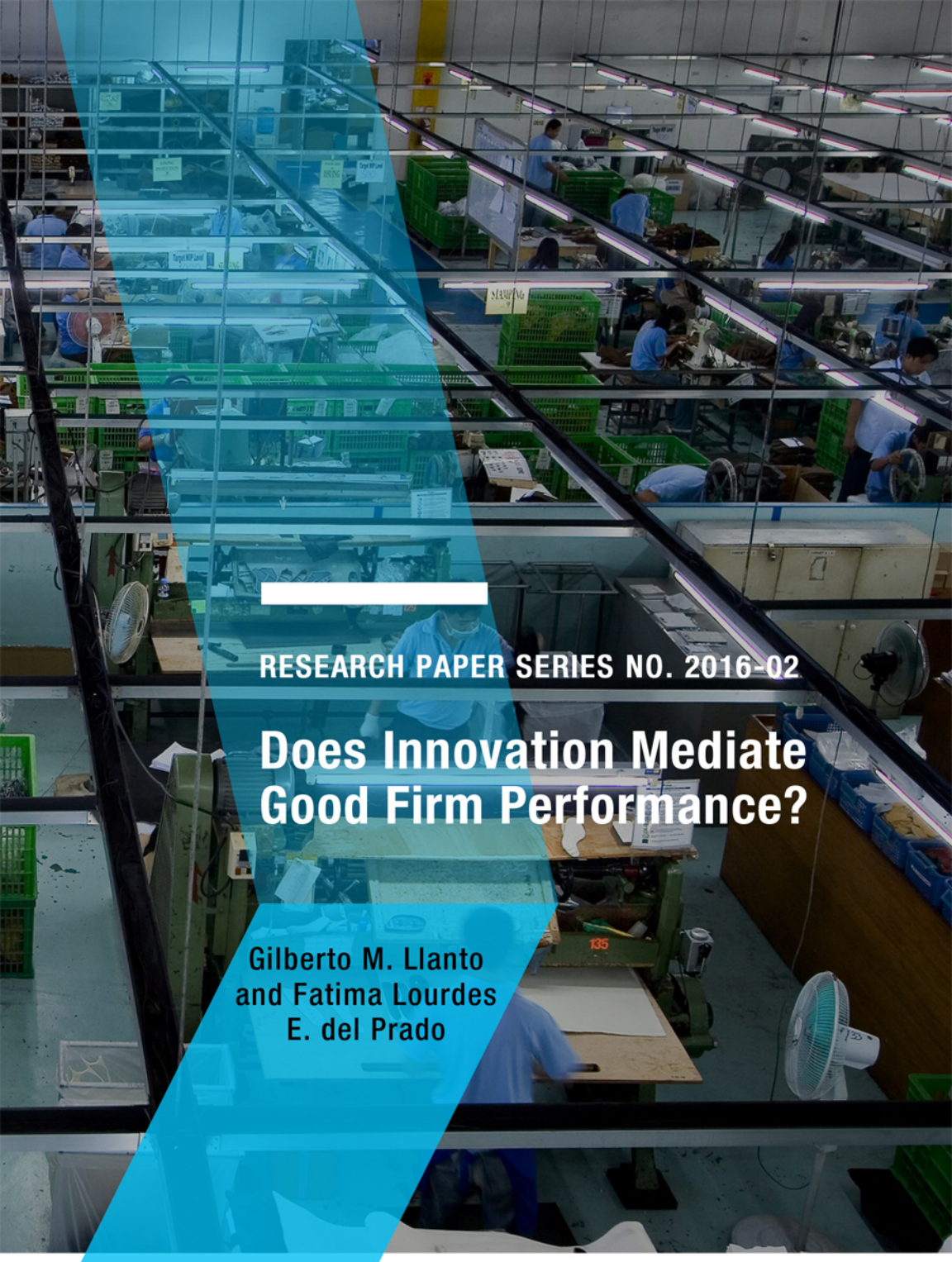

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Does Innovation Mediate Good Firm Performance?

