Innovation and Firms' Performance in the Rwandese Manufacturing Industry. A firm Level Empirical Analysis

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Abstract

The main objectives of this paper is (i) to determine factors that support engagement in innovative activities by Rwandese manufacturing firms; (ii) to assess effects of innovation decision on innovation performance of Rwandese manufacturing firms; and (iii) to evaluate impacts of innovation performance on financial performance of Rwandese manufacturing firms. To address these two objectives, we used a structural multistage framework as proposed by Crepon et al. (1998). Data used are from the 2006 enterprise survey conducted by the World Bank in Rwanda and referenced as 'ID RWA_2006_ES_v01_M_WB'. This study resulted in three main outcomes: (i) product innovation is linked directly to the process innovation, meaning that firms which engage in process innovation introduced new or improved products on the market; (ii) innovation output, here the 'international quality-recognition', is not linked to the firm engagement in innovation. It is linked to the use of technology licensed from foreign firms; (iii) the 'international quality-recognition' is the main determinant of firm's financial performance. Consequently, in order to boost manufacturing firms' financial performance a public assistance in Research and Development to Rwandese manufacturing is recommendable.

Keywords: Innovation, Manufacturing industry, International quality-recognition, Firm's performance

JEL Classification Codes: L60 – O14 – O31 – O32

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1. Introduction

For a rapid economic growth in developing economies, entrepreneurship and industrial development are among valuable targets. While entrepreneurship is the mainstay of significant economic growth, it can only expect tangible results through innovation. Innovation refers to all scientific, technological, organizational, financial and commercial steps which actually lead to, or are intended to lead to, the implementation of technologically new or improved products or services (OECD, 2005). The OECD (2005) inventories four types of innovation: product innovations, process innovations, organizational innovations and marketing innovations.

A number of factors can affect innovation activities. These include economic factors such as production costs and demand, factors specific to an enterprise such as skilled personnel or knowledge, and legal factors such as competition regulations and tax rules (Crepon et al., 1998). Marques at al. (2011) stressed the fact that encouraging firms to innovate will lead to a better economic performance of firms in terms of market and financial performance. Thus, policy that promotes innovation may help fostering growth and competitiveness among business, specific regions and in the economy at large.

Based on Schumpeter's (1940) theory of creative destruction that proposes that non-innovative firms and products are replaced with innovative ones; Rwanda, similar to many regional and African countries has identified innovation to be a sustainable way to ensure high economic growth and enterprise performance (MINECOFIN, 2013). Although innovation is generally regarded as a means of improving the competitiveness of firms and their performance locally or regionally, it hasn't been supported unambiguously by empirical work in Rwanda.

Different empirical evidence shows the dynamic role of entrepreneurial activity in promoting innovation and technology, economic growth and employment (Audretsch et al., 2006; Van Stel, 2006; Fritsch and Mueller, 2004; 2008). On the other hand entrepreneurship development has been based on innovative ideas and use of new technologies to support enterprise performance (Balachandran and Sakthivelan, 2013; Tuan, Nhan, Giang and Ngoc, 2016). According to Tuan, Nhan, Giang and Ngoc (2016), enterprise performance can be identified as a multidimensional concept that can be measured by three indicators: production, finance and marketing.

Having accepted the importance of innovation and technology, it is disappointing to note that in Rwandan context there is no prior specific research done to measure the impact of innovation and technology on enterprise performance and even the most direct and quantifiable outcomes of innovation and technology on entrepreneurship.

Thus, with the merit of fulfill this gap, this paper has as main objective of investigating the impact of innovation on entrepreneurship development in Rwanda. Therefore, two specific objectives are assigned to this study: (i) determine factors that support engagement in innovative activities by Rwandese manufacturing firms; (ii) assess the effects of innovation decision on innovation performance of Rwandese manufacturing firms; and (iii) evaluate impacts of innovation performance on financial performance of Rwandese manufacturing firms.

To address these three specific objectives, we had recourse to the structural multistage approach as suggested by Crepon et al. (1998). The Crepon (1998) modeling permits to deal with both problems of selection bias and simultaneity. Data used are from the "Rwanda 2006 Enterprise Survey" of the World Bank and referenced as 'ID RWA_2006_ES_v01_M_WB'.

