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

Juthathip Jongwanich
Faculty of Economics and Cluster of International Competitiveness
Thammasat University
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 unclear.

• 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

<table>
<thead>
<tr>
<th>Method</th>
<th>Formula</th>
<th>Explanation</th>
</tr>
</thead>
</table>
| 1) The Herfindahl index ($HHI$) | $HHI_j = \frac{\sum_{i=1}^{n} \left(S_{ij}^2\right)}{1-1/n} - 1/n$     | $0$ --- most diversified  
$1$ --- most specialized                                                                 |
| 2) the Gini coefficient ($Gini$) | $Gini_j = 1 - \frac{\sum_{i=1}^{n} \left(X_{ij} + X_{i-1,j}\right)}{n}$ | 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) | $Theil_j = \frac{1}{n} \sum_{i=1}^{n} \frac{X_{ij}}{\mu} \ln \left( \frac{X_{ij}}{\mu} \right)$ | The greater the index, the less diversified a country’s exports. |
The Theil’s entropy index (Theil)

\[ \text{Theil}_j = \frac{1}{n} \sum_{i=1}^{n} \frac{X_{ij}}{\mu} \ln \left( \frac{X_{ij}}{\mu} \right) \]

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

\[ \text{Theil}_j = \text{Theil}_j^W + \text{Theil}_j^B \]

Within = diversification arising from traditional
Between = diversification arising from exporting new products
• **Note that** Theil using count measures. Treating low and high value 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).

\[
IN_j = \frac{\sum_{i \in G^j} X_{ij}}{\sum_{i \in G^j} X_{iW}}
\]

\[
EX_j = \frac{\sum_{i \in G_j} X_{ij}}{\sum_{i \in G_j} X_{iW}}
\]

\[
EXM_j = \frac{\sum_{d=1}^{X} \sum_{h=1}^{n} g_{jd}}{\sum_{d=1}^{X} \sum_{h=1}^{n} m_{hd}}
\]

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

Herfindahl-Hirschman Index (HHI)

Gini Index

Theil’s entropy index

More concentrated

Digital integrated circuits
Comparing to other countries
Concentration by sector

Gini

- total
- agri
- manu
- hs03
- hs07_08
- hs16
- hs20
- hs28_38
- hs39_40
- hs50_60
- hs61_62
- hs84_85
- hs87

- 2002_2004
- 2005_2007
- 2008_2010
- 2011_2013
- 2014_2016
- 2017
• Diversification come from intensive or extensive margins?