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and Fatima Lourdes
E. del Prado

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Abstract

Aside from physical capital and human resource, private firms are also advised to invest in innovations to be more productive and profitable. However, it is important to ensure such investment is well-spent. This study found that product and process innovations do lead to increase in sales and profits, and improve labor productivity. It also showed that firm size, age, and foreign equity are important factors leading firms to innovate.

Introduction

Aside from physical capital and human resource, private firms are also advised to invest in innovations to be more productive and profitable. However, it is important to ensure such investment is well-spent. In this study, we follow the definition of the Organisation for Economic Co-operation and Development (1999) of innovation, which refers to the development, deployment, and economic utilization of new products, processes, and services. Moreover, we see the relevance of the definition by Albert et al. (2013), which describes innovation as activities in a firm involving the implementation of new or significantly improved products or processes (technological innovation), or new marketing or organizational methods (nontechnological innovation). We refer to "technological innovation" as product innovation and to "nontechnological innovation" as process innovation.

Despite their close link, studies show that product and process innovations tend to have different determinants (Rasiah 2003). While product innovation typically involves the introduction of a new product or service that often entails radical changes, process innovation would mean incremental or significant improvements in management or operating practices. Clearly, the resources required in terms of time and investments are different.

Small-sized firms or start-up companies, for instance, may find it more challenging to do product innovation than process innovation, while large companies could typically undertake product and process innovations as a matter of routine. Moreover, innovation may be inherently more pervasive in some sectors or industries than in others.

In designing development agendas, policymakers, donors, and the stakeholder community usually consider the promotion of innovations as a tool to develop the capacity of small and medium enterprises (SMEs) to generate higher value addition and greater job opportunities. The typical approach of many governments is the provision of financing instruments and the creation of institutions that will promote innovations.

However, the impact of innovation activities on firm performance is not as well-defined as we think. While there may be a growing body of theoretical literature that suggests innovation propels firm growth, empirical studies provide mixed results. For instance, Corsino (2008) pointed out that empirical investigations conducted at different levels of analysis have yielded significantly different estimates of the innovation–growth nexus.

With this, providing access to and financing for innovations could be a significant policy instrument. Thus, this raises the need for empirical evidence to show whether innovations do matter in firm performance. In particular, it is important to identify which between the product innovation and process innovation can really provide positive impact on the performance of the firms.

It is also crucial to identify the factors that lead firms to innovate. For instance, several studies show that good research and development (R&D) leads to innovation. A survey done by Mairesse and Sassenou (1991) had documented varying estimates of the contribution of R&D to productivity. Similarly, Lin and Chen (2007) showed the positive impact of administrative innovation on firm-level profitability.

In terms of SMEs, Nguyen et al. (2007) showed that innovations in Viet Nam—reflected in terms of new products, new product process, and improvement of existing products—increase firms' likelihood to export. Hall et al. (2009) also found a significant relationship between SMEs' innovations and productivity, profitability, and growth.

For service and manufacturing firms, Vincent et al. (2004) found a close association between the level of profit and innovation. However, a recent review of the said study done by Lööf and Heshmati (2002) indicated the lack of robustness of the results. They identified the sensitivity of the estimated relationship between innovativeness and firm performance to different types of models, estimation methods, measures of firm performance, classification of firms, type of innovations, and data sources.

In the case of the Philippines, several studies have also identified the factors that lead firms to innovate. Albert et al. (2013) showed that knowledge management is a good determinant of both product and process innovations. They also said that employment size and location in export processing zones can also be factors for firms to innovate. In another study, Llanto (2013) provided a descriptive analysis of several government financing and technology programs that can support the innovation of SMEs. He likewise outlined a few cases of successful private sector efforts on using innovations to improve products and business processes.

The *Philippine Development Plan* raises the need to investigate the impact of innovation on the performance of SMEs. According to the Asian Productivity Organization (2007), SMEs have the potential to

become powerful engines of manufactured export growth and upgrade in developing Asian countries, such as the Philippines.[1] This paper also asserts that through innovations, SMEs can contribute significantly to the economic growth and poverty reduction in the country (Llanto 2013).