This study resulted in three main outcomes: (i) product innovation is linked to the process innovation, meaning that firms which have engaged in process innovation have also introduced new or improved products on the market; (ii) innovation output, here the 'international quality-recognition', is not linked to the firm engagement in innovation. It is linked to the use of technology licensed from foreign firms; (iii) the 'international quality-recognition' is the main determinant of firm's financial performance.

The paper is organized as follows: after this introduction, we present a brief literature review. It is followed by a methodological section and empirical results. The paper ends by a conclusive section which summarizes the main findings and gives recommendations.

Literature review

As stressed by Fagerberg (2004), innovation is not a new phenomenon, but in spite of its importance it has not received enough attention of scholars. However, research on innovation and economic and social change has proliferated in recent years, particularly in social sciences. Especially, researches on the relationship between innovation and productivity or performance of firms has been synthesized by Mairesse and Mohnen (2010), Hall (2011) and Mohnen and Hall (2013) particularly. Mairesse and Mohnen (2010) analyzed innovation surveys' characteristics and econometric problems raised by such data collected. While Hall (2011) study concerned the synthesis of researches about the relationship between innovation and productivity at the firm level, Mohnen and Hall (2013) updated the literature review in both previous studies.

With the main target of determining the relationship between innovation and productivity of European firms, Hall (2011) reviewed the ways in which economists have analyzed the relationship between productivity and innovation. He concluded that there are substantial positive impacts of product innovation on revenue productivity, but that the impact of process innovation is more ambiguous. Also, he observed that at the individual firm level, process innovation can increase real output while leaving revenue mostly unchanged. Further, one of consequences of innovation is likely to be the entry of new innovating firms and the exit of some inefficient firms. Thus, he suggested to direct attention to the extent to which entry and exit regulation impacts the rationalization of industry structure in response to innovative activity.

As Hall (2011), Mohnen and Hall (2013) analyzed the effects of technological and non-technological innovations on the productivity of firms by reviewing the existing evidence from literature. They updated the survey by Hall (2011) and complemented the Mairesse and Mohnen (2010) survey on the use of innovation surveys to better understand innovation. From this survey of empirical literature, they concluded that innovation leads to a better productivity performance. Also, they observed that all types of innovation influence the productivity, but isolating individual effect remains difficult because of simultaneity of different types of innovation. Further, they observed that the effect of innovation is divided into two parts; one going to the real output, and another pertaining to the price at which the output is sold. However, they concluded that it is very difficult to dissociate them because of measurement issues.

Individual studies give further insights about the relationship between innovation and performance and raise detailed econometric problems according to specificities of each other. Also, they give various understandings about the probability of firms to engage in innovative activities.

Crepon et al. (1998), using an econometric method which corrects for selectivity[3] found that in France, some factors affect positively the probability for a firm to engage in innovation activities. They are number of employees, sales share and distribution, market demand and the technology. However, they observed that a small proportion of firms engage in research activities and/or apply for patents. About the effects of innovation on performance, taking into account both simultaneity and selectivity bias, they concluded that innovation output rises with innovation effort (investment in R&D) and firms productivity correlates with innovation output, represented by patents number or innovative sales.

Considering different types of innovation, Mairesse and Robin (2009) found that product innovation appears to be the main driver of labour productivity in the French manufacturing and service industries. The impact of process innovation was either not significant or close to zero. Also, Legros and Galia (2012), analyzing the sources of knowledge and their effects on productivity in French manufacturing, found that the market share and firm size have a positive impact on innovation decision and intensity of R&D. Also, they concluded that size and worker’s involvement matters to ISO 9000 certification. However, this main result is amplified by existence of competing products and patents. So that, they suggest that firms must invest not only in R&D, but also in different sources of internal and external knowledge such as workers’ training and ISO 9000 certification

Previous results confirm conclusions of Griffith et al. (2006) who studied the role that innovation plays in productivity of firms in four European countries using a structural multistage model (Crepon et al., 1998). These countries are France, Germany, Spain and UK. They used data from the third wave of the internationally harmonized community innovation surveys. They found that firms that operate mainly in international markets and larger firms are more engaged in formal innovative activities (here R&D). Also, they found that the process innovation is more positively influenced by suppliers’ information, while the product innovation is more influenced by the demand information. Further, conclusions of Griffith et al. (2006) state that the process innovation is associated with productivity only in France, while product innovation is associated with productivity in three countries, namely France, Spain and UK.

