



## BACKGROUND PAPER

# Landscape of Innovation in Developing Asia: Firm-level Perspective

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# LANDSCAPE OF INNOVATION IN DEVELOPING ASIA: FIRM-LEVEL PERSPECTIVE

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## A. Introduction

In this paper, we take a closer look at the innovative behavior of firms in developing Asia. How prevalent is firm-level innovation in the region? Which firms innovate? Does firm-level innovation vary by industry and firm characteristics? This exercise aims to explain key stylized facts of innovation in Asia at the firm level, which give us the broad contours of the current state of innovative activities in the region.

## B. What is innovation?

Innovation is broadly defined as the “ability to use knowledge to develop and apply new ideas that result in changes in the production and organizational structure of the firm” (Cirera and Maloney 2017). Figure 1 shows that there are various ways of looking at innovation. Either by the degree of change/newness it brings about (radical or incremental innovation) or by the area that innovation affects (product, process, services, technological, or organization). Radical innovation involves revolutionary technology, gives birth to new industries or products, and mostly what we think when we consider innovation. However, there is also what is called incremental innovation, which utilizes existing technologies and products to create additional value to products within existing markets. This type of innovation, based on implementing technologies and products already available elsewhere, is what mostly occurs in developing countries.

The Oslo Manual 2018<sup>1</sup> gives a more measurable definition of innovation. It defines innovation as a “new or improved product or business process (or combination thereof) that differs significantly from the firm's previous products or business processes and that has been introduced on the market or brought into use by the firm.” The latest definition reduced the four types of innovations found in the 2005 manual—product, process, organizational, and marketing—to two main types, product innovations and business process innovations. The revision addressed findings of empirical researches, which show that business managers (i.e., survey respondents) find it difficult to differentiate between organizational and process innovation. Moreover, it also

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<sup>1</sup> First published in 1992, the Oslo Manual is the international reference guide for collecting and using data on innovation. The most recent edition in 2018 takes into account a broader range of innovation-related phenomena as well as the experience gained from recent rounds of innovation surveys in Organisation for Economic Co-operation and Development countries and partner economies and organizations.

lessened the ambiguity of the requirement for a “significant” change by comparing both new and improved innovations with the firm’s existing products or business processes.

**Figure 1: A Taxonomy of Innovation**



Note: Other aspects of innovation, such as financing for innovation and measurement of innovation, are not included in this framework.

Source: Wehn, U. and C. Montalvo. 2018. *Dynamics of water innovation: Foundations of the Field*. Journal of Cleaner Production Special Issue on Water innovation.

Measuring innovation is a complicated exercise, more so given the subjective nature of the concept of innovation. Survey respondents in different countries may have different understanding of innovation, especially in what can be considered as a “new or significantly improved” product or process. Firms in developing countries may consider, for example, minor design changes as product innovation, but this is less often the case in the advanced countries (Cirera and Maloney 2017). The box reviews recent efforts of national and international agencies in collecting innovation data. It takes stock of existing data on innovation in developing Asia.

### Sources of Data on Innovation at the Firm Level

There are three sources of data on innovation in developing Asia. First is the World Bank Enterprise Survey (WBES), which provides the most comprehensive cross-country surveys on innovation. The survey covers over 125,000 establishments in 139 countries, including 32 countries in developing Asia, out of 45 countries. The WBES collects data on the development of new or significantly improved products and processes, research and development spending, and technology use. Below is a list of innovation and technology use indicators from the enterprise survey.

- (i) percent of firms using technology licensed from foreign companies,
- (ii) percent of firms having its own website,
- (iii) percent of firms using e-mail to communicate with clients/suppliers,
- (iv) percent of firms that introduced a new product/service,
- (v) percent of firms whose new product/service is also new to the main market,
- (vi) percent of firms that introduced a process innovation, and
- (vii) percent of firms that spend on research and development.

The survey compiles data from face-to-face interviews of business owners and top managers. It uses a stratified random sampling method stratified by firm size, business sector, and geographic region within a country. The beauty of the WBES is that it incorporates the innovation survey in the general enterprise survey. Thus, data on innovation can be related to a broader set of firm-level indicators such as firm characteristics, access to finance, annual sales, costs of inputs/labor, workforce composition, and other business climate and performance measures.

Another source of cross-country data on innovation is the United Nations Educational, Scientific and Cultural Organization Institute for Statistics (UIS) Innovation Survey. First started in 2013, this innovation survey takes place every 2 years. The UIS innovation survey provides information on the types of innovation implemented by firms, innovation activities, the linkages used, as well as obstacles faced when trying to innovate. It aims to meet the "growing need for comparable data on innovation in the business sector." It covers 71 countries, including nine economies in developing Asia: Azerbaijan; the People's Republic of China; Hong Kong, China; India; Indonesia; Japan; Kazakhstan; Malaysia; and the Philippines. The innovation indicators in the UIS innovation survey include:

- (i) percentage of product innovators in manufacturing.
- (ii) percentage of process innovators in manufacturing.
- (iii) percentage of innovative firms in manufacturing by size class.
- (iv) percentage of innovation-active firms in manufacturing.
- (v) percentage of non-innovative firms in manufacturing.
- (vi) percentage of manufacturing firms with only abandoned or ongoing innovation activities.
- (vii) percentage of manufacturing firms that engaged in innovation activities.
- (viii) percentage of manufacturing firms for which sources of information were highly important.
- (ix) percentage of manufacturing firms that cooperated with partners.
- (x) percentage of innovation-active manufacturing firms for which hampering factors were highly important.
- (xi) percentage of non-innovative manufacturing firms for which hampering factors were highly important.
- (xii) percentage of organizational innovators in manufacturing. and
- (xiii) percentage of marketing innovators in manufacturing.

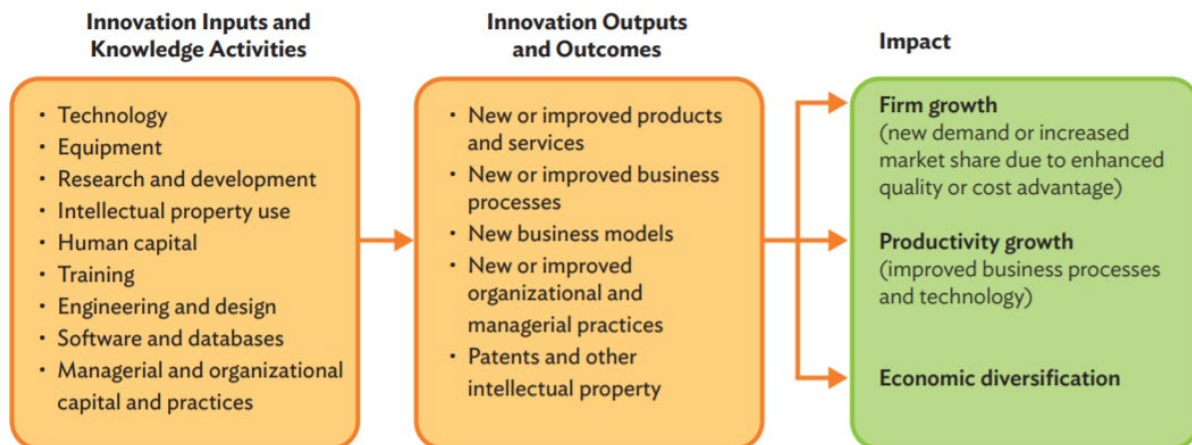
Finally, there are also country-level innovation surveys. Several economies in developing Asia, such as the India; Indonesia; Japan; Malaysia; the People's Republic of China; Republic of Korea; Singapore; Taipei, China; Thailand; and Viet Nam, have conducted some innovation survey, mainly following Oslo Manual framework. However, differences in survey instruments, sampling methodology, and population of inference make comparison and benchmarking of innovation indicators across countries extremely challenging (Cirera and Muzi 2016).