Data and Survey Methodology

Scope and coverage

The data are results of the 2013 Survey on Production Processes for Manufacturing Establishments. With technical and financial support from the Economic Research Institute for ASEAN and East Asia, the Philippine Institute for Development Studies commissioned the National Statistics Office to administer the survey among manufacturing firms operating in the five provinces of CALABARZON, namely, Cavite, Laguna, Batangas, Rizal, and Quezon. Included in the sample were firms with average total employment of 20 workers and over, engaged in one or predominantly one type of economic activity, and under single control or ownership.

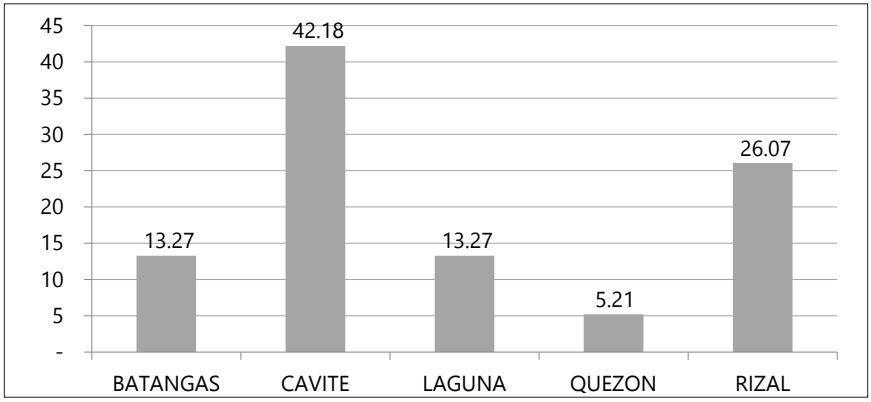
Sampling design

Sample establishments were systematically drawn until a proportional allocation from different industries of various sizes within each province was reached. We arranged the establishments within each province according to their 2009 Philippine Standard Industrial Classification (PSIC), their employment size, and by business name. Samples were then selected systematically and iteratively until the maximum sample size per province was attained and the required sample sizes were accomplished.

In case of closure or nonavailability of the respondent, replacement samples were drawn from the remaining establishments. Furthermore, respondents from the fiscal year 2012 survey were also included in the sampling frame in an effort to create a panel and establish links with the previous years' surveys.

[1] The Asian Productivity Organization added that more than 90 percent of enterprises in its member-countries are SMEs, which account for about 75 percent of the gross domestic product, compared to 50 percent in the rest of the world. SMEs play an important role in economic and social life, and generate a large number of nonagricultural jobs, exports, sales, and value added.

Figure 1. Distribution of survey respondents by location (province)



Source: Authors' compilation

A total of 220 establishments[2] plus a certain percentage for replacement purposes were included in this study. The establishments belonged to the one-digit level industry code of the 2009 PSIC for manufacturing, which may be organizationally classified as either a single establishment, a branch, or an establishment and main office.

Summary of Survey Results

Profile of respondents

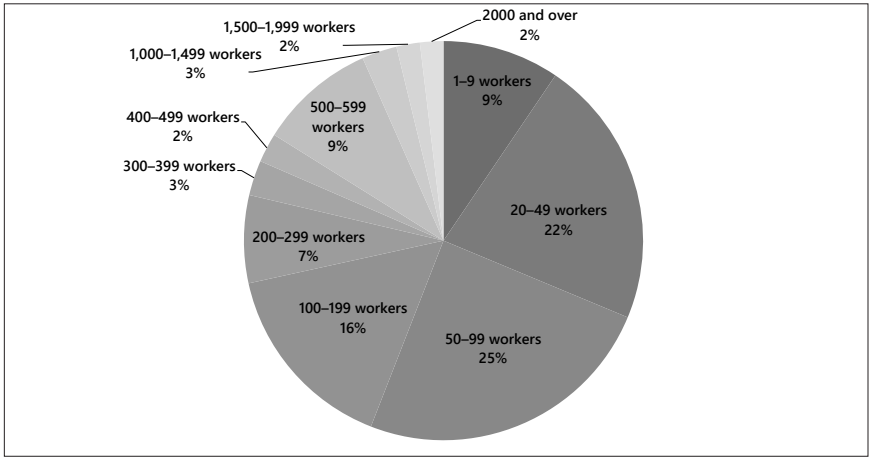
A total of 211 firms responded to the survey. Of the said figure, 89 establishments (42.2%) are located in Cavite. Around 26 percent are located in Rizal province. Quezon had the least number of respondents that were surveyed (5.2% or 11 respondents) (Figure 1).