[3] This method is known over the acronym of CDM, initials of authors’ names: Crepon, Duguet and Mairesse.

Also, previous findings are supported by the conclusion of Zemplinerova and Hramadkova (2012) in Czechoslovakia. These authors found that probability to engage in innovation for a firm is positively influenced by its size. Also, analyzing the relationship between innovation and productivity in the Mexican manufacturing industry, Brown and Guzman (2014) concluded that firms that have more propensity to innovate are the largest, with high technological intensity and market share. Also, other outcomes of their study are that advertising; knowledge appropriability, foreign direct investment, information technologies and access to credit have a positive effect on innovation efforts.

In Greece, Beneki et al. (2012) attempted to investigate the relationship between innovativeness and firm performance and concluded on the unwillingness of the private sector to invest in R&D and the low productivity of innovation. Thus, they suggest leveraging private investment in innovation through public investment.

Bronwyn et al. (2009), using the structural multistage model which incorporates information on innovation success, analyses impacts of innovation on productivity of SMEs in Italy. They found that the international competition fosters R&D intensity, especially within high-tech firms. Determinants of engagement in both product and process innovations were firm size, investment in R&D and in equipment. Also, they found that both product and process innovation influenced the productivity of SMEs firms; especially process innovation. However, they observed that productivity of larger and older firm among SMEs was less influenced by their innovativeness.

In Belgium, Van Beveren and Vandenbussche (2009), using data from the Community Innovation Survey for Belgium attempt to explore the relationship between firm-level innovation activities and the propensity to start exporting. Their study resulted in significant positive effects of combination of product and process innovation on probability to enter the export market. However, they pointed to endogeneity of innovation activities, and so, observed that firms that have good prospects of entering the export market in the next period are more likely to invest in innovation activities.

However in developing countries, findings about the impact of each type of innovation are somehow different. Waheed (2011) when analyzing the influence of product and process innovations on firms' productivity in Bangladesh and Pakistan found that the process innovation affects more the productivity of firms rather than the product innovation. In Mexican, Brown and Guzman (2014) found that firms that have the higher propensity to innovate are those which are larger in terms of intensity in high technology and market share. Also, they found that Firms which innovate have a level of labor productivity 1.3 times higher than firms that do not innovate. However, their study doesn't distinguish between process and product innovations.

In Vietnam, Tuan et al. (2016) found that process, organization and marketing innovation respectively have the significantly positive impact on innovative performances. However, they observed that product innovation activities had no statistical impact on the innovative performance. Further, they concluded that factors which influence innovative performance had also positive effects on production, market and finance performances.

About methodological issues, we can refer to Lööf and Heshmati (2006). Indeed, with aim of analyzing the sensitivity of the estimated relationship between innovativeness and firm performance, Lööf and Heshmati (2006) found that the simultaneity between innovation activities and productivity or performance is of great importance and merits much more attention rather than the selectivity bias. Also, they found enough homogeneity of the relationship between innovation and productivity in both manufacturing and services firms.

Studies which link innovation to firm performance or that analyse determinants of firm innovativeness are yet few in developing countries. Especially, in Rwanda, on the best of our knowledge, no other similar study has been conducted. Thus, this paper seems having merit of filling this gap. Also, findings from this study could be usefulness for policy making about efficiency of innovativeness within Rwandese manufacturing industry.

2. Methodological framework

A. The model

In order to address three objectives of this study, we refer to the CDM framework as detailed in Crepon et al. (1998). The theoretical foundation of this methodology is the Cobb-Douglass production function:

$$Q = AL^{\alpha}K^{\beta} \qquad (1)$$

Where Q is the total profit before taxes, A is the level of innovation, L and K labor and capital inputs. Parameters α and β are elasticities of production with respect to labor and capital inputs.

However, the CDM models raise two econometric problems: the selectivity bias and simultaneity bias. The selectivity bias arises from the fact that not all firms engage in innovation and some innovations are not successful. The simultaneity bias is from many factors which can influence both firms' decision to innovate, its level of expenditure on innovation as well as its final performance.