Sources: World Bank Enterprise Survey, UNESCO Innovation Survey; and national sources.

### C. Why should we care about innovation?

As Figure 2 shows, innovation is a significant source of growth and a necessary condition for competitiveness (Romer 1990, Aghion and Howitt 1992, and Aghion et al. 2014). At the firm-level, an extensive empirical literature highlights the positive impact of firm-level innovation, including research and development (R&D) activities, on firm performance and productivity (Hall et al. 2009, Harrison et al. 2008, Mairesse et al. 2005, and Raffo et al. 2008). There are few studies on the gains from organizational and marketing innovation, but the available literature points to a positive effect on firm productivity (Raffo et al. 2008 and Masso and Vahter 2008). For instance, Bloom et al. (2006) find a strong positive relationship between better management practices and firm performance. Better management practice is not innovation per se. However, organizational innovation improves management practices, which raise firms' employment, productivity, and growth rates.

**Figure 2: Why should we care about innovation?**



Source: Xavier Cirera and William F. Maloney. 2017. *The Innovation Paradox: Developing-Country Capabilities and the Unrealized Promise of Technological Catch-Up*. Washington, DC: World Bank.

**Table 1: Innovation and Firm Performance: Selected Empirical Evidence**

Authors (year)	Country Coverage	Type/Measure of Innovation	Impact of Innovation on Productivity
Mairesse et al. (2005)	France	Product new to firm Product new to market Process	(+) Log sales per employee
Griffith et al. (2006)	France, Germany, Spain, and United Kingdom	Product innovation	France, Spain, United Kingdom: (+) log sales per employee Germany: (-) not significant log sales per employee
		Process innovation	France: (+) log sales per employee United Kingdom: (+) not significant Germany, Spain: (-) not significant



Authors (year)	Country Coverage	Type/Measure of Innovation	Impact of Innovation on Productivity
Raffo et al. (2008)	France, Spain, Switzerland, Argentina, Brazil, Mexico	Product innovation	(+) log sales per employee for all countries
		Organizational innovation	Brazil: (+) log sales per employee
Hall et al. (2009)	Italy	Product innovation	(+) log sales per employee
		Process innovation	
Duguet (2006)	France	Radical innovation	(+) total factor productivity growth
		Incremental product innovation	(-) not significant total factor productivity growth
Janz et al. (2003)	Germany, Sweden	Process innovation	Germany (-) log sales per employee Sweden: (-) not significant
van Leeuwen and Klomp (2006)	Netherlands	Process innovation	(-) growth of sales per employee
Loof & Heshmati (2006)	Sweden	Process innovation	(-) manufacturing (-) not sig services
		Organizational innovation	(-) not sig manufacturing (-) not sig services
Harrison et al. (2006)	France, Germany, Spain, and United Kingdom	Product innovation	(+) employment growth
Masso & Vahter (2008)	Estonia	Product innovation	(+) not significant value-added per employee
		Process innovation	(+) value added per employee
		Organizational innovation	(+) value added per employee
Criscuolo (2009)	18 OECD countries	Process innovation	(+) not significant log sales per employee

OECD = Organisation for Economic Co-operation and Development.

Notes: (+) positive significant relationship between innovation type and productivity; (-) negative significant relationship between innovation type and productivity.

Source: Authors' summary; not meant to be an exhaustive list of all studies on this topic.

The literature also tells us that knowledge capital investments to boost productivity is not solely an advanced country activity. However, the nature of innovation in developing countries is somewhat different and best characterized as “marginal improvements in process or products, rather than significant technology adoption, and very infrequently involves frontier research” (Cirera and Maloney 2017). This is a process of technology adoption, imitation, and adaptation that takes place far from the technological frontier, where firms adopt incremental changes (Fagerberg et al. 2010). While innovation activities in developing countries often occur at the margins and are based on implementing technologies and products already available elsewhere, this process can still allow for the development of a comparative advantage.

#### D. Firm-Level Innovation Landscape in Developing Asia

This section describes the extent and intensity of firm-level innovation in developing Asia. We explore where innovation is occurring in the region and examine firm characteristics associated with higher innovation rates. We also explore firm-level innovation activities such as R&D and technology use and explore variations by industry and firm characteristics. This paper aims to paint a picture of firms' innovative behavior in developing Asia and how firm characteristics relate to innovation.

For each economy, we use the latest available year of World Bank's Enterprise Survey to analyze and describe the innovation behavior of firms in developing Asia (Table 2). The enterprise survey

covers 27 countries from developing Asia, which includes 26,855 firms from manufacturing, retail, and services sector (Table 2).<sup>2</sup>

**Table 2: Sample Composition**

Region	Country	Firm Size			Total
		Small (<20)	Medium (20–99)	Large (100+)	
Central and West Asia (n=2729)	Armenia (2013)	179	135	46	360
	Azerbaijan (2013)	214	143	33	390
	Georgia (2013)	247	87	26	360
	Kazakhstan (2013)	308	219	73	600
	Kyrgyz Republic (2013)	114	119	37	270
	Tajikistan (2013)	199	124	36	359
	Uzbekistan (2013)	152	143	95	390
East Asia (n=3060)	China, People's Republic of (2012)	625	1,084	991	2700
	Mongolia (2013)	200	126	34	360
South Asia (n=13725)	Afghanistan (2014)	270	112	28	410
	Bangladesh (2013)	507	514	421	1442
	Bhutan (2015)	156	82	15	253
	India (2014)	3,065	4,028	2,188	9281
	Nepal (2013)	293	140	49	482
	Pakistan (2013)	536	451	260	1247
	Sri Lanka (2011)	322	179	109	610
Southeast Asia (n=6999)	Cambodia (2016)	194	118	61	373
	Indonesia (2015)	484	451	385	1320
	Lao People's Democratic Republic (2016)	217	104	47	368
	Malaysia (2015)	347	343	310	1000
	Myanmar (2016)	363	160	84	607
	Philippines (2015)	464	504	367	1335
	Thailand (2016)	400	324	276	1000
The Pacific (n=342)	Viet Nam (2015)	376	352	268	996
	Papua New Guinea (2015)	13	33	19	65
	Solomon Isl. (2015)	64	67	20	151
	Timor-Leste (2015)	88	30	8	126
<b>Total</b>		<b>10,397</b>	<b>10,172</b>	<b>6,286</b>	<b>26,855</b>

Note: Year after the country name indicates survey year.

