Export Diversification, Margins and Economic Growth at Industrial Level: Evidence from Thailand

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Introduction

- For many developing Asian economies including Thailand, 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

- It is argued that diversification helps reduce export instability as it provides a hedge against price variations and shocks in specific product markets

- Countries/firms that can produce many products with their comparative advantages have a high capability of absorbing or adapting to foreign technologies

- In theory, role of export diversification on productivity and growth **is underlined.**

- **Traditional trade theory**, particularly the Ricardian and/or Hecksher-Ohlin models, wherein **countries should specialize** and be actively concerned with factor accumulation, not diversification.

- **New trade theory** emphasizing firm heterogeneity tends to suggest a complex relationship between trade diversification and productivity

- 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**

- 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

- **Extensive margins** refer to expanding exports through creating new/higher quality products and/or developing new trading partners.

- Evenett and Venables (2002), Brenton and Newfarmer (2007); Cadot et.al. (2011) find that export diversification was mostly explained by intensive margins.

- expanding exports through such margins could create downside risks since a country/firm may overly rely on **a fixed basket of export products**

- Hummels and Klenow (2005), as well as Pham and Martin (2007), find that extensive margins (new products) are crucial

- 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.==

- 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.

Key objective of this study

- With the unclear solutions about the role of diversifications and margins, this study aims to examine the impact of export diversification and margins on economic growth, using Thailand as a case study.

- Differences from other studies, mostly use cross-countries analysis, this study uses **industrial analysis** to take into account firm-heterogeneity (proposed by new trade theory)

- 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.

Facts about diversifications and Margins in Thailand

How to measure diversifications and margins

	Share of exports line i	
1) The Herfindahl index (*HHI*)	$$HHI_j = \frac{\sum_{i=1}^{n}\left(S_{ij}\right)^2 - 1/n}{1 - 1/n}$$	0 --- most diversified 1 --- most specialized
2) the Gini coefficient (*Gini*)	$$Gini_j = 1 - \sum_{i=1}^{n}\frac{\left(X_{ij} + X_{i-1,j}\right)}{n}$$	to calculate export share and then sort values in ascending order to calculate Cumulative exports Gini gives insight on the skewness of products
3) The Theil's entropy index (Theil)	Share of exports line i $$Theil_j = \frac{1}{n}\sum_{i=1}^{n}\frac{X_{ij}}{\mu}\ln\left(\frac{X_{ij}}{\mu}\right)$$	The greater the index, the less diversified a country's exports.

The Theil's entropy index (Theil)

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

Where $\mu = \sum_{i=1}^{n}\left(X_{ij}/n\right)$

$$Theil_j = Theil_j^{W} + Theil_j^{B} \qquad \lim_{\mu_0\to 0} T^{B} = \ln\left(\frac{n}{n_1}\right)$$

Within = diversification arising from traditional

Between = diversification arising from exporting new products

- **Note that** Theil using count measures. <u>Treating low and high value products equally.</u> In fact, the implications of margins arising from low- and high-value products on (long-term) growth could be different (Hummels and Klenow, 2005).

$$IN_j = \frac{\sum_{i \in G_1} X_{ij}}{\sum_{i \in G_1} X_{iW}}$$

$$EX_j = \frac{\sum_{i \in G_2} X_{ij}}{\sum_{i \in G_2} X_{iW}}$$

$$EXM_j = \frac{\sum_{d=1}^{x} \sum_{k=1}^{n} g_k^{j,d}}{\sum_{d=1}^{x} \sum_{k=1}^{n} m_k^{d}}$$

The ==share of exports== in traditional products in the world market

The ==share of exports== in new products in the world market

The ==share of exports (traditional and new)== in the new market destinations

- We use trade data under the Harmonized System (HS) classification 2002 at 6 digits , which covers approximately 5,000 products and 200 export destinations per year during 2002-2017