Size of establishment

Establishment size may be determined either by the number of workers employed or total assets. In terms of employment, 72 percent of the respondents employ not more than 199 full-time employees, considered micro, small, and medium-sized enterprises (MSMEs) under Philippine standards (Figure 2). In terms of assets, about 27 percent have total assets ranging from USD 100,000 to USD 499,999. Meanwhile, 17 percent have assets worth USD 10 million and above (Figure 3).

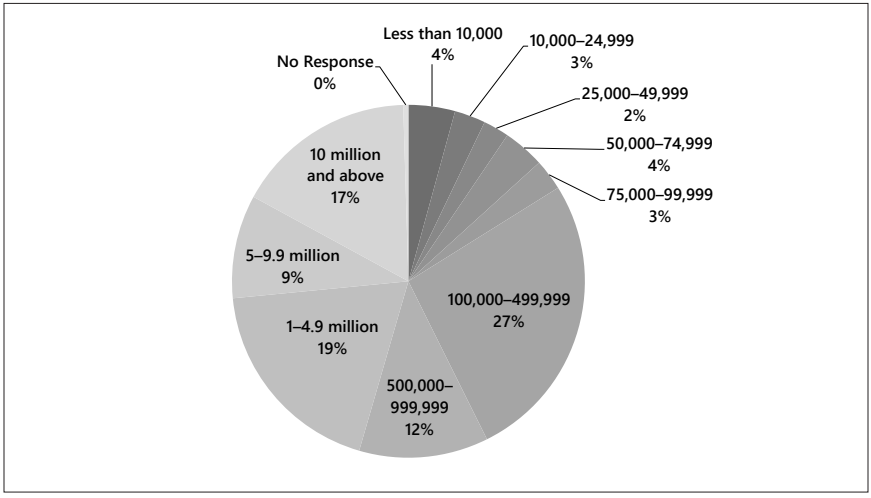
[2] Only 211 completed questionnaires were considered in this report. As of writing, additional 17 accomplished questionnaires are being verified.

Figure 2. Respondents by employment size



Source: Authors' compilation

Figure 3. Respondents by total assets (in USD)

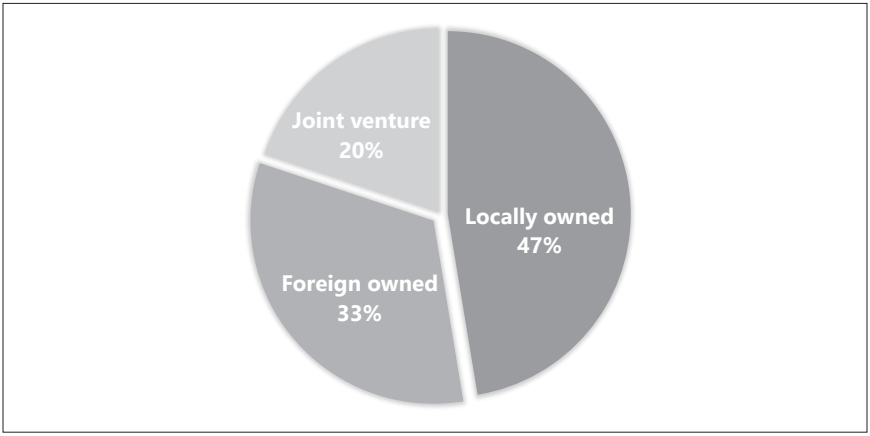


Source: Authors' compilation

Firm ownership

Of the 211 surveyed establishments, 100 or 47 percent are locally owned, while 53 percent (111 establishments) have foreign ownership (Figure 4). Of the percentage that have foreign ownership, 33 percent are wholly foreign owned, while 20 percent are joint-venture firms. The results are not surprising because the region is home to several economic zones where many foreign-owned and joint-venture firms are located.

