Global Engagement and Innovation Activities: The Case of Malaysian Manufacturing Firms

Lim Ee Shiang (Universiti Sains Malaysia)
Cassey Lee (ISEAS – Yusof Ishak Institute)

25 Feb 2022

Virtual Conference on Technology Transfer and Firm Competitiveness,
24 – 25 Feb 2022 (Tokyo Time)
Outline

1. Introduction
2. Research Questions & Objectives
3. The Analytical Framework & Methodology
4. The Results
5. Concluding Remark
1. Introduction

- Globalisation of business facilitates innovation and technology transfer
- Technological knowledge are acquired via engagement in global business activities - foreign investment, exporting, import of foreign inputs, and cross-border worker mobility
- Empirical studies in developed countries
  - Global engaged firms use more innovation input and generate more innovation output in developed countries.
  - Heterogeneity in innovation behavior observed across globally engaged firms in developed countries.
1. Introduction

- Mixed empirical evidence on the relationship between R&D and innovation in developing countries
- Evidence from developing countries - firms organise their innovation activities differently from firms in developed countries:
  - Fewer firms undertake formal R&D activities
  - Other innovation inputs are more important than R&D ⇒ greater emphasis on physical capital investment for innovation and acquisition of technology
- Existing literature focuses on innovation activities such as R&D, product and process innovations. Other types of innovation activities were less explored
- Knowledge about the presence of a diversity of global engagement in other types of innovation activity is limited.
2. Research Questions & Objectives

Questions

1. How is global engagement drive related to innovation input and output?
2. What does innovation activity varies across different global engaged firms?

Objectives

1. To examine the role of global engagement in innovation input and output
2. To assess the prevalence of various types of innovation activities for groups of firms that are global engaged differently
3. The Analytical Framework & Methodology
3. The Analytical Framework & Methodology

**Objectives & Method of Analysis**

**Global Engagement Variables**
(i) Non-globally oriented firms
(ii) Export-oriented domestic firms
(iii) Non-export oriented foreign firms
(iv) Export-oriented foreign firms

**Other Independent Variables**
- Firm size
- Firm age
- Belonging to group
- Legal ownership structure

**Input Indicators**
- Formal R&D activity
- Human capital training
- Purchase or license invention or knowledge
- Usage of foreign technology license

**Output Indicators**
- Product innovation
- Process method innovation
- Process logistic innovation
- Process supporting innovation
- Marketing Innovation
- Organisational innovation

**Input Indicators**
- Formal R&D activity
- Human capital training
- Purchase or license invention or knowledge
- Usage of foreign technology license

**Output Indicators**
- Product innovation
- Process method innovation
- Process logistic innovation
- Process supporting innovation
- Marketing Innovation
- Organisational innovation

**Other Indicators**
- Ongoing innovation activity
- Abandoned innovation activity

**Data:**
2015 World Bank’s Enterprise Survey
Typology of Globalised Firms

Criteria used:

Foreign ownership and export orientation
Method of Analysis

(I) Multivariate Analysis : Logit Model

\[
\ln \left( \frac{P}{1-P} \right) = \alpha + \beta_i X_i + \beta_j Y_j + \mu_i
\]

where

- \( P \) = the probability of a firm engaging in innovation activity \( k \)
- \((1 - P)\) = the probability of a firm not engaging in innovation activity \( k \)
- \( X_i \) = global engagement variables
- \( Y_i \) = firm-specific and industry specific variables
- \( \beta_i, \beta_j \) = the coefficients for the explanatory variables

(II) Bivariate Analysis

Incidence of innovation:

% of firms engaging in innovation activity \( k \) within the group.

3. The Analytical Framework & Methodology
4. The Results
Incidence of Innovation for Malaysian manufacturing firms

Incidence of Innovation : % of firms engaging in innovation activity k

- Process Logistic Innovation: 41.6%
- Marketing Innovation: 37.3%
- Process Supporting Innovation: 32.8%
- Process Method Innovation: 31.4%
- Organisational Innovation: 27.6%
- Product Innovation: 12.5%
- Human capital training: 33.7%
- Purchase or license patent: 26.7%
- Ongoing innovation activity: 22.6%
- Abandoned innovation activity: 19.7%
## Innovation Input Indicators

<table>
<thead>
<tr>
<th></th>
<th>Non-globally engaged firms</th>
<th>Export-oriented domestic firms</th>
<th>Non-export oriented foreign firms</th>
<th>Export-oriented foreign firms</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Formal R&amp;D activity</strong></td>
<td>13.4</td>
<td>34.0</td>
<td>30.0</td>
<td>37.5</td>
</tr>
<tr>
<td><strong>Human capital training</strong></td>
<td>24.3</td>
<td>42.0</td>
<td>45.0</td>
<td>39.2</td>
</tr>
<tr>
<td><strong>Purchase or license patent</strong></td>
<td>15.1</td>
<td>33.3</td>
<td>32.5</td>
<td>43.3</td>
</tr>
<tr>
<td><strong>Usage of foreign technology license</strong></td>
<td>9.4</td>
<td>23.0</td>
<td>46.2</td>
<td>36.1</td>
</tr>
<tr>
<td><strong>Ongoing innovation activity</strong></td>
<td>16.5</td>
<td>27.2</td>
<td>45.0</td>
<td>21.9</td>
</tr>
<tr>
<td><strong>Abandoned innovation activity</strong></td>
<td>30.3</td>
<td>38.5</td>
<td>10.1</td>
<td>21.1</td>
</tr>
</tbody>
</table>