Diversification and margins within Thai exports: first look
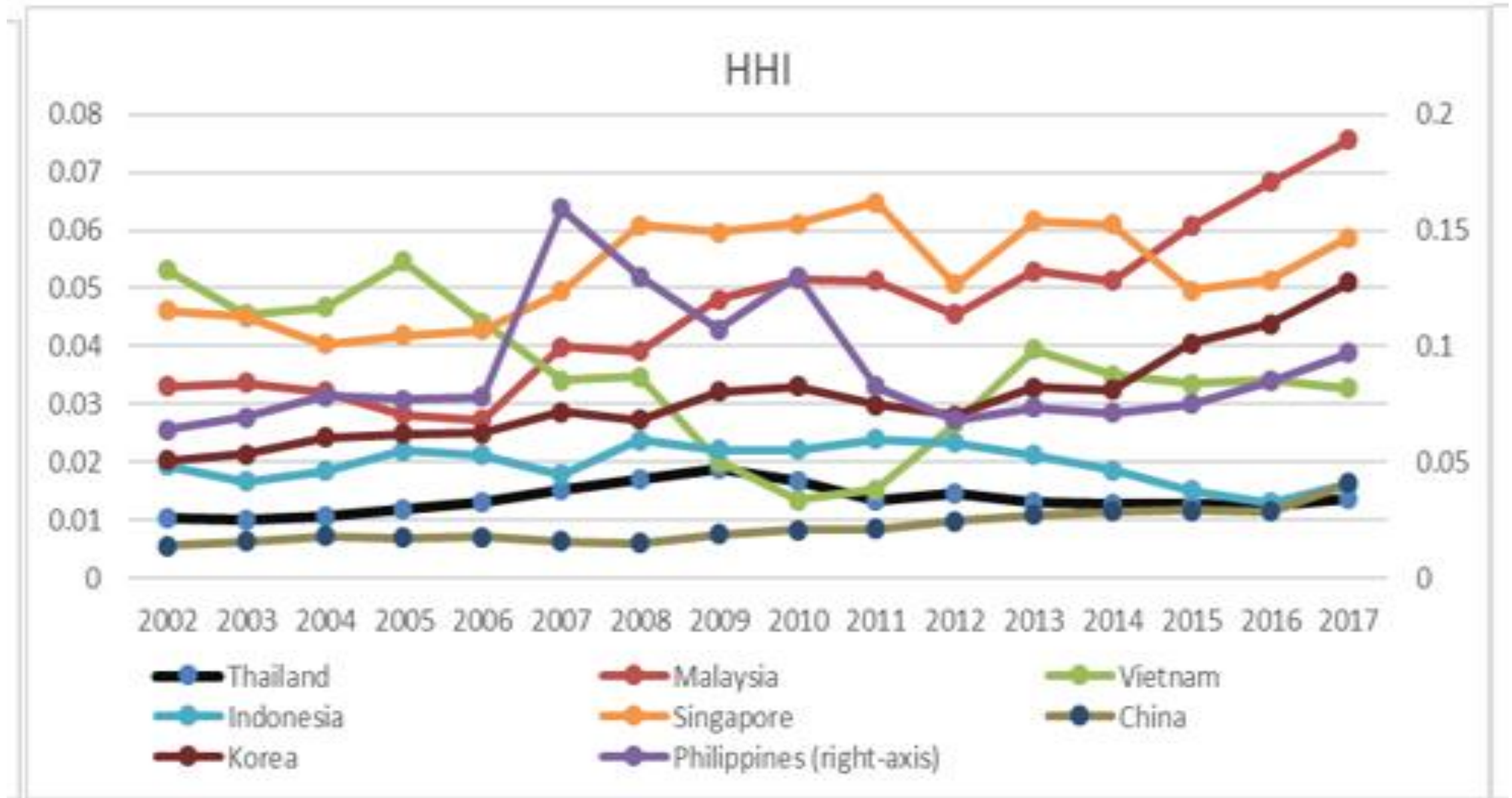

