	40	40	40	40	40	40	40	40	40	40	40
Dummy year	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Dummy industry	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Wald chi2	690.34	400.90	600.05	56.15	57.01	52.39	151.46	135.33	78.93	1129.00	189.05
Prob > chi2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
AR (2)	0.590	0.435	-0.229	0.352	-0.082	0.441	0.227	0.263	0.170	0.626	-0.262
Prob > Z	0.555	0.664	0.819	0.725	0.934	0.659	0.820	0.793	0.865	0.531	0.794
Sargan test	6.786	6.652	6.689	4.308	4.001	4.163	4.095	3.854	3.749	4.747	6.367
Prob > chi2	0.963	0.967	0.966	0.997	0.998	0.997	0.997	0.998	0.999	0.994	0.973

Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1
Source: Author's estimations

Table 8: Results of Textiles and Apparel Industries, 2002-16

Variables	A	B	C	D	E	F	G	H	I	J	K
lnGDPgrowt(t-1)	-0.284	-0.267	-0.333*	-0.296	-0.392*	-0.260	-0.291	-0.397*	-0.274	-0.339*	-0.415**
	(0.212)	(0.189)	(0.206)	(0.241)	(0.222)	(0.225)	(0.230)	(0.214)	(0.219)	(0.193)	(0.181)
lnexports (share in GDP)	-0.114**	-0.158**	0.120	-0.158***	-0.154***	-0.326***	-0.129***	-0.141***	-0.097***	-0.100*	-0.195***
	(0.045)	(0.077)	(0.087)	(0.040)	(0.026)	(0.079)	(0.033)	(0.027)	(0.027)	(0.059)	(0.053)
lnimports (share in GDP)	-0.100*	-0.081*	-0.132**	-0.100*	-0.123**	-0.099*	-0.101*	-0.120**	-0.105*	-0.092*	-0.062
	(0.053)	(0.051)	(0.054)	(0.053)	(0.053)	(-0.052)	(0.056)	(0.055)	(0.057)	(0.057)	(0.044)
lninitialincome	-0.243***	-0.220***	-0.266***	-0.239***	-0.228***	-0.236***	-0.244***	-0.230***	-0.251***	-0.230***	
	(0.062)	(0.063)	(0.065)	(0.056)	(0.060)	(0.055)	(0.064)	(0.065)	(0.066)	(0.063)	
lnHHI	0.024	0.378*	0.160								
	(0.082)	(0.226)	(0.111)								
lnHHI^2		0.095*									
		(0.052)									
lnHHI_exports			0.080**								
			(0.033)								
lnGini				-0.421	1.956**	-0.458					
				(0.266)	(0.950)	(0.291)					
lnGini^2					2.389***						
					(0.907)						
lnGini_exports						-0.590***					
						(0.172)					
lnTheil							-0.039	0.099	-0.024		
							(0.145)	(0.138)	(0.176)		
lnTheil^2								0.342***			
								(0.094)			
lnTheil_exports									-0.156***		
									(-0.033)		
lnintensive (Theil)										0.124	
										(0.193)	
lnextensive (Theil)										-0.995	
										(0.723)	
lnintensive (INit)											0.112**
											(0.057)
lnextensive_product (EXit)											0.013**
											(0.006)
lnextensive_market (EXMit)											0.006
											(0.006)
constant	1.388***	1.558***	1.769***	1.094***	1.590***	1.093***	1.277***	1.233***	1.355***	1.319***	2.444***
	(0.654)	(0.709)	(0.559)	(0.595)	(0.618)	(0.572)	(0.536)	(0.456)	(0.515)	(0.393)	(0.766)
Observations	32	32	32	32	32	32	32	32	32	32	32
Dummy year	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Dummy industry	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Wald chi2	194.30	99.88	99.37	31.42	68.45	214.94	429.95	149.35	955.87	73.85	177.75
Prob > chi2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
AR (2)	-1.074	-1.384	-0.707	-1.289	-0.669	-1.115	-1.190	-0.538	-0.900	-1.273	-0.738
Prob > Z	0.283	0.166	0.479	0.197	0.504	0.265	0.234	0.591	0.368	0.203	0.460
Sargan test	10.629	10.693	7.558	9.093	7.871	9.148	9.941	8.768	9.537	8.198	6.000
Prob > chi2	0.778	0.774	0.940	0.873	0.929	0.870	0.824	0.889	0.848	0.916	0.998

Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1
Source: Author's estimations

Table 9: Results of Electronics and Electrical Appliance Industries, 2002-16

Variables	A	B	C	D	E	F	G	H	I	J	K
lnGDPgrowt(t-1)	-0.184*	-0.241**	-0.182*	-0.170*	-0.203*	-0.204*	-0.161*	-0.113	-0.168	-0.167*	-0.301***
	(0.098)	(0.100)	(0.114)	(0.098)	(0.108)	(0.115)	(0.096)	(0.095)	(0.109)	(0.096)	(0.100)
lnexports (share in GDP)	-0.053	-0.043	-0.044	-0.047	0.001	0.003	-0.052	-0.026	-0.032	-0.059*	-0.186***
	(0.038)	(0.038)	(0.034)	(0.038)	(0.034)	(0.041)	(0.037)	(0.032)	(0.035)	(0.034)	(0.048)
lnimports (share in GDP)	-0.151**	-0.154***	-0.123**	-0.108*	-0.163**	-0.137**	-0.112*	-0.081	-0.117**	-0.105*	-0.059
	(0.065)	(0.056)	(0.061)	(0.060)	(0.661)	(0.067)	(0.063)	(0.060)	(0.059)	(0.062)	(0.051)
lninitialincome	-0.304***	-0.310***	-0.264***	-0.291***	-0.309***	-0.305***	-0.292***	-0.277***	-0.294***	-0.288***	-0.296**
	(0.037)	(0.035)	(0.039)	(0.038)	(0.037)	(0.037)	(0.037)	(0.038)	(0.036)	(0.036)	(0.035)
lnHHI	-0.081*	-0.153	-0.083**								
	(0.043)	(0.124)	(0.039)								
lnHHI^2		-0.034									
		(0.032)									
lnHHI_exports			0.004								
			(0.016)								
lnGini				-0.294	-0.507	-0.298*					
				(0.194)	(0.545)	(0.182)					
lnGini^2					-0.242						
					(0.400)						
lnGini_exports						0.044					
						(0.090)					
lnTheil							-0.126	-0.139*	-0.041		
							(0.081)	(0.086)	(0.082)		
lnTheil^2								0.007			
								(0.071)			
lnTheil_exports									-0.011		
									(0.027)		
lnintensive (Theil)										-0.142*	
										(0.093)	
lnextensive (Theil)										-0.014	
										(0.154)	
lnintensive (INit)											0.173***
											(0.046)
lnextensive_product (EXit)											-0.003
											(0.007)
lnextensive_market (EXMit)											0.009*
											(0.005)
constant	2.595***	2.653***	2.238***	2.640***	2.683***	2.661***	2.789***	2.524***	2.709***	2.666***	3.568***
	(0.340)	(0.319)	(0.417)	(0.374)	(0.325)	(0.324)	(0.378)	(0.345)	(0.391)	(0.397)	(0.450)
Observations	104	104	104	104	104	104	104	104	104	104	104
Dummy year	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Dummy industry	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Wald chi2	1000.92	802.58	781.34	773.48	485.10	614.06	596.46	556.69	4063.71	9990.25	4118.18
Prob > chi2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
AR (2)	0.597	0.763	0.196	0.647	0.813	1.044	0.736	0.998	0.660	1.317	0.939
Prob > Z	0.551	0.446	0.845	0.518	0.416	0.297	0.462	0.318	0.510	0.188	0.348
Sargan test	18.839	20.532	29.466	24.146	18.961	21.755	24.057	29.808	28.454	19.470	25.162
Prob > chi2	0.532	0.153	0.389	0.236	0.216	0.114	0.240	0.232	0.287	0.427	0.240

Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1
Source: Author's estimations.