Source: World Bank Enterprise Survey.

## 1. Firm-level innovation in developing Asia is relatively high.

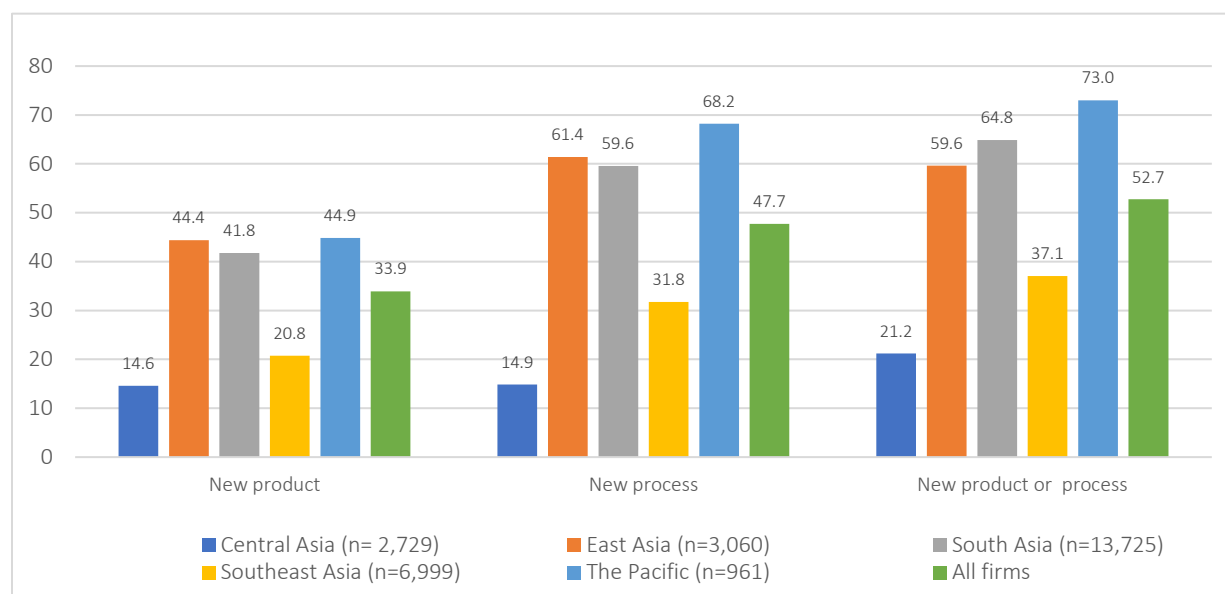
The average innovation rate in developing Asia, i.e., the share of firms reporting introducing a new or significantly improved product or process in the past 3 years, is around 53% (Figure 3). Innovation is highest in the Pacific where up to 73% of firms report introducing a new or significantly improved product or process, followed by 65% of firms in South Asia, 60% of firms in East Asia, 37% of firms in Southeast Asia, and 21% of firms in Central Asia.

About 34% of firms in developing Asia report introducing a new product. Product innovation is highest in the Pacific, East Asia, and South Asia at more than 40%. This figure is notably lower in Central Asia at around 15% and Southeast Asia at around 20%.

<sup>2</sup> From our sample, we exclude five countries in the Pacific (Fiji, Micronesia, Samoa, Tonga, and Vanuatu) without data on innovation variables.

Compared with product innovation, the proportion of firms that report a process innovation is relatively higher at about 48% on average in developing Asia. Process innovation in the region is highest in the Pacific, South Asia, and East Asia—at more than 60%.

**Figure 3: Share of Firms Reporting a New Product or Process by Region**



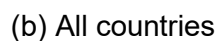
Notes: (i) The Pacific regional average includes Papua New Guinea, Solomon Islands, and Timor-Leste only. (ii) Regional averages of innovation indicators are computed by taking a simple average of country estimates. Source: World Bank Enterprise Survey database.

## 2. Reported Innovation Rates Tend to Be Higher in Low-Income Countries

If we look at innovation rates by country, we find that firms in countries with lower per capita income report higher innovation rates (Figure 4 [a]). However, in a larger sample of countries, we see a U-shaped relationship between innovation and gross domestic product per capita (Figure 4 [b]). Firms further away from the technological frontier have lower productivity levels. These firms may regard small improvements in products or processes as “innovation,” which is less often the case in more advanced economies. Moreover, making incremental improvements in products or processes is relatively less expensive for firms further away from the technological frontier, which could translate in the data as higher innovation activity.