In order to deal with these two problems, the CDM model is constructed in three steps. The first step accounts for the fact that the firm is engaged in innovation activity. Here, the innovative activity is described by two equations: the first which concerns the decision to innovate and the second which deals with the innovation input, for example investment in Research and Development. Two equations are linked to their determinants in the first two stages of the innovation process.

In the third stage, the innovation output (for example the number of patents) of firm is related to its innovation intensity (spending in R & D). The last stage concerns the relationship between firm's performance, innovation input and innovation output.

We summarize the four equations used in the CDM modeling.

$$g_i^* = x_{1i}\beta_1 + u_{1i} \qquad (2)$$

With g_{it}^* a latent variable of innovation decision equals to 1 if the firm has undertaken innovation activity or zero if not. Variable x_{1it} represents vector of explanatory variables, β_1 the associated coefficient vector. Subscript i designates the firm, while u_{1it} is the term error.

$$k_i^* = x_{2i}\beta_2 + u_{2i} \qquad (3)$$

Where k_i^* represents the amount invested in innovation for the firm i. Variable x_{2i} represents vector of explanatory variables, β_2 the associated coefficient vector. Subscript i designates the firm, while u_{2i} is the term error of the equation (3).

With reference to the innovation literature, these first two stages of the systemic approach are estimated jointly by a generalized Tobit model with the maximum likelihood estimation method.

The second stage accounts for the impact of engagement and investment in innovation to the innovation output. Here, can be considered as innovation output the number of new or improved products/services or the number of patents.

$$t_i^* = x_{3i}\beta_3 + u_{3i} \qquad (4)$$

Where t^* is an innovation output; other variables and parameters being defined as above.

The last equation accounts for the effects of innovation input and output to the firm's performance. In the literature, they used usually the Cobb-Douglass production function augmented to innovation variables.

$$q_i = x_{4i}\beta_4 + k_i^* + t_i^* + u_{4i} \qquad (5)$$

Where q_i is the indicator of firm's financial performance, k_i^* and t_i^* are variables representing innovation input and output respectively; x_{4i} is the vector of explanatory variables, β_4 the associated coefficient vector and u_{4i} the term error. All variables of equation (5) are in log form except dummy variables. With reference to the innovation literature, this last specification is estimated with three-stage least squares (Lööf and Heshmati, 2006), where the inverse Mills ratio is introduced in the equation (3) in order to deal with the selection bias.

B. Model specification

In equation (2), the dependent variable is the engagement of the firm in product innovation. Here, we consider that the firm engages in innovation if it introduced a new or significatively improved product on the market. Here, the process innovation is considered as a prerequisite to reach the product innovation. Explanatory variables of equation (2) contain process innovation, domestic competition, foreign ownership and added value per worker.

Because of lack of appropriate data, equation (3), which concerns the relationship between the intensity of investment in innovation and appropriate explanatory variables, is not used in our modeling. Instead of equation (3), we used equation (4) which refers to innovation output. Thus, we determined the relationship between innovation decision and innovation output, represented here by the fact that the firms has an *international quality-recognition*. The innovation output equation contains as explanatory variables the process innovation as defined earlier, number of new competitors entering the market, use of website and e-mails with clients and suppliers, use of licensed technology, company age by 2006, total fixed assets per worker, added value per worker and number of employees in 2005. Equation (4) includes also the inverse Mill's ratio.

Equation (2) and equation (4) are estimated jointly using the generalized tobit method.

Also, equation (4) and (5) are estimated jointly. All variables of equation (5) are in log form except dummy variables. With reference to the innovation literature, this last specification is estimated with three-stage least squares (Lööf and Heshmati, 2006); but in our modeling they are estimated using the two-stage least squares method because the equation (3) is missing.

Equation (5) is the performance one and contains as explanatory variables the capacity utilization (representing the competitiveness of the firm), the technology intensity represented here by the electricity expenditure, variables of market conditions (represented by direct export sales share and national market sales share), use of information technology represented by use of e-mails and web site, company age, number of employees, total fixed assets (representing here the physical capital) and the international quality recognition (here representing the innovation output as announced earlier).