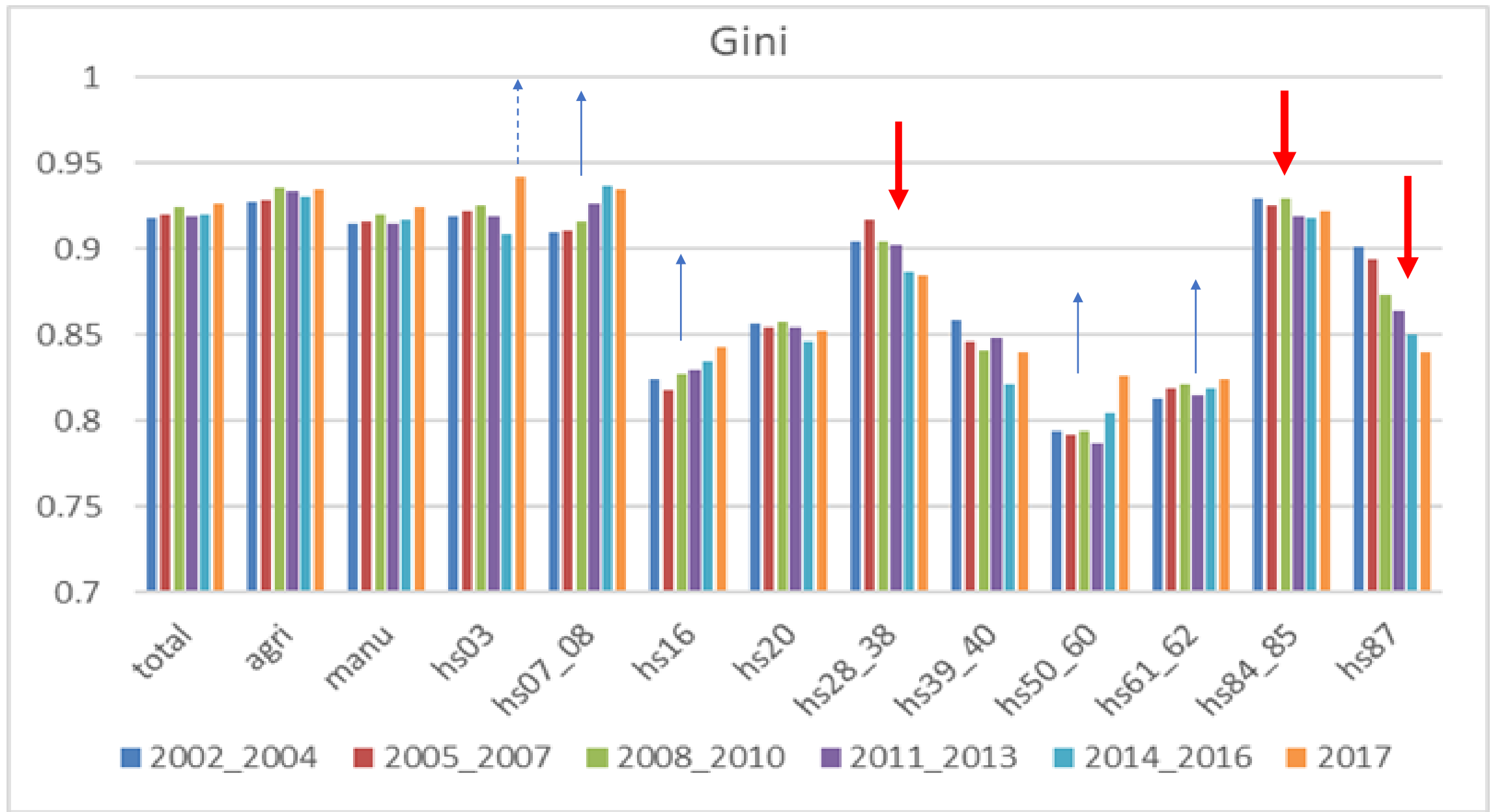Figure 1: Export Diversification in Thailand, 2002-17
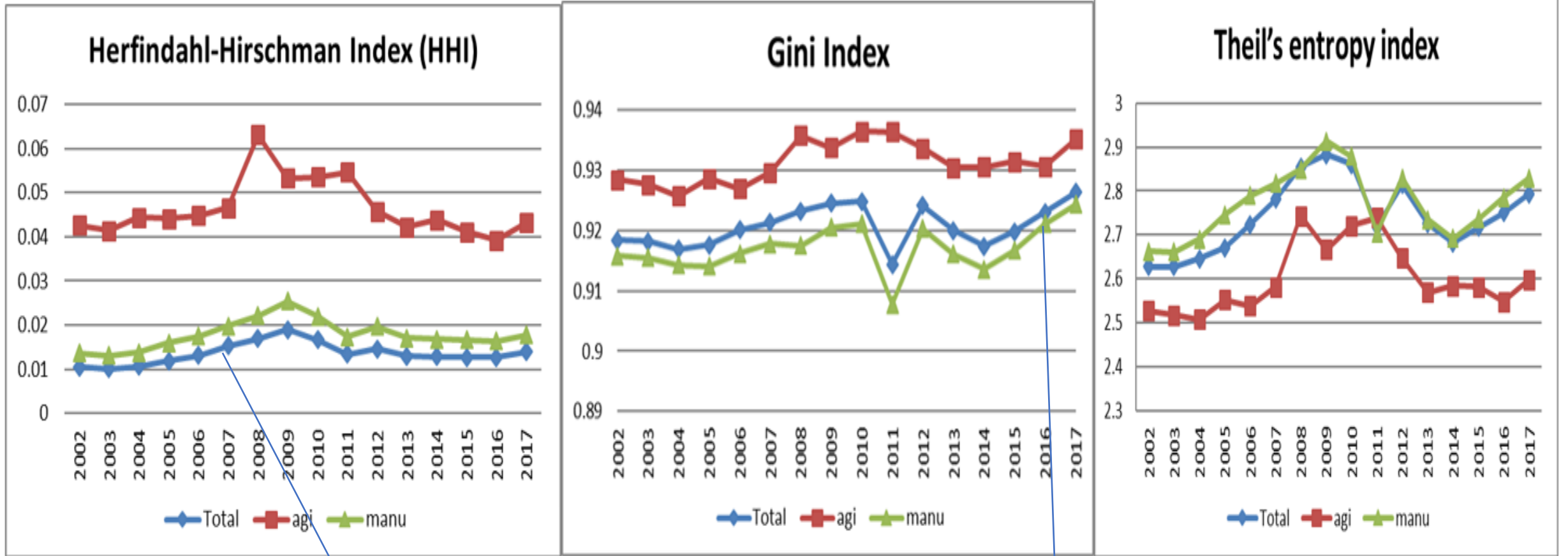
More concentrated