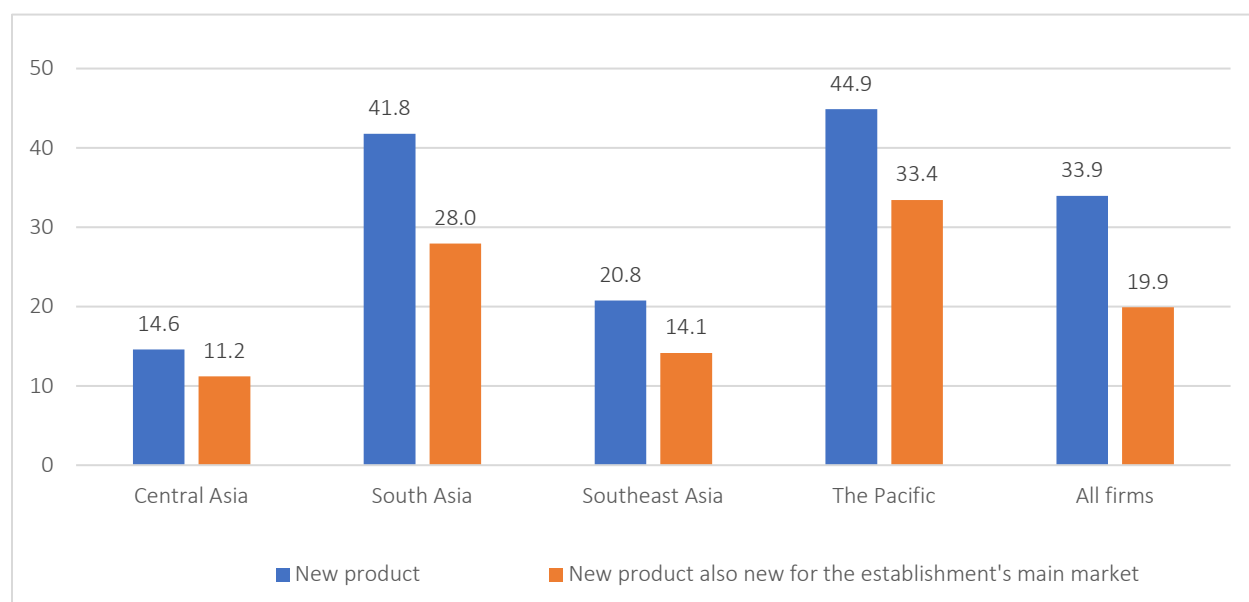
(a) Developing Asia



### 3. If we consider the novelty of the product innovation to the firm's main market, innovation rates fall.

Figure 5 shows that, if we consider the novelty of the product innovation to the firm's main market, innovation rates fall substantially. On average, 34% of firms developing Asia introduced a new product, but only 20% of firms introduced a new product that is also new to the market. This is also the case for all regions in developing Asia but most apparent in South Asia, where about 42% of firms report introducing a new product, but only 28% of firms introduced a new product that is also new to the market. This finding indicates the degree of novelty of the reported innovation rates in developing Asia and provides a distinction between innovation that is new to the firm (marginal innovation) versus new to the market innovation (radical innovation). In line with the findings of Cirera and Maloney (2017), we find that product innovation in developing Asia consists mainly of small improvements to existing products.

**Figure 5: Share of Firms Reporting a New Product**



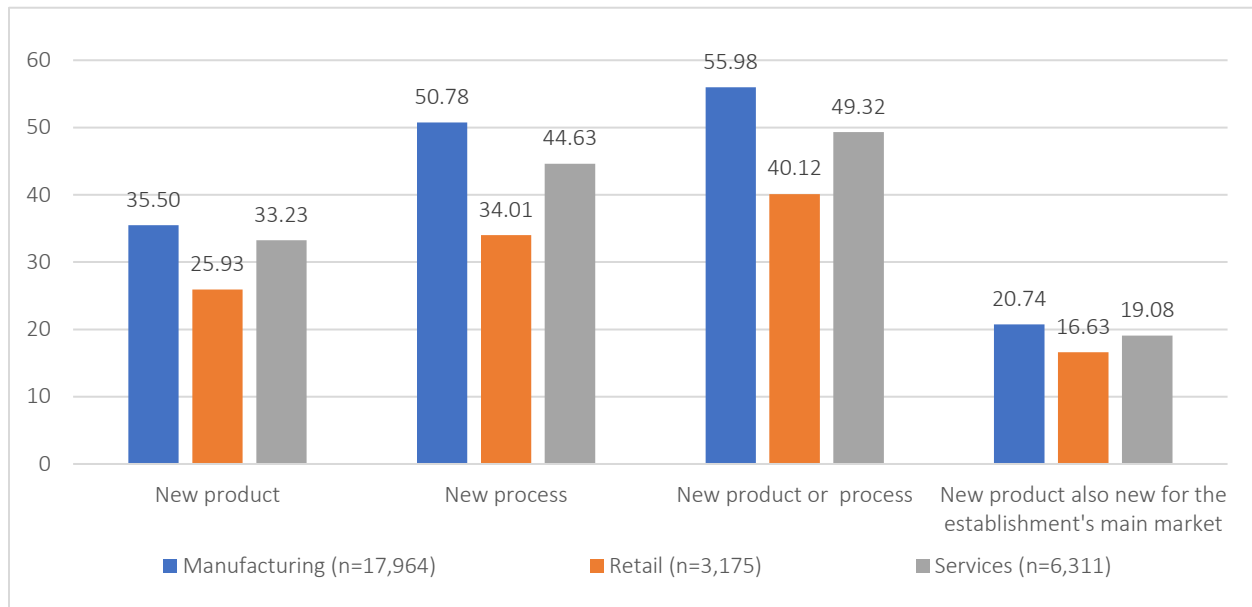
Notes: (i) East Asia not included because data covers only Mongolia. (ii) The Pacific regional average includes Papua New Guinea, Solomon Islands, and Timor-Leste only.

Source: World Bank Enterprise Survey database.

### 4. By industry, the share of firms that introduced a product or process innovation is highest in manufacturing.

A comparison of innovation patterns by industry show that innovation rates are higher for firms in manufacturing. About 36% of manufacturing firms report introducing a new product, 51% introduced a new process, and more than half of firms introduced either a new product or process (Figure 6). Using a student t-test for equality of proportions between groups, we find that these differences are statistically significant (Appendix 1).

**Figure 6: Share of Firms Reporting a New Product or Process, by Industry**

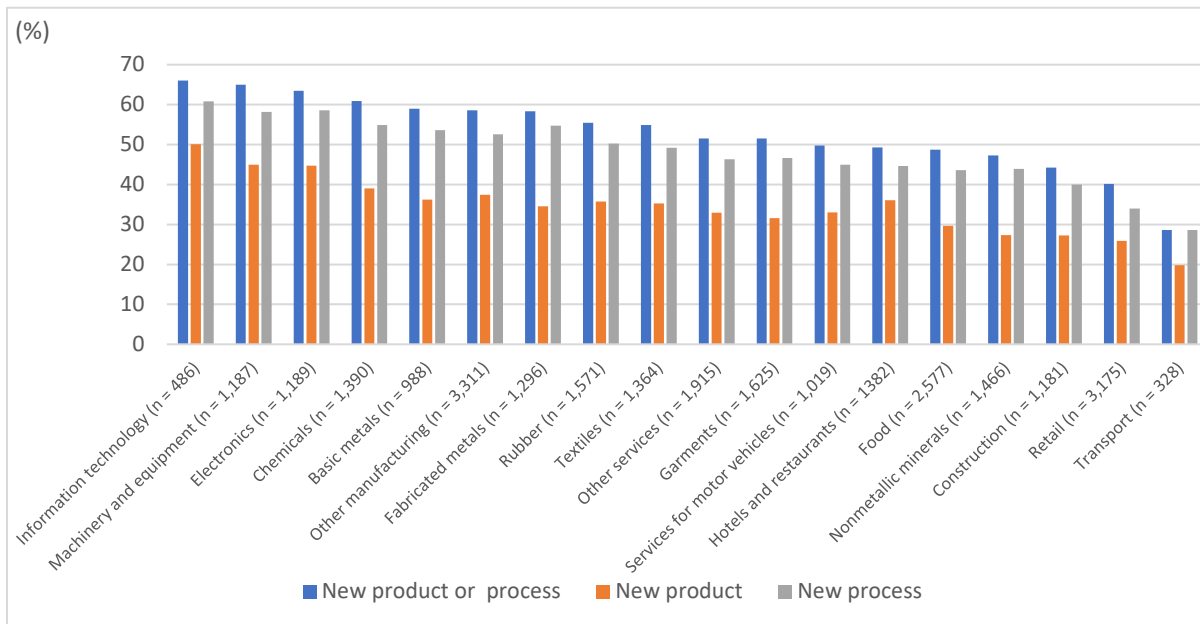


Source: World Bank Enterprise Survey database.