C. Data requirement

Data used were collected by the World Bank in 2006 in Rwanda and under the theme "Enquête sur le climat des investissements et la productivité" and referenced as RWA_2006_ES_v01_M_WB. It could be preferable to use "the World Bank innovation follow up module - enterprise survey Rwanda 2011" which were dedicated to the specific issue of innovation in manufacturing and services firms. However, this survey combine both manufacturing and service firms; and because of a lot of missing observations, the number of manufacturing firms is not enough to permit an appropriate analysis. Consequently, using the 2011-innovation survey could not allow determining the true relationship between innovation and firm's performance in the manufacturing sector. Thus, one of limitations of this study is data which are dated and don't give the actual picture of innovativeness of manufacturing firms today.

3. Empirical findings

A. Overview of the sample.

We start this presentation by descriptive statistics about age, size, capacity utilization and employees of the sample used.

A.1Employment and size of firms

The sample used contains 59 manufacturing companies located in Huye and Kigali cities. Categorization used is borrowed from the World Bank and define company size as follows:

- A small company is defined as using between 5 and 19 full time employees included.
- A medium company has between 20 and 99 full time employees.
- A large company is defined as possessing 100 employees and above.

Figure 1: Sample size.
Source: Author's computation from ID RWA_2006_ES_v01_M_WB

According to the figure 1, the sample is dominated by small and medium firms. They are respectively 23 and 25 companies. Only 11 firms are categorized as large.

With reference to number of employees, about 41% of firms are classified as small companies using less than 19 employees. Also, about 81% of companies studied are into category SMEs: they employ less than 100 individuals.,

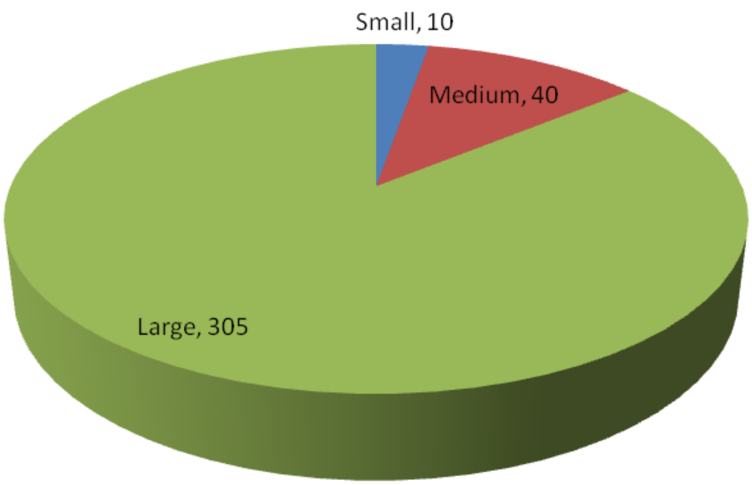

Figure 2: Average number of employees per company by firm size.
Source: Author's computation from ID RWA_2006_ES_v01_M_WB

However, individually, we observed that large company use in average the highest number of full time employees, about 305 individuals per company. Small firm uses in average only 10 individuals.

B.1Age of companies

Also, referring to the company experience, young firms are also small while elder ones are large. About 53% of firm has less than eight of operating years, meaning that majority of firms in Rwanda are too young. The eldest firm had 66 operating years in 2006. In Average large firm had 22 operating years, medium firm possessed 16 operating years while the small firm had only 7 operating years.

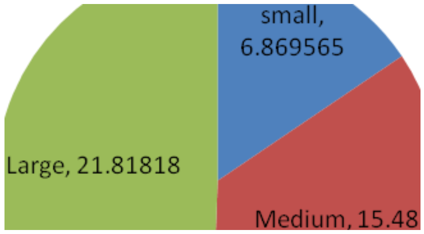

Figure 3: Age of firms according to their size.
Source: Author's computation from ID RWA_2006_ES_v01_M_WB

C.1Capacity utilization of firms

The capacity utilization of firms reflects also their competitiveness. Consequently, according to their size, we observe with figure 4 that small firms are more competitive in Rwanda, they use above 76% of their potential capacity. Medium firms are less competitive because they use only 55.5% of their capacity. However, large firms are also relatively more competitive rather than medium firms.