A) Theil, intensive and extensive margins of Thailand

- 2005_2007
- 2008_2010
- 2011_2013
- 2014_2016
- 2017

- Theil
- Intensive
- Extensive
<table>
<thead>
<tr>
<th></th>
<th>Intensive margin</th>
<th>Extensive margin (Products)</th>
<th>Extensive margin (Markets)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total</strong></td>
<td>1.68 1.87 1.93</td>
<td>0.46 2.75 0.25</td>
<td>2.68 7.73 3.27</td>
</tr>
<tr>
<td><strong>Agriculture (HS 0-21)</strong></td>
<td>4.23 4.53 4.55</td>
<td>0.09 0.31 0.06</td>
<td>9.29 13.46 4.29</td>
</tr>
<tr>
<td><strong>Manufacturing (HS 28-98)</strong></td>
<td>1.63 1.87 1.87</td>
<td>0.53 5.19 0.27</td>
<td>2.25 8.21 3.28</td>
</tr>
<tr>
<td><strong>Fish and crustaceans (HS03)</strong></td>
<td>5.12 4.55 2.95</td>
<td>2.62 0.03 0.06</td>
<td>2.27 10.97 5.80</td>
</tr>
<tr>
<td><strong>Edible vegetables and Fruits (HS0708)</strong></td>
<td>2.73 3.99 4.22</td>
<td>0.18 0.06 0.00</td>
<td>0.83 12.94 0.11</td>
</tr>
<tr>
<td><strong>Preparations of meats, fish and crustaceans (HS16)</strong></td>
<td>17.83 20.60 18.73</td>
<td>0.00 0.00 0.00</td>
<td>36.12 33.12 34.13</td>
</tr>
<tr>
<td><strong>Preparations of vegetabes, fruits (HS20)</strong></td>
<td>4.75 4.64 4.93</td>
<td>0.00 0.00 0.00</td>
<td>5.37 16.32 0.48</td>
</tr>
<tr>
<td><strong>Products of Chemicals (HS 28-38)</strong></td>
<td>0.89 1.25 1.13</td>
<td>0.21 10.79 0.12</td>
<td>1.99 7.42 0.02</td>
</tr>
<tr>
<td><strong>Plastics and Rubber (HS 39-40)</strong></td>
<td>3.25 4.53 3.93</td>
<td>0.00 0.00 5.35</td>
<td>3.17 12.43 3.61</td>
</tr>
<tr>
<td><strong>Textile (HS 50-60)</strong></td>
<td>1.71 2.29 1.87</td>
<td>0.15 10.78 2.00</td>
<td>3.80 4.30 2.14</td>
</tr>
<tr>
<td><strong>Apparel and clothing accessories (HS 61-62)</strong></td>
<td>1.42 1.01 0.88</td>
<td>0.00 0.00 57.92</td>
<td>1.32 2.67 4.05</td>
</tr>
<tr>
<td><strong>Electronics (HS 84-85)</strong></td>
<td>2.01 2.10 2.16</td>
<td>0.05 3.78 0.83</td>
<td>1.60 6.06 1.58</td>
</tr>
<tr>
<td><strong>Vehicles (HS 87)</strong></td>
<td>1.21 2.33 2.40</td>
<td>0.00 0.00 0.00</td>
<td>4.75 31.84 11.78</td>
</tr>
<tr>
<td></td>
<td>Thailand</td>
<td>Korea</td>
<td>China</td>
</tr>
<tr>
<td>------------------</td>
<td>----------------</td>
<td>---------------</td>
<td>---------------</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>1.68</td>
<td>1.87</td>
<td>1.93</td>
</tr>
<tr>
<td>Agriculture HS (0-21)</td>
<td>4.23</td>
<td>4.53</td>
<td>4.55</td>
</tr>
<tr>
<td>HS03</td>
<td>5.12</td>
<td>4.55</td>
<td>2.95</td>
</tr>
<tr>
<td>Hs0708</td>
<td>2.73</td>
<td>3.99</td>
<td>4.22</td>
</tr>
<tr>
<td>HS16</td>
<td>17.83</td>
<td>20.60</td>
<td>18.73</td>
</tr>
<tr>
<td>อุตสากรรม HS (28-98)</td>
<td>1.63</td>
<td>1.87</td>
<td>1.87</td>
</tr>
<tr>
<td>กลุ่มเคมีภัณฑ์ HS (28-38)</td>
<td>0.89</td>
<td>1.25</td>
<td>1.13</td>
</tr>
<tr>
<td>กลุ่มผลิตสิ่งทอและยาง HS (39-40)</td>
<td>3.25</td>
<td>4.53</td>
<td>3.93</td>
</tr>
<tr>
<td>กลุ่มสิ่งทอ HS (50-60)</td>
<td>1.71</td>
<td>2.29</td>
<td>1.87</td>
</tr>
<tr>
<td>กลุ่มเสื้อผ้า HS (61-62)</td>
<td>1.42</td>
<td>1.01</td>
<td>0.88</td>
</tr>
<tr>
<td>กลุ่มอุตสาหกรรมยาง HS (84-85)</td>
<td>2.01</td>
<td>2.10</td>
<td>2.16</td>
</tr>
<tr>
<td>กลุ่มยานยนต์ HS (87)</td>
<td>1.21</td>
<td>2.33</td>
<td>2.40</td>
</tr>
</tbody>
</table>
# Extensive margin