##### **5. Information technology and high-tech manufacturing sector are the most innovative.**

The information technology sector, as well as high-tech manufacturing such as machinery and equipment, electronics, and chemicals, appear to have the highest share of firms engaged in innovation (Figure 7). The t-test also reveals that information technology and high-tech manufacturing sectors have statistically higher proportions for product and process innovation.

**Figure 7: Share of Firms Reporting a New Product or Process, by-Subsector**



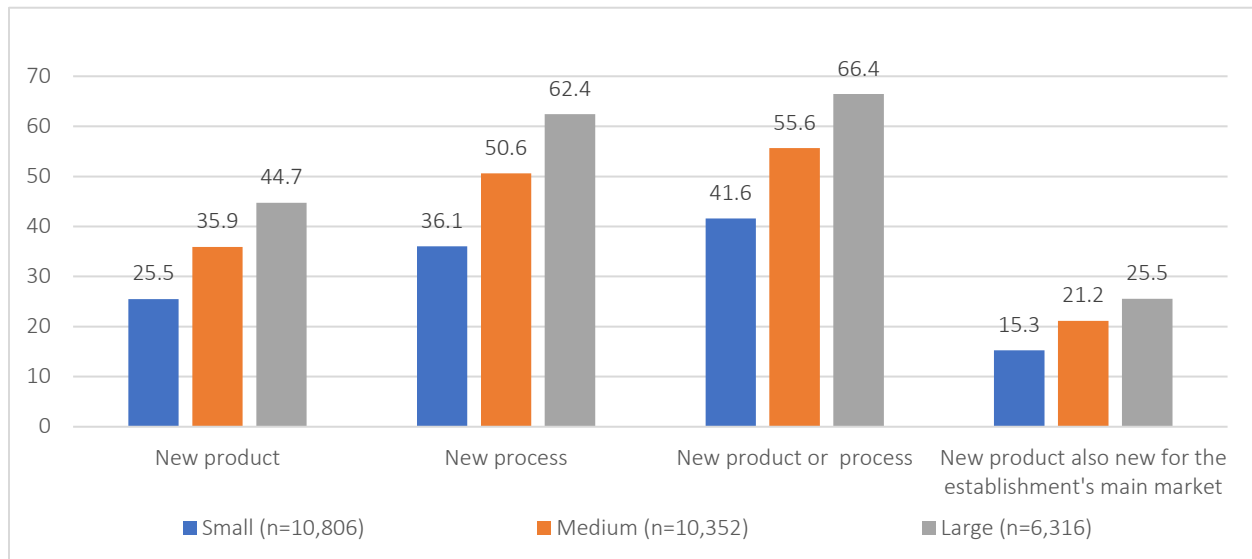
Source: World Bank Enterprise Survey database.

## 6. Large firms are more innovative than small and medium-sized enterprises in developing Asia.

About 66% of large firms introduced either a product or process innovation compared to 56% of medium-sized firms and 42% of small firms (Figure 8). Results of the test for equality of proportions show that large firms have a statistically higher proportion for product and process innovation.

We also find that process innovation rates are relatively higher compared with firm-level product innovation for small, medium, and large firms. About 45% of large firms introduced a product innovation compared with only about 36% of medium firms and 26% of small firms. On the other hand, about 62% of large firms introduced a process innovation. In contrast, only 36% of small firms and 51% of medium firms introduced a process innovation.

**Figure 8: Share of Firms Reporting a New Product or Process, by Firm Size**



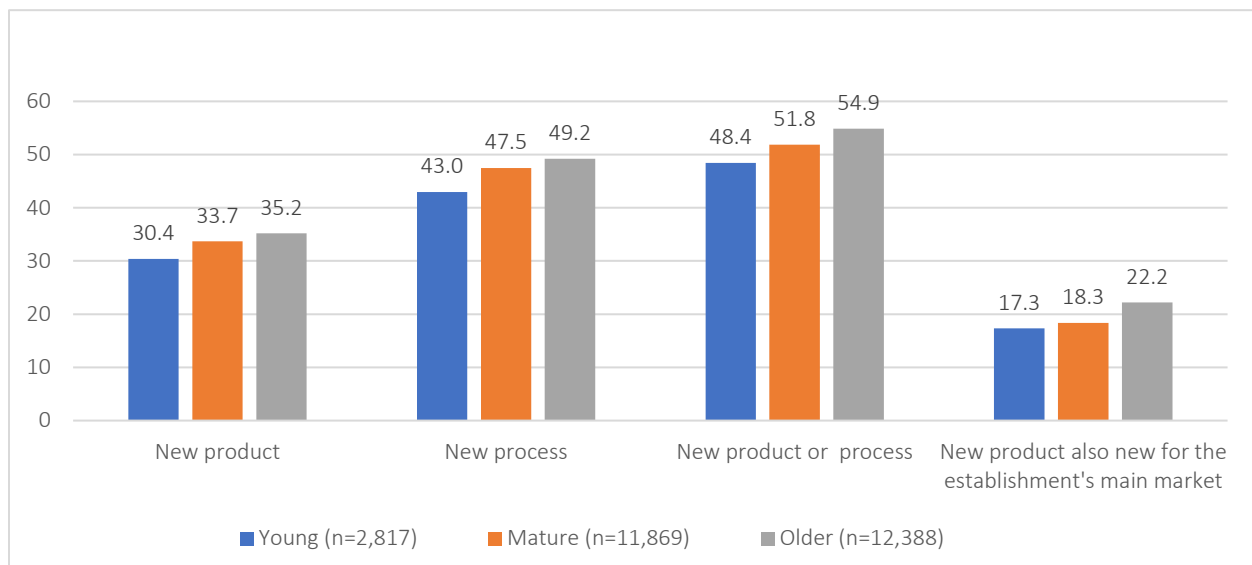
Note: Small refers to firms with <20 employees; medium firms are those with 20–99 employees; large firms are those with 100+ employees.

Source: World Bank Enterprise Survey database.

## 7. Product and process innovation rates are higher in older firms.

Product and process innovation rates are higher for older firms or firms that have been in business for more than 16 years, and this difference is statistically significant (Figure 9).