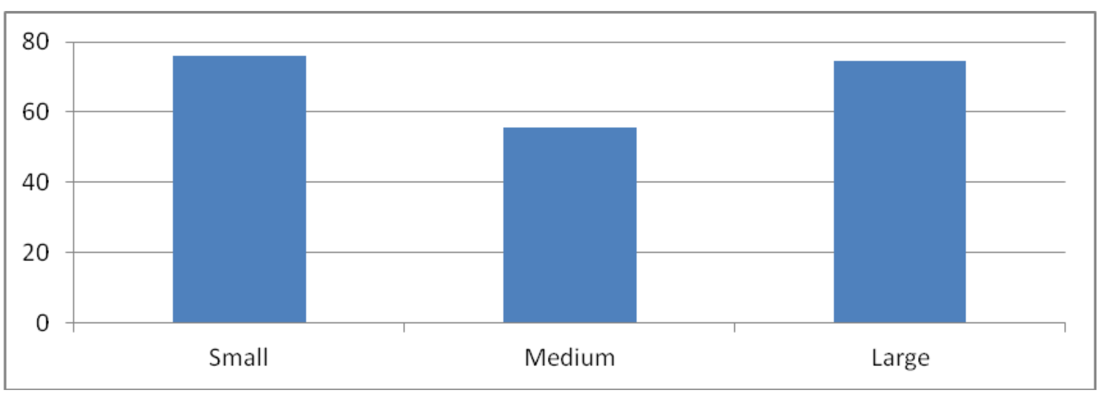

Figure 4. Capacity utilization of firms
Source: Author's computation from ID RWA_2006_ES_v01_M_WB

4.1. Innovation and financial performance of firms

In order to analyse effects of innovation on firm's financial performance, presentation of results is done in two stages. First, we analyse effects of innovation engagement on innovation output, here the 'international quality-recognition'. After, we analyse the effects of 'international quality-recognition' on financial performance of firms.

A. **Effects of innovation decision on innovation performance**.

According to table 1, innovation engagement is related to the innovation output (international quality recognition) via the inverse Mills ration. This ratio is not significatively relevant as we can observe from its p-value. This suggests that the selection bias is not enough, results which confirms the conclusion of Lööf and Heshmati (2006). This allows us using the two-stage least squares technique at the last stage without the inverse Mills ratio.

The product innovation, representing here the innovation decision by firms is positively linked to process innovation and negatively to the value-added per worker. This attests that a firm engages in process innovation in order to have a new or improved product. Also, the financial performance of firm is not the main determinant of the innovation decision. Firms engage in innovative activities in order to improve their finance and not the reverse.

However, innovation engagement has no significant effect on international quality recognition of firms. The last is more influenced by the use of technology licensed from foreign companies. In comparison with other variables, use of technology licensed has the highest coefficient and is statistically very significant. In opposite, even if the process innovation influences significatively the product innovation, it has no effect on the international quality recognition.

Also, number of full time employees is one of factors of 'international quality-recognition'. This reflects the idea that firm's size influences the international quality recognition of manufacturing companies. However, as the coefficient is too low, influence of company size on firm innovation output is almost negligible. On the contrary, the use of e-mail in relations with clients or suppliers impacts negatively the international quality recognition. This result is conflicting and very difficult to interpret. However, we think that in 2005 use of e-mails was a new story in the

Rwandese manufacturing industry, and was mainly adopted by small firms which are not enough innovative as announced above.

Table 1. Effects of innovation engagement on innovation output using the generalized tobit regression.