Figure 4. Respondents by capital structure



Source: Authors' compilation

Upgrading and introduction of new product

Of the firms surveyed, 113 (54%) have introduced new products in the last two years. Most of these firms are likewise from the plastic and rubber, and food, beverages, and tobacco sectors (Table 1).

In terms of ownership, the survey results indicate that 26 out of the 113 firms that have introduced new products in the last two years are joint-venture firms. More so, more than 60 percent of foreign-owned firms have introduced new products, compared to about 44 percent of locally owned firms (Table 2).

Sixty percent of firms that have introduced new products in the last two years are MSMEs. However, looking at the MSME sector alone, firms that have introduced new products were only close to half of the firms surveyed. Meanwhile, about 75 percent of the large firms have introduced new products in the last two years (Table 3).

Innovation measures

As for the type of innovation, 71 firms made innovations, such as introduction of a new product, redesigning packaging, or significantly changing appearance or design of existing products, while 31 firms tried at least one of these activities. Firms with foreign equity were mostly the ones that made such innovations. In addition, relatively more firms from the food, beverages, and tobacco and plastic and rubber sectors successfully carried out innovation activities (Table 4).

Table 1. Respondents that introduced new products in the last two years by main business activity

Sector	Introduced New Products	Did Not Introduce New Products	No Response	Grand Total
Food, beverages, and tobacco	14	16		30
Textiles	2	2		4
Apparel, leather	12	9		21
Footwear		1	1	2
Wood, wood products	1	4		5
Paper, paper products, printing	4	3		7
Chemicals, chemical products	6	2		8
Plastic, rubber products	15	7		22
Other nonmetallic mineral products	7	4		11
Iron, steel	3	2		5
Nonferrous metals		4		4
Metal products	7	13		20
Machinery, equipment, tools	10	5		15
Computers and computer parts	6	2		8
Other electronics and components	12	9		21
Precision instruments	2	3		5
Automobile, auto parts	6	6		12
Other transportation equipment and parts	2	1		3
Handicraft	1			1
Others	3	4		7
Grand total	**113**	**97**	**1**	**211**

Source: Authors' compilation

In terms of product innovation measures, about 35 percent (73 out of 208 firms) introduced a new product by significantly improving existing products, while 16 percent at least tried (Table 5). About 28 percent of the firms also developed totally new products based on existing technologies, while about 22 percent used new technologies.

Table 2. Respondents that introduced new products in the last two years by capital structure

Capital Structure	Introduced New Products	Did Not Introduce New Products	No Response	Grand Total
Locally owned	44	56		100
Foreign-owned	43	26		69
Joint venture	26	15	1	42
Grand total	**113**	**97**	**1**	**211**

Source: Authors' compilation

Table 3. Respondents that introduced new products in the last two years by employment size

Employment Size	Introduced New Products	Did Not Introduce New Products	No Response	Grand Total
1–19 workers	8	12		20
20–49 workers	15	31		46
50–99 workers	27	25		52
100–199 workers	19	14		33
200–299 workers	8	6	1	15
300–399 workers	4	2		6
400–499 workers	4	1		5
500–599 workers	17	3		20
1000–1499 workers	5	1		6
1500–1999 workers	3	1		4
2000 and over	3	1		4
Grand total	**113**	**97**	**1**	**211**

Source: Authors' compilation

Firm innovation activities are not limited to product innovation. Firms can also undertake process innovations. There are wide forms of innovations particularly when firms adopt new production processes and/or introduce changes or improvements in production processes and operating facilities, marketing, and business strategies to make themselves more competitive (Albert et al. 2013).