<table>
<thead>
<tr>
<th>Region</th>
<th>New products (% of world)</th>
<th>New markets (% of world)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thai</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>0.45656</td>
<td>2.74539</td>
</tr>
<tr>
<td>Agriculture (0-21)</td>
<td>0.08802</td>
<td>0.31264</td>
</tr>
<tr>
<td>Manufacturing (28-98)</td>
<td>0.53217</td>
<td>5.19375</td>
</tr>
<tr>
<td>Korea</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>1.87342</td>
<td>2.54744</td>
</tr>
<tr>
<td>Agriculture (0-21)</td>
<td>0.07638</td>
<td>0.17108</td>
</tr>
<tr>
<td>China</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>1.70075</td>
<td>78.35346</td>
</tr>
<tr>
<td>Agriculture (0-21)</td>
<td>65.00393</td>
<td>79.175</td>
</tr>
<tr>
<td>Manufacturing (28-98)</td>
<td>2.49681</td>
<td>46.23093</td>
</tr>
<tr>
<td>Vietnam</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>0.2779</td>
<td>0.39548</td>
</tr>
<tr>
<td>Agriculture (0-21)</td>
<td>0.07712</td>
<td>0.08499</td>
</tr>
<tr>
<td>Manufacturing (28-98)</td>
<td>0.29402</td>
<td>0.42922</td>
</tr>
<tr>
<td>Malaysia</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>1.91164</td>
<td>2.35826</td>
</tr>
<tr>
<td>Agriculture (0-21)</td>
<td>0.04471</td>
<td>1.29747</td>
</tr>
<tr>
<td>Manufacturing (28-98)</td>
<td>0.56215</td>
<td>0.12948</td>
</tr>
</tbody>
</table>
Diversifications, Margins and Export Growth

Model applied

\[ g_{it} = c_0 + c_1 Y_{i,t-1} + c_2 X_{it} + c_3 Diver_{it} + c_4 C_{it} + \eta_i + \varepsilon_{it} \]  

where \( g_{it} \) 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

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

(2)

\[ g_{it} = c_0 + c_1 Y_{i,t-1} + c_2 X_{it} + c_3 \text{Diver}_{it} + c_4 \text{Diver}_{it} \cdot \text{Diver}_{it} + c_5 C_{it} + \eta_i + \varepsilon_{it} \]  

(3)

Measured by Theil

\[ g_{it} = c_0 + c_1 Y_{i,t-1} + c_2 X_{it} + c_3 \text{intensive}_{it} + c_4 \text{extensive}_{it} + c_5 C_{it} + \eta_i + \varepsilon_{it} \]  

(4)

\[ g_{it} = c_0 + c_1 Y_{i,t-1} + c_2 X_{it} + c_3 \text{IN}_{it} + c_4 \text{EX}_{it} + c_5 \text{EXM}_{it} + c_7 C_{it} + \eta_i + \varepsilon_{it} \]  

(5)

Measured by share in the world market
<table>
<thead>
<tr>
<th></th>
<th>Total</th>
<th>Processed food</th>
<th>Textile and apparel</th>
<th>Chemical, plastics, rubbers</th>
<th>Electronics</th>
<th>Motor vehicles (+ electronics)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HHI</td>
<td>(-)</td>
<td>✓ (+)</td>
<td>✓ (+)</td>
<td>✓ (-)</td>
<td>✓ (-)</td>
<td>✓ (-)</td>
</tr>
<tr>
<td>Gini</td>
<td>✓ (-)</td>
<td>✓ (+)</td>
<td>✓ (+)</td>
<td>✓ (-)</td>
<td>✓ (-)</td>
<td>✓ (-)</td>
</tr>
<tr>
<td>Theil</td>
<td>✓ (-)</td>
<td>✓ (+)</td>
<td>✓ (+)</td>
<td>✓ (-)</td>
<td>✓ (-)</td>
<td>✓ (-)</td>
</tr>
<tr>
<td>HHI^2</td>
<td></td>
<td>✓ (+)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gini^2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Theil^2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HHI. Export</td>
<td></td>
<td>✓ (+)</td>
<td>✓ (+)</td>
<td>✓ (-)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gini. Export</td>
<td></td>
<td>✓ (+)</td>
<td></td>
<td>✓ (-)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Theil . Export</td>
<td></td>
<td>✓ (+)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>Processed food</td>
<td>Textile and apparel</td>
<td>Chemical, plastics, rubbers</td>
<td>Electronics</td>
<td>Motor vehicles (+ electronics)</td>
</tr>
<tr>
<td>----------------------</td>
<td>-------</td>
<td>---------------</td>
<td>---------------------</td>
<td>-----------------------------</td>
<td>-------------</td>
<td>-------------------------------</td>
</tr>
<tr>
<td>Intensive (IN)</td>
<td>✓ (+)</td>
<td>✓ (+)</td>
<td>✓ (+)</td>
<td>✓ (+)</td>
<td>✓ (+)</td>
<td>✓ (+)</td>
</tr>
<tr>
<td>Extensive_products</td>
<td>✓ (+)</td>
<td>✓ (+)</td>
<td>✓ (+)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Extensive_market</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✓ (-)</td>
<td>✓ (+)</td>
</tr>
</tbody>
</table>
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