Digital integrated circuits

Comparing to other countries

Concentration by sector

- **Diversification come from intensive or extensive margins?**

A) Theil, intensive and extensive margins of Thailand

	Intensive margin			Extensive margin (Products)			Extensive margin (Markets)		
	2005-07	2011-13	2014-16	2005-07	2011-13	2014-16	2005-07	2011-13	2014-16
Total	**1.68**	**1.87**	**1.93**	**0.46**	**2.75**	**0.25**	**2.68**	**7.73**	**3.27**
Agriculture (HS 0-21)	**4.23**	**4.53**	**4.55**	**0.09**	**0.31**	**0.06**	**9.29**	**13.46**	**4.29**
Manufacturing (HS 28-98)	**1.63**	**1.87**	**1.87**	**0.53**	**5.19**	**0.27**	**2.25**	**8.21**	**3.28**
Fish and crustaceans (HS03)	5.12	4.55	2.95	2.62	0.03	0.06	2.27	10.97	5.80
Edible vegetables and Fruits (HS0708)	2.73	3.99	4.22	0.18	0.06	0.00	0.83	12.94	0.11
Preparations of meats, fish and crustaceans (HS16)	17.83	20.60	18.73	0.00	0.00	0.00	36.12	33.12	34.13
Prepartions of vegeatbles, fruits (HS20)	4.75	4.64	4.93	0.00	0.00	0.00	5.37	16.32	0.48
Products of Chemicals (HS 28-38)	0.89	1.25	1.13	0.21	10.79	0.12	1.99	7.42	0.02
Plastics and Rubber (HS 39-40)	3.25	4.53	3.93	0.00	0.00	5.35	3.17	12.43	3.61
Textile (HS 50-60)	1.71	2.29	1.87	0.15	10.78	2.00	3.80	4.30	2.14
Apparel and clothing accessories (HS 61-62)	1.42	1.01	0.88	0.00	0.00	57.92	1.32	2.67	4.05
Electronics (HS 84-85)	2.01	2.10	2.16	0.05	3.78	0.83	1.60	6.06	1.58
Vehicles (HS 87)	1.21	2.33	2.40	0.00	0.00	0.00	4.75	31.84	11.78