**Figure 9: Share of Firms Reporting a New Product or Process, by Firm Age**



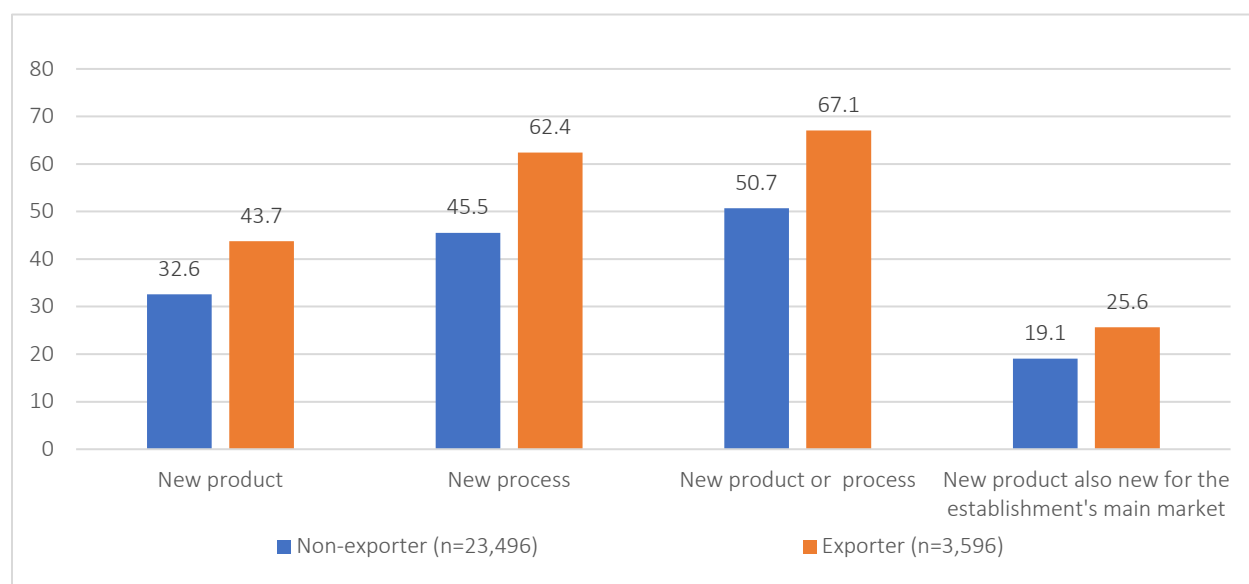
Note: Young refers to firms in operation for at least 5 years; mature firms are those in operation for 6–15 years; and older firms are those in business for more than 16 years.

Source: World Bank Enterprise Survey database.

## 8. Firms that export are more innovative.

Reported product and process innovation rates are higher in firms that export, and this difference is statistically significant (Figure 10). For instance, 67% of exporters report introducing either a product or process innovation compared with about 51% of non-exporters. Process innovation rate for exporters is also considerably higher at 62% compared with only about 46% in non-exporters.

**Figure 10: Share of Firms Reporting a New Product or Process, by Exporting Activity**



Source: World Bank Enterprise Survey database.

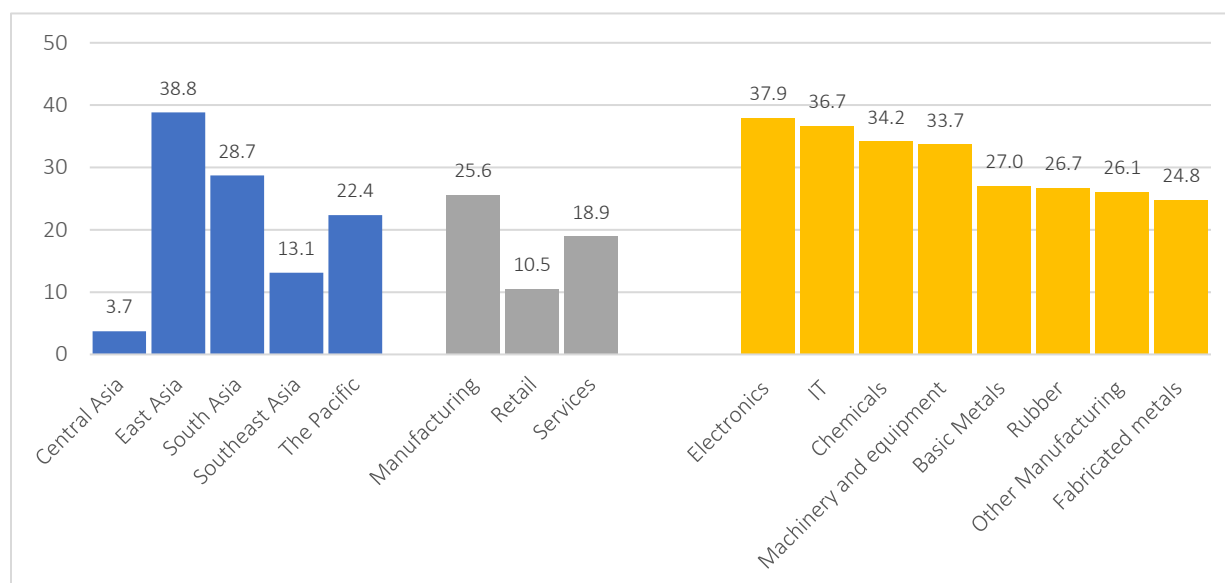
## 9. The share of firms that spend on research and development is highest in East Asia and high-tech manufacturing.

There are notable differences in the share of firms spending on R&D across regions. About 38% of firms in East Asia report spending on research and development (Figure 11). The majority of firms that spent on R&D in East Asia (around 91%) are from the People's Republic of China. This figure is significantly lower for countries in Central Asia (at 3.7%) and in Southeast Asia at 13.1%) (Figure 11). We find that differences in innovation rates by region present similar patterns with regard to spending on R&D. Regions with a higher share of firms reporting either a product or process innovation rates also have a higher share of firms reporting spending on R&D and vice versa.

We also find that a higher percentage of manufacturing firms, particularly those in high-tech manufacturing such as electronics, chemicals, and machinery and equipment, report spending on research and development.



**Figure 11: Share of Firms Reporting Research and Development Spending, by Region and Industry**



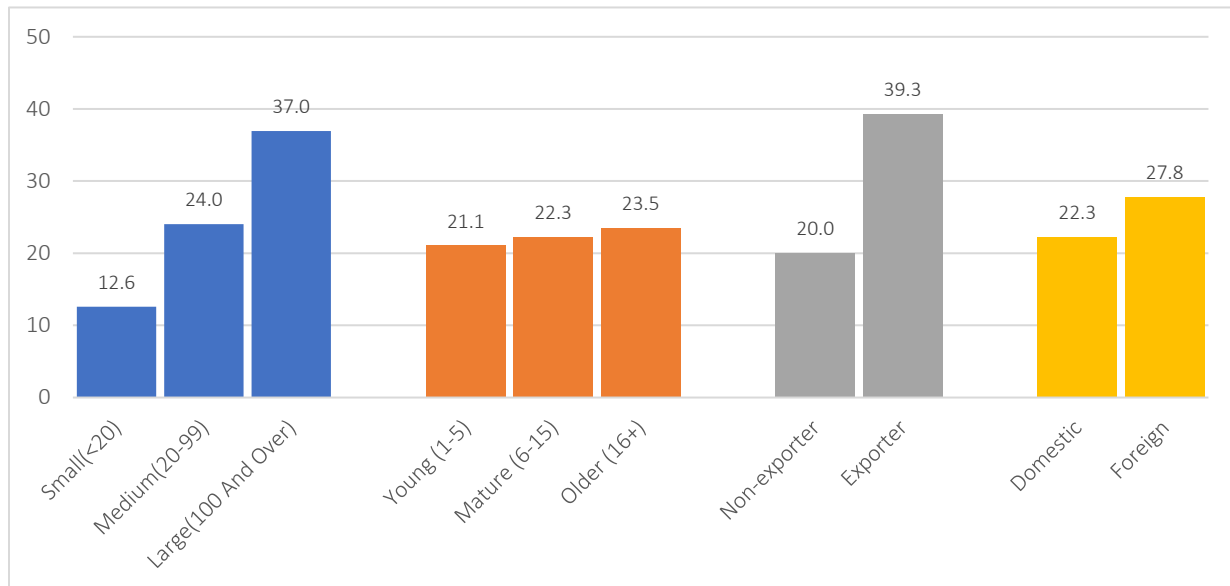
Note: The Pacific regional average includes only Papua New Guinea, Solomon Islands, and Timor-Leste.