Table 10: Results of Electronics, Electrical Appliances and Motor vehicle Industries, 2002-16

Variables	A	B	C	D	E	F	G	H	I	J	K
lnGDPgrowt(t-1)	-0.232***	-0.276***	-0.187**	-0.210**	-0.178**	-0.269***	-0.246**	-0.245**	-0.221**	-0.209**	-0.358***
	(0.090)	(0.088)	(0.098)	(0.091)	(0.083)	(0.100)	(0.100)	(0.102)	(0.103)	(0.089)	(0.080)
lnexports (share in GDP)	-0.052	-0.017	-0.040	-0.054	-0.009	0.045	0.032	0.034	0.074	-0.052	-0.205***
	(0.046)	(0.043)	(0.039)	(0.044)	(0.033)	(0.037)	(0.036)	(0.035)	(0.052)	(0.042)	(0.065)
lnimports (share in GDP)	-0.186***	-0.204***	-0.144**	-0.128**	-0.110**	-0.227***	-0.226***	-0.230***	-0.228***	-0.161**	-0.106**
	(0.059)	(0.051)	(0.057)	(0.055)	(0.055)	(0.057)	(0.058)	(0.056)	(0.060)	(0.059)	(0.051)
lninitialincome	-0.331***	-0.348***	-0.324***	-0.317***	-0.304***	-0.352***	-0.354***	-0.355***	-0.359***	-0.321***	-0.311***
	(0.039)	0.039	(0.044)	(0.040)	(0.040)	(0.042)	(0.042)	(0.043)	(0.046)	(0.038)	(0.036)
lnHHI	-0.106**	-0.160	-0.068*								
	(0.049)	(0.133)	(0.040)								
lnHHI^2		-0.028									
		(0.034)									
lnHHI_exports			-0.018								
			(0.015)								
lnGini				-0.364*	-1.181**	-0.462***					
				(0.203)	(0.558)	(0.177)					
lnGini^2					-0.666						
					(0.444)						
lnGini_exports						0.049					
						(0.076)					
lnTheil							-0.151**	-0.139*	-0.154**		
							(0.066)	(0.079)	(0.064)		
lnTheil^2								0.030			
								(0.054)			
lnTheil_exports									-0.026		
									(0.023)		
lnintensive (Theil)										-0.220**	
										(0.106)	
lnextensive (Theil)										-0.126	
										(0.179)	
lnintensive (INit)											0.186***
											(0.057)
lnextensive_product (Exit)											0.004
											(0.004)
lnextensive_market (EXMit)											0.005
											(0.006)
constant	2.869***	2.905***	2.969***	2.913***	2.812***	3.117***	3.305***	3.314***	3.259***	3.208***	3.623***
	(0.396)	(0.378)	(0.433)	(0.405)	(0.468)	(0.399)	(0.413)	(0.422)	(0.421)	(0.430)	(0.488)
Observations	120	120	120	120	120	120	120	120	120	120	120
Dummy year	yes	yes	yes	yes	yes	yes	Yes	yes	Yes	yes	yes
Dummy industry	yes	yes	yes	yes	yes	yes	Yes	yes	Yes	yes	yes
Wald chi2	591.08	623.03	5384.95	663.45	794.94	463.68	606.37	620.32	541.74	1374.17	1828.71
Prob > chi2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
AR (2)	0.369	0.674	0.382	0.239	0.342	0.832	0.746	0.685	0.584	1.022	1.181
Prob > Z	0.712	0.500	0.702	0.811	0.733	0.405	0.456	0.493	0.559	0.307	0.238
Sargan test	18.447	18.918	27.657	28.791	31.498	18.321	15.844	15.584	14.127	17.385	14.384
Prob > chi2	0.558	0.218	0.324	0.092	0.173	0.246	0.393	0.410	0.516	0.564	0.497

Note: Our observations under ISIC 4 digits are not enough to analyse motor vehicles (ISIC 3410, 3420, 3430, 3591) per se. Thus, we include observations of automotive sector with electronic sector. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Source: Author's estimations

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Appendix I: Table Extensive Margin in terms of New Products (number of new products in each market)