International quality recognized	**Coefficients**	**P-Values**
Process innovation	0.238057	0.667
New competitor entered market	-0.059423	0.404
Use of web site with clients or suppliers	0.055952	0.614
Use of technology licensed	0.7233031	0.000
Use of e-mail with clients or suppliers	-0.212101	0.019
Company experience	0.0020135	0.483
Total fixed assets per worker	1.88E-09	0.664
Added value per worker	-8.82E-10	0.901
employees	0.0015207	0.000
_cons	-0.183072	0.762
Product innovation		
Process innovation	2.376331	0.000
Domestic competitor on production cost	-0.010132	0.981
Foreign ownership	0.0061147	0.349
Added value per worker	-3.34E-08	0.096
_cons	-0.755568	0.059
Mills lambda	0.1361329	0.766
rho	0.68301	
sigma	0.1993147	
Number of observations	59	
Uncensored observations	35	
Wald chi2(9)	83.31	
Prob > chi2	0000	

Source: Author's computation from ID RWA_2006_ES_v01_M_WB

B. Effects of innovation of financial performance

According to the table 2 below, we observe that the main determinant of financial efficiency of manufacturing firms is the 'international quality-recognition'. Its coefficient is the highest and statistically significant. This variable is the proxy of innovation output and can be interpreted as having a positive impact on financial performance. Firms which possess the 'international quality-recognition' are likely to be financially efficient rather than firms without this recognition.

Table 2. Effects of innovation output on financial performance: two-stage least squares.

Log added value	**Coefficients**	**P-Values**
Log capacity utilization	0.5609422	0.055
Log electricity cost	0.2894754	0.000
Direct exports share	0.0170243	0.048
National sales share	0.0027956	0.700
Use mail with clients or suppliers	0.2029652	0.449
Use web site with clients or suppliers	-0.8519364	0.004
Log company experience	0.1570394	0.226
Log employees	0.5086777	0.000
Log total fixed assets	0.1973117	0.001
International quality-recognized	0.9073776	0.003
_cons	5.633773	0.000
Number of observations	51	
F(9, 41)	33.110	
Prob > F	0.000	
Total (centered) SS	189.7216	
Total (uncentered) SS	17600.32	
Residual SS	20.4518	
Centered R^2	0.88922	
Uncentered R^2	0.9988	
Root MSE	0.6333	
Sargan statistic (over identification test of all instruments)	28.446	
Chi-sq(8) p-val	0.0002	

Source: Author's computation from ID RWA_2006_ES_v01_M_WB

The second factor of performance is the use of web site in relations with clients or suppliers. However, its coefficient is negative and, as mentioned earlier, this can attest that the use of information technology tools is still at the beginning and more adopted by small and less innovative firms. This is likely true because according to the table 2, the firm size is also a positive determinant of financial performance of manufacturing firms. Indeed, increase in number of employees by 10 per cent leads to the rise of financial performance by 5 per cent. Consequently, small firms by the number of full time employees are handicapped by their size itself.

Also, the competitiveness, the technology intensity and the physical capital are other determinants of firms' performance. The competitiveness is here represented by the capacity utilization and export sales share of the firm. They are both positively linked to the financial performance. Total electricity cost and total fixed assets are respectively proxies of technology intensity and physical capital. These two factors are correlated because they reflect that the firm masters its productive technology. Consequently, previous results show that combination of competitiveness and technology intensity are important instruments of manufacturing firm's performance.

4. Summary and conclusion

This study had as specific objectives of (i) determining factors of innovation decision and (ii) effects of innovation activity on manufacturing firms' performance in Rwanda. To address these two objectives we recourse to the structural multistage modeling as suggested by Crépon et al. (1998). However, in order to conform to data availability, we used a two-stage technique, where in the first stage we determined the relationship between innovation decision and innovation output. In the second and last stage, we established the relationship between innovation output and firm's performance. Data used are from the World Bank '2006 - enterprise survey'.

This study resulted in three main outcomes: (i) product innovation is linked directly to the process innovation, meaning that firms which decided to engage in process innovation have introduced new or improved products on the market; (ii) innovation output, here the 'international quality-recognition', is not linked to the firm engagement in innovation. It is linked to the use of technology licensed from foreign firms; (iii) the 'international quality-recognition' is the main determinant of firm's financial performance.

With respect to empirical findings above, we recommended a public assistance in R&D to private manufacturing firms in order to boost their innovativeness. Also, it is advisable that manufacturing firms apply for an 'international quality-recognition', because it is important for their financial sustainability.

However, it is important to underline that empirical findings of this study must be considered with cautions. Data used are enough dated and didn't permit to consider all variables of interest, particularly gender and age of owner. Consequently, we suggest undertaking deeper analyses which emphasize thematic studies (type of firms) and ownership structure of firms using data newly collected.

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