Source: World Bank Enterprise Survey database.

## 10. A higher share of large firms and exporters report spending on research and development.

About 37% of large firms invested in R&D, almost three times the share of small firms doing so (Figure 12). Exporting firms in developing Asia are also twice more likely to invest in R&D than non-exporters (40% of exporters versus 20% of non-exporters). The higher share of large firms, older firms, exporters, and foreign-owned firms that spend on R&D is statistically significant based on the results of the test for equality of proportions.

**Figure 12: Share of Firms Reporting Research and Development Spending, by Firm Characteristics**



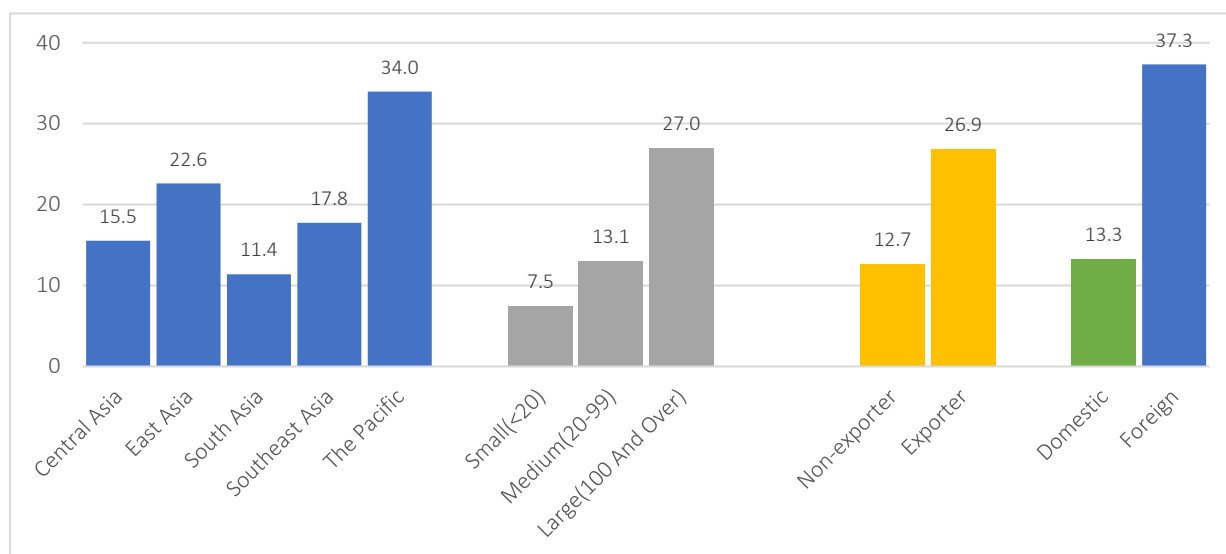
Source: World Bank Enterprise Survey database.

**11. A higher share of large firms, exporters, and foreign-owned firms report using technology licensed from foreign companies.**

The share of firms that use technology licensed from foreign companies is about 34% in the Pacific and around 23% in East Asia (Figure 13). For other regions in developing Asia such as Central and West Asia, South Asia, and Southeast Asia, the use of licensed technology is lower at below 2%. We also find that technology licensing is lower in less-developed countries such that the share of firms reporting using licensed technology increases with per capita gross domestic product (Figure 14).

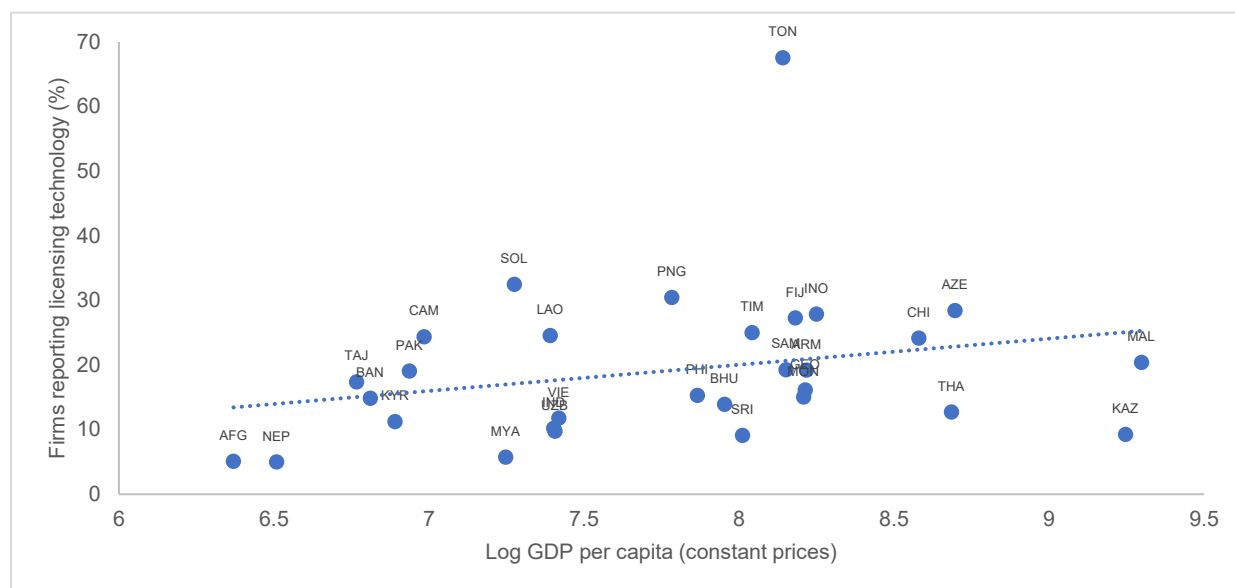
By firm size, the share of firms that report using technology licensed from foreign companies is about 27% for large firms, 13.1% for medium firms, and 7.5% for small firms. Exporting firms are up to two times more likely to use licensed technology than non-exporters (27% of exporters versus 13% of non-exporters). About 37% of foreign-owned firms report using licensed technology compared with only 13% of domestic-owned firms.