	Total			Asia			East Asia			Southeast Asia			South Asia		
	2005_2007	2011_2013	2014_2016	2005_2007	2011_2013	2014_2016	2005_2007	2011_2013	2014_2016	2005_2007	2011_2013	2014_2016	2005_2007	2011_2013	2014_2016
Total	350	437	111	237	315	80	31	33	6	99	137	64	64	110	3
Agriculture (HS 0-21)	86	82	17	54	61	9	6	2	0	9	24	5	22	21	0
Manufacturing (HS 28-98)	264	355	94	183	254	71	25	31	6	90	113	59	42	89	3
Fish and crustaceans (HS03)	9	7	3	6	5	2	0	0	0	0	1	0	2	1	0
Edigible vegetables and fruits (HS0708)	6	13	0	5	5	0	1	1	0	0	0	0	4	2	0
Preparations of meats, fish and crustaceans (HS16)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Preparations of vegetables, Fruits (HS20)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Products of Chemicals (HS 28-38)	111	161	26	82	126	21	7	14	1	45	57	18	21	51	0
Plastics and rubber (HS39-40)	0	0	1	0	0	1	0	0	0	0	0	1	0	0	0
Textile (HS 50-60)	19	49	11	11	30	9	5	4	0	1	8	8	0	12	0
Apparel andclothing accessories (HS 61-62)	0	0	1	0	0	1	0	0	0	0	0	1	0	0	0
Electronics (HS 84-85)	27	5	8	20	3	4	1	0	0	11	3	4	4	0	0
Vehicles (HS 87)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

	EU28			USA			Latin			Africa			Others		
	2005_2007	2011_2013	2014_2016	2005_2007	2011_2013	2014_2016	2005_2007	2011_2013	2014_2016	2005_2007	2011_2013	2014_2016	2005_2007	2011_2013	2014_2016
Total	39	63	18	9	6	2	9	5	1	17	26	4	48	22	6
Agriculture (HS 0-21)	13	13	5	2	0	0	2	1	1	4	3	1	13	4	1
Manufacturing (HS 28-98)	26	50	13	7	6	2	7	4	0	13	23	3	35	18	5
Fish and crustaceans (HS03)	0	2	1	1	0	0	0	0	0	1	0	0	2	0	0
Edigible vegetables and fruits (HS0708)	1	7	0	0	0	0	0	0	0	0	1	0	0	0	0
Preparations of meats, fish and crustaceans (HS16)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Preparations of vegetables, Fruits (HS20)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Products of Chemicals (HS 28-38)	9	17	5	2	2	0	2	3	0	7	6	0	11	7	0
Plastics and rubber (HS39-40)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Textile (HS 50-60)	3	8	1	0	3	0	0	0	0	0	6	1	5	2	0
Apparel andclothing accessories (HS 61-62)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Electronics (HS 84-85)	2	1	0	1	0	0	1	0	0	1	1	1	3	0	3
Vehicles (HS 87)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Source: Author's calculation.

Appendix I (cont.): Table Extensive Margin in terms of New Markets (number of products in new markets)

	Total			Asia			East Asia			Southeast Asia		
	2005_2007	2011_2013	2014_2016	2005_2007	2011_2013	2014_2016	2005_2007	2011_2013	2014_2016	2005_2007	2011_2013	2014_2016
Total	16996	12187	615	8879	9706	136	0	532	0	2001	8651	0
Agriculture (HS 0-21)	1887	1322	128	1182	953	42	0	54	0	176	857	0
Manufacturing (HS 28-98)	15109	10865	487	7697	8753	94	0	478	0	1825	7794	0
Fish and crustaceans (HS03)	146	105	5	110	91	5	0	6	0	24	81	0
Edigible vegetables and fruits (HS0708)	307	188	19	248	152	9	0	5	0	13	140	0
Preparations of meats, fish and crustaceans (HS16)	152	74	9	72	45	3	0	4	0	7	38	0
Preparations of vegetables, Fruits (HS20)	327	204	21	159	122	7	0	15	0	30	96	0
Products of Chemicals (HS 28-38)	1043	1315	44	637	1135	11	0	32	0	255	1068	0
Plastics and rubber (HS39-40)	1233	795	52	586	610	7	0	45	0	153	508	0
Textile (HS 50-60)	1324	1054	34	757	859	8	0	16	0	211	812	0
Apparel andclothing accessories (HS 61-62)	1779	577	19	674	395	5	0	61	0	79	322	0
Electronics (HS 84-85)	3363	2474	111	1759	1997	15	0	112	0	417	1774	0
Vehicles (HS 87)	543	334	27	214	241	9	0	19	0	49	197	0