Table 4. Firms that introduced a new product, redesigned the packaging, or significantly changed the design of their existing products, by ownership and by main business activity

Capital Structure	Achieved	Tried	Not Tried Yet	No Response	Grand Total
Locally owned	27	12	4	56	99
Foreign owned	32	9	2	24	67
Joint venture	12	10	5	15	42
Grand total	**71**	**31**	**11**	**95**	**208**
Sector	**Achieved**	**Tried**	**Not Tried Yet**	**No Response**	**Grand Total**
Food, beverages, and tobacco	11	1	2	15	29
Textiles	1		1	2	4
Apparel, leather	3	6	3	9	21
Footwear		1		1	2
Wood, wood products	1			4	5
Paper, paper products, printing	2	2		3	7
Chemicals, chemical products	4	2		2	8
Plastic, rubber products	10	4	1	7	22
Other nonmetallic mineral products	2	2	3	4	11
Iron, steel	3			2	5
Nonferrous metals				4	4
Metal products	5	1		14	20
Machinery, equipment, tools	8	2		3	13
Computers and computer parts	4	2		2	8
Other electronics and components	7	5		9	21
Precision instruments	2			3	5
Automobile, auto parts	4	2		6	12
Other transportation equipment and parts	2			1	3
Handicraft		1			1
Others	2		1	4	7
Grand total	**71**	**31**	**11**	**95**	**208**

Source: Authors' compilation

Table 5. Product innovation measures achieved or tried by respondents

Innovation Measures	Achieved	Tried	Not Tried Yet	No Response	Grand Total
Introduced a new product, redesigned packaging, or significantly changed design of the existing products of the establishment	71	31	11	95	208
Introduced a new product, significantly improved existing products with respect to capabilities, user friendliness, components, subsystems, etc.	73	34	6	95	208
Developed totally new product based on "existing" technologies	59	33	21	95	208
Developed totally new product based on "new" technologies	45	37	31	95	208

Source: Authors' compilation

Table 6. Process and business management innovation measures achieved or tried by respondents

Innovation Measures	Achieved	Tried	Not Tried Yet	Grand Total
Production	89	86	35	210
Procurement, outsourcing	74	82	54	210
Business process re-engineering	58	74	78	210
Sales promotion	57	80	71	208
Sales management	63	78	67	208
Inventory control	86	84	40	210
Logistics	76	82	51	209
Accounting	84	85	40	209

Source: Authors' compilation

As shown in Table 6, wider forms of innovations are widely practiced by the sampled firms. These can manifest through the adoption of new or improved business practices in production, procurement, and similar activities. Over 70 percent of the firms surveyed have tried and achieved some form of process innovations in the last two years.

Table 7. Improvement in business performance

Business Performance Measures	Significant Increase	Moderate Increase	Satisfactory	Moderate Decrease	Significant Decrease	Grand Total
Sales	15	58	79	49	12	213
Profit	16	45	83	52	17	213
Export value	8	30	57	28	8	131
Labor productivity	20	66	89	31	5	211

Source: Authors' compilation

Improvement in business performance

The survey also sought information on the improvement in business performance, which may be taken as probable effects of product and process innovations. Respondents were asked to personally assess the impact of innovation activities to company productivity, specifically on revenue and production-related measures. A five-point narrative rating scale from satisfactory, moderate to significant increase or decrease was presented. Significant increase (decrease) would mean substantial or sizeable improvement (drop) in the suggested indicators, while moderate increase (decrease) connotes some improvement (decline) from the 2011–2012 performance measures. A satisfactory rating, meanwhile, implies no detectable change between periods.

The result suggests that only about 29–35 percent of the firms have reported moderate to substantial increases in sales, profit, and export value, whereas 40–50 percent achieved moderate and significant profit and labor productivity growths in 2013 (Table 7). About 35–45 percent of the sampled firms reported a satisfactory rating, which indicates no significant changes in all performance measures.