Intensive margin

	Thailand			Korea			China			Vietnam		
	2005-07	(2) 2011-13	(3) 2014-16	2005-07	(2) 2011-13	(3) 2014-16	2005-07	(2) 2011-13	(3) 2014-16	2005-07	(2) 2011-13	(3) 2014-16
Total	1.68	**1.87**	**1.93**	3.95	4.59	4.30	12.78	**15.45**	**17.61**	0.75	**1.25**	**1.87**
AgricultureHS (0-21)	4.23	**4.53**	**4.55**	1.06	1.18	1.02	7.01	6.48	6.46	2.96	**3.44**	**3.67**
HS03	5.12	4.55	2.95	2.00	2.48	1.92	11.58	12.83	12.92	5.17	6.27	6.69
Hs0708	2.73	3.99	4.22	1.06	0.73	0.56	6.85	8.31	7.76	2.33	3.65	4.26
HS16	17.83	20.60	18.73	1.26	0.97	0.90	19.41	16.72	14.81	3.91	4.82	7.19
อุตสาหกรรม HS (28-98)	1.63	**1.87**	**1.87**	3.99	4.67	4.47	14.01	**18.37**	**19.80**	0.52	**1.18**	**1.91**
กลุ่มเคมีภัณฑ์ HS (28-38)	0.89	1.25	1.13	2.47	3.20	3.08	4.72	7.27	8.00	0.18	0.31	0.39
กลุ่มพลาสติกและยาง HS (39-40)	3.25	4.53	3.93	4.58	5.84	5.66	8.30	11.36	13.08	0.48	0.87	0.98
กลุ่มสิ่งทอ HS (50-60)	1.71	2.29	1.87	5.45	5.64	5.33	21.67	28.47	31.19	50.90	2.51	3.39
กลุ่มเสื้อผ้า HS (61-62)	1.42	1.01	0.88	0.78	0.33	0.29	35.66	40.92	36.93	2.21	4.37	6.17
กลุ่มอิเลคโทรนิกส์ HS (84-85)	2.01	2.10	2.16	5.32	6.12	5.87	18.91	27.48	29.67	0.19	1.17	2.14
กลุ่มยายนต์ HS (87)	1.21	2.33	2.40	4.20	5.39	5.07	2.17	4.33	4.65	0.12	0.23	0.31

Extensive margin

	New products (% of world)			New markets (% of world)		
	2005-07	2011-13	2014-16	2005-07	2011-13	2014-16
Thai						
Total	0.45656	2.74539	0.25473	2.69682	7.79439	3.3889
Agriculture (0-21)	0.08802	0.31264	0.05883	9.34206	13.48372	4.41286
Manufacturing (28-98)	0.53217	5.19375	0.26533	2.25288	8.29417	3.39062
Korea						
Total	1.87342	2.54744	2.58745	4.7959	5.98296	7.94343
Agriculture (0-21)	0.07638	0.17108	0.11537	0.36227	2.81045	1.33691
Manufacturing (28-98)	11.33537	4.86537	9.40427	5.10344	5.86763	7.66063
China						
Total	1.70075	78.35346	0.90844	9.48624	12.60364	30.46276
Agriculture (0-21)	65.00393	79.175	0.05773	4.00633	5.86744	8.64722
Manufacturing (28-98)	2.49681	46.23093	41.13453	10.59056	15.03648	39.34651
Vietnam						
Total	0.2779	0.39548	0.47314	1.24751	3.35994	1.90456
Agriculture (0-21)	0.07712	0.08499	0.909	7.869	9.96032	5.01327
Manufacturing (28-98)	0.29402	0.42922	0.22887	0.31463	2.32307	0.2265
Malaysia						
Total	1.91164	2.35826	0.53585	2.67226	4.21225	0.65239
Agriculture (0-21)	0.04471	1.29747	0.04178	6.66117	4.59351	2.57263
Manufacturing (28-98)	0.56215	0.12948	1.05383	1.66404	2.67631	0.63563