**Figure 13: Percent of Firms Using Technology Licensed from Foreign Companies, by Region, Size, and Industry (%)**



Source: World Bank Enterprise Survey database.

**Figure 14: Scatter Plot of Technology Licensing on Gross Domestic Product per Capita**



Source: World Bank Enterprise Survey database.

## E. Key Messages

- We find that firm level-innovation in developing Asia is relatively high, but consists of marginal improvements to existing products.
- By level of economic development, a U-shaped relationship emerges between the share of firms reporting engaging in innovation and gross domestic product per capita.
- Reported rates of process innovation tend to be higher than product innovation at all income levels.
- By industry, we find that information technology and high-tech manufacturing are the most innovative.
- By firm characteristics, large firms, older firms, and exporters are more innovative.
- Finally, differences in innovation rates by region and by firm characteristics present similar patterns with regard to spending in research and development and licensing of technology. We find that regions with a higher share of firms reporting product/process innovation, also have a higher share of firms reporting spending on research and development and a higher share of firms reporting licensing foreign technology.
- We also find that technology licensing is lower in less-developed countries, such that the share of firms reporting using licensed technology increases with per capita gross domestic product.

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# APPENDIX 1: RESULTS OF STUDENT T-TEST FOR EQUALITY OF PROPORTIONS BETWEEN GROUPS

Variable	Firm introduced a new product?				Firm introduced a new process?				Firm introduced either a new product or process?			
	No	Yes	Diff.	P-value	No	Yes	Diff.	P-value	No	Yes	Diff.	P-value
<b>By region</b>												
Central and West Asia	0.36	0.15	0.22	0.00	0.52	0.15	0.37	0.00	0.56	0.21	0.35	0.00
East Asia	0.33	0.44	-0.12	0.00	0.47	0.61	-0.15	0.00	0.52	0.60	-0.08	0.00
South Asia	0.26	0.42	-0.16	0.00	0.34	0.60	-0.26	0.00	0.40	0.65	-0.25	0.00
Southeast Asia	0.38	0.21	0.18	0.00	0.53	0.32	0.22	0.00	0.58	0.37	0.21	0.00
The Pacific	0.34	0.45	-0.11	0.00	0.47	0.68	-0.21	0.00	0.52	0.73	-0.21	0.00
<b>By size</b>												
Small (<20)	0.39	0.26	0.14	0.00	0.55	0.36	0.19	0.00	0.60	0.42	0.18	0.00
Medium (20-99)	0.33	0.36	-0.03	0.00	0.46	0.51	-0.05	0.00	0.51	0.56	-0.05	0.00
Large (100+)	0.31	0.45	-0.14	0.00	0.43	0.62	-0.19	0.00	0.49	0.66	-0.18	0.00
<b>By age</b>												
Young (1-5)	0.34	0.30	0.04	0.00	0.48	0.43	0.05	0.00	0.53	0.48	0.05	0.00
Mature (6-15)	0.34	0.34	0.01	0.26	0.48	0.47	0.01	0.35	0.54	0.52	0.02	0.00
Older (16+)	0.33	0.35	-0.02	0.00	0.47	0.49	-0.03	0.00	0.51	0.55	-0.04	0.00
<b>Exporting status</b>												
Exporter	0.33	0.44	-0.11	0.00	0.46	0.62	-0.17	0.00	0.51	0.67	-0.16	0.00
<b>Ownership</b>												
Foreign-owned firms	0.34	0.37	-0.03	0.01	0.48	0.49	-0.02	0.25	0.53	0.56	-0.03	0.01
<b>By industry</b>												
Manufacturing	0.31	0.35	-0.05	0.00	0.41	0.51	-0.10	0.00	0.46	0.56	-0.10	0.00
Retail	0.35	0.26	0.09	0.00	0.49	0.34	0.15	0.00	0.54	0.40	0.14	0.00
Other services	0.34	0.33	0.01	0.19	0.48	0.45	0.04	0.00	0.54	0.49	0.04	0.00
<b>By sector</b>												
Food	0.34	0.30	0.05	0.00	0.48	0.44	0.05	0.00	0.53	0.49	0.04	0.00
Textiles	0.34	0.35	-0.01	0.31	0.48	0.49	-0.02	0.27	0.53	0.55	-0.02	0.11
Garments	0.34	0.32	0.03	0.04	0.48	0.47	0.01	0.38	0.53	0.51	0.01	0.31
Chemicals and chemical products	0.34	0.39	-0.05	0.00	0.47	0.55	-0.08	0.00	0.52	0.61	-0.09	0.00
Rubber and plastics products	0.34	0.36	-0.02	0.13	0.48	0.50	-0.03	0.04	0.53	0.55	-0.03	0.02
Nonmetallic mineral products	0.34	0.27	0.07	0.00	0.48	0.44	0.04	0.00	0.53	0.47	0.06	0.00
Basic metals	0.34	0.36	-0.02	0.13	0.47	0.54	-0.06	0.00	0.52	0.59	-0.07	0.00
Fabricated metals	0.34	0.35	-0.01	0.62	0.47	0.55	-0.07	0.00	0.52	0.58	-0.06	0.00
Machinery and equipment	0.33	0.45	-0.12	0.00	0.47	0.58	-0.11	0.00	0.52	0.65	-0.13	0.00
Electronics	0.33	0.45	-0.11	0.00	0.47	0.59	-0.11	0.00	0.52	0.63	-0.11	0.00
Other manufacturing	0.33	0.37	-0.04	0.00	0.47	0.53	-0.06	0.00	0.52	0.59	-0.07	0.00
Retail	0.35	0.26	0.09	0.00	0.49	0.34	0.15	0.00	0.54	0.40	0.14	0.00
Information technology	0.34	0.50	-0.16	0.00	0.48	0.61	-0.13	0.00	0.52	0.66	-0.14	0.00

Variable	Firm introduced a new product?				Firm introduced a new process?				Firm introduced either a new product or process?			
	No	Yes	Diff.	P-value	No	Yes	Diff.	P-value	No	Yes	Diff.	P-value
Hotel and restaurants	0.34	0.36	-0.02	0.10	0.48	0.45	0.03	0.03	0.53	0.49	0.04	0.01
Services of motor vehicles	0.34	0.33	0.01	0.54	0.48	0.45	0.03	0.11	0.53	0.50	0.03	0.06
Construction	0.34	0.27	0.07	0.00	0.48	0.40	0.08	0.00	0.53	0.44	0.09	0.00
Transport	0.34	0.20	0.14	0.00	0.48	0.29	0.19	0.00	0.53	0.29	0.24	0.00
Other services	0.34	0.33	0.01	0.3560	0.48	0.46	0.01	0.26	0.53	0.52	0.01	0.28

Source::Authors' calculations.