Determinants and Impacts of Innovations: Empirical Results

The systematic relationship among firms' decision to undertake innovation activities, their inherent attributes, and the impact of these activities on firm performance is already well-established in the literature. To some extent, the descriptive statistics obtained from the cross tabulations

seem to support the notion that there is a link between innovation activities and economic performance of firms. They also indicate that firm characteristics—such as size, foreign equity, and industry sector—are important factors in making innovations. To deepen our understanding, it will be helpful to employ an econometric model that identifies what factors explain firms' decision to innovate and whether this decision can lead to positive, desirable performance outcomes.

Empirical model

As stated earlier, studies show that product and process innovations tend to have different determinants (Rasiah 2003). Thus, the determinants of innovation are examined separately for product (PROD) and process (PROC) innovations. A simplified probit regression model is used in the estimation to determine product and process innovation:

$$\text{Prod}\,(Ijt = 1 \mid X, Y) = \beta 0 + \beta 1\ \text{AGE} + \beta 2\ \text{SIZE} + \beta 3\ \text{FOREIGN} + \beta\ 4\ \text{HIGHTECH} + \mu$$

Innovative behavior (I_{jt}) is given by PROD (PROC) equal to 1 if a firm does product (process) innovation, 0 if not. Firm age (AGE) refers to the number of years that the firm has been operating in CALABARZON. Employment size is measured by the SIZE variable. It is equal to 1, meaning large, if it has over 200 employees, otherwise it is set to 0. Equity ownership, meanwhile, is represented by FOREIGN, in which 0 connotes locally owned firms and 1 if it is partial or fully owned by foreigners. To capture the differences in innovation practices across sectors, electronics and information technology-related industries (HIGHTECH=1) are differentiated from primary or low-technology sectors like food manufacturing, textile, and related activities (HIGHTECH=0).

Probability of making innovations

Age, size of firm, and foreign equity are statistically significant determinants of the probability of undertaking innovation (Table 8). The age of the firm matters to process innovation just as significantly as employment size, which is found to influence both process and product innovation among surveyed firms.

Large and more mature firms seem to have a higher propensity to introduce process and product innovations than smaller and younger

firms. The large firms are more established in the market and could be expected to invest in innovation to maintain their competitiveness. The knowledge and experience accumulated by mature firms over the years may have also worked to their advantage as these increase their probability to undertake process innovation by 0.8 percent.

Meanwhile, it seems the availability of more workers also allows larger firms to innovate. A bigger workforce increases the firms' probability to carry out product and process innovation activities by 25 and 21 percent, respectively. With proper incentives for their workforce, larger firms may find it easier to accomplish product and process innovations compared to smaller firms. The talent pool for innovation is obviously bigger in larger than in smaller firms and, thus, product and process innovations may be more easily teased out of these firms with proper incentives or motivation.

Among the surveyed firm characteristics, foreign capital participation is one of the most important predictors of product innovation. This reflects the ability of foreign investors to supply domestic firms with scientific and nonscientific resources, including the

Table 8. Probability of engaging in product and process innovation in the last two years

	Product Innovation		Process Innovation	
	Coefficient	Marginal Effects	Coefficient	Marginal Effects
Age	0.007	0.003	0.021**	0.008**
	(0.009)	(0.004)	(0.009)	(0.004)
Large	0.661***	0.251***	0.577***	0.215***
	(0.215)	(0.076)	(0.216)	(0.075)
Foreign	0.316*	0.125*	0.177	0.069
	(0.191)	(0.075)	(0.192)	(0.075)
Hightech	-0.001	-0.001	0.009	0.003
	(0.025)	(0.010)	(0.024)	(0.010)
_cons	-0.379		-0.464*	
	(0.236)		(0.239)	
se				

Notes: *** p<0.01, ** p<0.05, * p<0.1
Source: Authors' computation

latest technology, thereby, boosting the innovative capability of the latter (Love and Ashcroft 1999; Michie and Sheehan 2003; Aghion et al. 2009).