Diversifications, Margins and Export Growth

Model applied

$$g_{it} = c_0 + c_1 Y_{it-1} + c_2 X_{it} + c_3 Diver_{it} + c_4 C_{it} + \eta_i + \varepsilon_{it} \qquad \text{(1)}$$

g_{it} is economic growth (real GDP) of sector i at time t. (three-year average)

In our empirical analysis, real GDP at the industry level is classified at 4-digit International Standard of Industrial Classification (ISIC) Rev 3.

$Diver_{it}$ is the export diversification of sector i at time t. --- Concordance matching HS code with 4-digit ISIC Rev.3

- Extend the model

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

$$g_{it} = c_0 + c_1 Y_{i,t-1} + c_2 X_{it} + c_3 Diver_{it} + c_4 X_{it} \cdot Diver_{it} + c_5 C_{it} + \eta_i + \varepsilon_{it} \qquad (3)$$

Measured by Theil

$$g_{it} = c_0 + c_1 Y_{i,t-1} + c_2 X_{it} + c_3 intensive_{it} + c_4 extensive_{it} + c_5 C_{it} + \eta_i + \varepsilon_{it} \qquad (4)$$

$$g_{it} = c_0 + c_1 Y_{i,t-1} + c_2 X_{it} + c_3 IN_{it} + c_4 EX_{it} + c_5 EXM_{it} + c_7 C_{it} + \eta_i + \varepsilon_{it} \qquad (5)$$

Measured by share in the world market

Results

	Total	Processed food	Textile and apparel	Chemical, plastics, rubbers	Electronics	Motor vehicles (+ electronics)
HHI	(-)	✓ (+)	✓ (+)	✓ (-)	✓ (-)	✓ (-)
Gini	✓ (-)	✓ (+)	✓ (+)	✓ (-)	✓ (-)	✓ (-)
Theil	✓ (-)	✓ (+)	✓ (+)	✓ (-)	✓ (-)	✓ (-)
HHI^2			✓ (+)			
Gini^2			✓ (+)			
Theil^2			✓ (+)			
HHI. Export		✓ (+)	✓ (+)	✓ (-)		
Gini. Export		✓ (+)	✓ (-)			
Theil . Export		✓ (+)	✓ (-)			

	Total	Processed food	Textile and apparel	Chemical, plastics, rubbers	Electronics	Motor vehicles (+ electronics)
Intensive (IN)	✓ (+)	✓ (+)	✓ (+)		✓ (+)	✓ (+)
Extensive_products		✓ (+)	✓ (+)			
Extensive_market				✓ (-)	✓ (+)	

Conclusions and inferences

- This paper investigates the relationship between **export diversification, export margins and economic growth** at the industry level during 2002-16 using Thailand as a case study.

- Three alternative measures (HHI, Gini, Theil) are used to proxy export diversification and we use two alternatives (Theil and share in the world market) to measure intensive and extensive margins.

- Our results show that industrial heterogeneity is important in analysing the impact of export diversification and export margins on economic growth.

- Export diversification helps to boost economic growth only in some industries, i.e. electronics, automotive and chemicals, plastics and rubber

- Specialization matters in promoting growth, i.e. processed food and textiles and apparel

- The expansion of intensive margins still plays an important role in boosting economic growth in key industries in Thailand.

- Extensive margins (new products) are found to be significant in promoting economic growth only in processed food and textiles and apparel

- Extensive margins (new market destinations) reveals a significance in boosting growth only in the electronics sector.

- Our analysis **points 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, to move up another level of income, Thailand needs to expand more extensive margin (especially in terms of new products)

    - Extensive margins should be promoted simultaneously with improving traditional products.

    - **Excess profit** as a result of enhancing competitiveness in traditional products could form the core **internal financial resource** to drive ventures into new products, new markets or both.

    - Proper trade and industrial policies, including Free Trade Agreements (FTAs) as well as innovation planning, would still be needed to support firms/industries