### Bivariate Analysis: Incidence of Innovation

**Findings:**

1. **Export oriented foreign & domestic firms**: formal R&D

2. **Foreign firms**
   - **Non-export oriented**
     - Usage of foreign technology license
   - **Export oriented**
     - Purchase or license patent

3. **Export oriented Domestic Firms**
   - Abandoned innovation activity
### Bivariate Analysis: Incidence of Innovation

#### Findings:

1. **Export oriented foreign & domestic firms**
   - Product & marketing innovation
2. **Non-export oriented foreign firms**
   - Process logistic innovation

#### Innovation Output Indicators

<table>
<thead>
<tr>
<th>Innovation Indicators</th>
<th>Incidence of Innovation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Non-globally engaged</td>
</tr>
<tr>
<td></td>
<td>Export-oriented domestic</td>
</tr>
<tr>
<td></td>
<td>Non-export oriented</td>
</tr>
<tr>
<td></td>
<td>Export-oriented foreign</td>
</tr>
<tr>
<td></td>
<td>firms</td>
</tr>
<tr>
<td></td>
<td>firms</td>
</tr>
<tr>
<td></td>
<td>firms</td>
</tr>
<tr>
<td></td>
<td>firms</td>
</tr>
<tr>
<td>Product innovation</td>
<td>4.7</td>
</tr>
<tr>
<td>Process method innovation</td>
<td>20.6</td>
</tr>
<tr>
<td>Process supporting</td>
<td>32.9</td>
</tr>
<tr>
<td>Process logistic innovation</td>
<td>25.3</td>
</tr>
<tr>
<td>Marketing innovation</td>
<td>27.1</td>
</tr>
<tr>
<td>Organisational innovation</td>
<td>17.9</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Export-oriented foreign</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>19.8</td>
</tr>
<tr>
<td></td>
<td>39.8</td>
</tr>
<tr>
<td></td>
<td>50.9</td>
</tr>
<tr>
<td></td>
<td>37.0</td>
</tr>
<tr>
<td></td>
<td>48.5</td>
</tr>
<tr>
<td></td>
<td>36.0</td>
</tr>
</tbody>
</table>

- **Export oriented foreign firms**
  - Product innovation: 19.8%
  - Process method innovation: 39.8%
  - Process supporting innovation: 50.9%
  - Process logistic innovation: 37.0%
  - Marketing innovation: 48.5%
  - Organisational innovation: 36.0%

- **Non-export oriented foreign firms**
  - Product innovation: 7.5%
  - Process method innovation: 42.5%
  - Process supporting innovation: 51.2%
  - Process logistic innovation: 48.8%
  - Marketing innovation: 37.5%
  - Organisational innovation: 32.5%
Multivariate Analysis: Logit Regression Results for Participation in Innovation Activity

<table>
<thead>
<tr>
<th>Export-oriented domestic firms</th>
<th>Formal R&amp;D</th>
<th>Human capital training</th>
<th>Purchase or license patent</th>
<th>Usage of foreign technology license</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.7775***</td>
<td>0.6469***</td>
<td>0.6264**</td>
<td>0.8014**</td>
</tr>
<tr>
<td>Export-oriented foreign firms</td>
<td>0.4455</td>
<td>0.0843</td>
<td>0.6752**</td>
<td>1.2885***</td>
</tr>
<tr>
<td>Non-export oriented foreign firms</td>
<td>0.0324</td>
<td>0.4839</td>
<td>0.2076</td>
<td>1.7130***</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1.5242***</td>
<td>0.7344***</td>
<td>0.3191</td>
<td>0.4070*</td>
<td>0.8208***</td>
<td>0.4541*</td>
</tr>
<tr>
<td>Export-oriented foreign firms</td>
<td>1.2667***</td>
<td>0.5176*</td>
<td>-0.0444</td>
<td>-0.4045</td>
<td>0.3412</td>
<td>-0.1538</td>
</tr>
<tr>
<td>Non-export oriented foreign firms</td>
<td>0.2447</td>
<td>0.3709</td>
<td>0.3373</td>
<td>-0.0678</td>
<td>0.0696</td>
<td>-0.2214</td>
</tr>
</tbody>
</table>

- Export-oriented domestic firms: all innovation activities except process logistic innovation
- Export-oriented foreign firms: product and process innovations, purchase or license patent, usage of foreign technology license
- Non-export oriented foreign firms: usage of foreign technology license
Key Findings

- Malaysian manufacturing firms are more involved in process related innovation and marketing innovation.
- Globally engaged firms were more likely to undertake innovation input and output activities than non-globally engaged firms.
- Domestic firms are more likely to abandon their innovation activity.
- Diversity in innovation behaviour observed across globally engaged firms.
Sources of Heterogeneity

1. Differences in the Market Orientation
   - **Export Oriented Foreign Firms**
     - Likelihood of product innovation, purchase or license patent
   - **Non-Export Oriented Foreign Firms**
     - Lower incidence of product innovation, formal R&D activity

2. Differences in the Ownership Structure
   - **Export Oriented Domestic Firms**
     - Likelihood of product innovation, marketing innovations, & formal R&D
   - **Export Oriented Foreign Firms**
     - Higher incidence of purchase & license patent, usage of foreign technology license

3. Differences in the Ownership Structure & Market Orientation
   - **Non-Export Oriented Foreign Firms**
     - Higher Incidence of process logistic innovation than export-oriented domestic and foreign firms
Concluding Remarks

The way firms organise their inputs for innovation process and the way firms pursue their innovation strategy differs

(a) between globally engaged firms and non-globally engaged firms

(b) across globally engaged firms

⇒ Globally engaged firms are not homogenous

Policies that aim to encourage firms to engage in innovation activity need to recognise heterogeneity in innovation behaviour across globally engaged firms