Interestingly, the type of technology (i.e., high or low) employed by firms does not seem to influence the probability to undertake product and process innovations. The assumption that high-technology industries are more predisposed to innovate is not validated in the present case. We surmise that process and product innovations in high-technology firms may tend to be more capital intensive and may take a longer time to be completed. Hence, the interval between innovations—process-or-product-wise—is longer perhaps than the two years indicated in the survey results.

The finding on employment size as an important determinant of innovation is consistent with the results of the 2009 Department of Science and Technology Survey on Innovation Activities (Albert et al. 2013). The results showed that the larger the firm, the more likely that it will engage in process innovations. The report likewise found a positive correlation between innovation and location in Philippine Economic Zone Authority areas. This implies that location in an economic zone is a good predictor of innovations among firms. It found negative results for age and foreign equity, implying that these are not good predictors of innovation.

Impact of innovation on firm performance

In this paper, firm performance is indicated by increase (decrease) of sales, increase (decrease) of profits, and improvement (decline) in labor productivity. Data on sales, profit, and labor productivity here are from the surveyed firms' response to the question of whether the product and process innovations introduced during the past two years correspond to moderate to substantial improvements in sales, labor productivity, and firm profit. Our estimates suggest that incremental process innovations significantly affect firm performance as indicated by firm sales, profit, and labor productivity.

For instance, process innovations undertaken by sampled business establishments for the past two years are estimated to increase sales by 19 percent and profits by 20 percent, and raise labor productivity by 24 percent (Table 9). Product innovation also has a positive and significant impact on sales and labor productivity. However, it has a fairly small impact compared to process innovation, which generally involves significant improvements in the managerial operations and production.

Table 9. Impact of innovations on firm performance

	Sales	Marginal Effects	Profit	Marginal Effects	Labor Productivity	Marginal Effects
Product	0.438**	0.158	0.269	0.090	0.435**	0.167
	(0.182)	(0.253)	(0.186)	(0.249)	(0.178)	(0.259)
_cons	-0.650***		-0.716***		-0.469***	
	(0.138)		(0.140)		(0.132)	
Process	0.530***	0.188	0.641***	0.205	0.635***	0.239
	(0.185)	(0.252)	(0.195)	(0.243)	(0.183)	(0.256)
_cons	-0.728***		-0.967***		-0.614***	
	(0.146)		(0.157)		(0.142)	

Notes: *** p<0.01, ** p<0.05, * p<0.1
Source: Authors' computation

Product innovations generally exhibit a certain degree of novelty, which may have two opposing effects on revenue streams (Corsino 2008). One is the inertia effect, which might cause slower market acceptance of extremely novel products. This may result in a temporary insignificant impact of innovations on firms' performance indicators. The other is the efficiency effect that ensures the desired state wherein rapid market penetration creates opportunities for higher sales and profits. In the present case, product innovation that leads to the commercialization of a new product or service translates to higher probability of increased sales and labor productivity. However, it is expected to happen in a much slower rate and probability than process innovations.

Concluding Remarks

Our empirical results affirmed that innovation does mediate good firm performance. Product and process innovations lead to increase in sales and profits, and improve labor productivity. The paper also showed that firm size, age, and foreign equity are important factors leading firms to innovate. Of particular importance to the Philippine development narrative is our finding on the role of foreign equity as a determinant of innovation. Removing regulatory and structural barriers to allow the entry of foreign direct investments (FDIs) will be critical in attracting such investments to the domestic market. FDIs bring along new products,

expertise, innovations, and a host of complementary institutions (e.g., efficient global supply chains) that are indispensable in playing a more substantial role in the Association of Southeast Asian Nations region that is marked for greater economic integration.

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Aside from physical capital and human resource, private firms are also advised to invest in innovations to be more productive and profitable. However, it is important to ensure such investment is well-spent. This study found that product and process innovations do lead to increase in sales and profits, and improve labor productivity. It also showed that firm size, age, and foreign equity are important factors leading firms to innovate.

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