	South Asia			Latin			Africa			Others		
	2005_2007	2011_2013	2014_2016	2005_2007	2011_2013	2014_2016	2005_2007	2011_2013	2014_2016	2005_2007	2011_2013	2014_2016
Total	1501	0	0	1224	0	0	2174	250	68	4719	2231	411
Agriculture (HS 0-21)	349	0	0	84	0	0	176	63	11	445	306	75
Manufacturing (HS 28-98)	1152	0	0	1140	0	0	1998	187	57	4274	1925	336
Fish and crustaceans (HS03)	28	0	0	9	0	0	9	0	0	18	14	0
Edigible vegetables and fruits (HS0708)	88	0	0	8	0	0	3	3	0	48	33	10
Preparations of meats, fish and crustaceans (HS16)	16	0	0	5	0	0	23	2	1	52	27	5
Preparations of vegetables, Fruits (HS20)	31	0	0	23	0	0	44	14	0	101	68	14
Products of Chemicals (HS 28-38)	91	0	0	63	0	0	126	14	1	217	166	32
Plastics and rubber (HS39-40)	67	0	0	105	0	0	189	30	13	353	155	32
Textile (HS 50-60)	97	0	0	65	0	0	190	40	3	312	155	23
Apparel andclothing accessories (HS 61-62)	101	0	0	108	0	0	336	13	2	661	169	12
Electronics (HS 84-85)	263	0	0	286	0	0	414	37	11	904	440	85
Vehicles (HS 87)	30	0	0	60	0	0	87	10	2	182	83	16

Source: Author's calculation

Appendix II: Effects of Export Diversification on Economic Growth

Variables	A	B	C
lnGDPgrowt(t-1)	-0.156***	-0.152***	-0.152***
	(0.030)	(0.028)	(0.028)
lnexports (share in GDP)	0.091**	0.087**	0.088**
	(0.038)	(0.036)	(0.037)
lnimports (share in GDP)	-0.101***	-0.111***	-0.106***
	(0.037)	(0.037)	(0.037)
lninitialincome	-0.323***	-0.324***	-0.324***
	(0.029)	(0.028)	(0.029)
lnHHI	-0.005		
	(0.026)		
lnHHI_dumagrfood	0.076		
	(0.085)		
lnHHI_dumchemical	-0.143**		
	(0.067)		
lnHHI_dumtextile	0.234*		
	(0.122)		
lnHHI_dumelectonics	-0.078		
	(0.068)		
lnHHI_dumauto	-0.168*		
	(0.091)		
lnGini		-0.090**	
		(0.400)	
lnGini_dumagrfood		0.903***	
		(0.331)	
lnGini_dumchemical		-0.922**	
		(0.418)	
lnGini_dumtextile		0.991*	
		(0.575)	
lnGini_dumelectonics		-0.401*	
		(0.220)	
lnGini_dumauto		-0.503	
		(0.383)	
lnTheil			-0.030
			(0.027)
lnTheil_dumagrfood			0.267*
			(0.161)
lnTheil_dumchemical			-0.340***
			(0.127)
lnTheil_dumtextile			0.419*
			(0.228)
lnTheil_dumelectonics			-0.150
			(0.097)
lnTheil_dumauto			-2.690
			(0.186)
constant	3.026***	3.009***	3.037***
	(0.264)	(0.250)	(0.266)
Observations	424	424	424
Dummy year	yes	yes	yes
Dummy industry	yes	yes	yes
Wald chi2	352.08	448.11	397.25
Prob > chi2	0.000	0.000	0.000
AR (2)	0.543	1.03	0.957
Prob > Z	0.587	0.303	0.339
Sargan test	14.180	16.907	15.086
Prob > chi2	0.512	0.324	0.445

Note: lnHHI_dumagrfood is interaction term between diversification (HHI) and dummy variable of processed food sector (ISIC 1511-1549). lnHHI_dumchemical is interaction term between diversification (HHI) and dummy variable of chemical sector (ISIC 2320-2695). lnHHI_dumtextile is interaction term between diversification (HHI) and dummy variable of textile and apparel (ISIC 1711-1911). lnHHI_dumelectonics is interaction term between diversification (HHI) and dummy variable of electronic sector (ISIC 2911-3312). lnHHI_dumauto is interaction term between diversification (HHI) and dummy variable of automotive sector (ISIC 3410-30 and 3591). Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Source: Author's estimations