# Exploring Determinants of Firm´s Innovation in Morocco: Evidence from the World Bank Enterprises Survey

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**Abstract:** This study investigates the determinants of firm's innovation in Morocco using data from the World Bank Enterprise Surveys among 1,096 enterprises for the year 2019. Using probit regression model, the results show that firm size, formal training, and informal sector competition are the main drivers of product, process, R&D investment, and foreign certification innovation. Furthermore, foreign ownership and the exporter status also significantly impact firms' innovation. The results indicate that small and medium-sized enterprises are less likely to innovate compared to large firms, and firms in the manufacturing sector are more likely to innovate compared to service sector firms. The findings of this study can be used by enterprises to develop effective strategies for innovation and by policy-makers to enhance the competitiveness of the Moroccan economy.

**Keywords:** Innovation, New technologies, Probitregression, Morocco.

**JEL Classification:** O30, O32, C20, N77.

## 1. INTRODUCTION

One of the most major challenges in developing countries is reducing the existing economic performance gap for firms positioned far from the technological frontier. Improving this ability requires innovation that helps to enhance the firm's capabilities through the acquisition of knowledge capital and the development of management and organizational skills, along with their implicit knowledge (Wan et al. 2005; Dziallas & Blind, 2019). To promote productivity growth, itis vital to focus on the types of innovative activities that firms in developing countries undertake and their determinants (Zemplinerová & Hromádková, 2012).

In order to bring new products or processes to market, firms need to transform their knowledge capital or innovation inputs into innovation outputs (Cirera & Muzi, 2016; Morris, 2018). These outputs can include a range of improvements, such as higherquality, organizational changes, or patented intellectual property. To improve their ability to innovate, firms invest in a range of innovation inputs, including tangible assets like technology and equipment, as well as intangible assets like human and creative capital, and managerial and organizational capital (Medase & Barasa, 2019). Depending on the complexity of the innovation, specific innovation activities may be required (Mishra et al. 2021).

The factors that influence the direction, potential, and speed of a firm's product and production updates are referred to as determinants of innovation. The overall strategy of the enterprise should be considered when forming innovation strategies, as the two are closely linked. However, it is important to also consider specific determinants of innovation that are unique to the firm and its surroundings. These determinants could encompass access to finance, firm's size, market demand, the presence of skill edlabor, competition, government regulations, and others (Shashi et al. 2019; Kireyeva et al. 2021). Understanding these determinants is crucial for shaping effective innovation strategies and promoting firm performance in developing countries (Barrichello et al. 2020 quality of human capital (Kireyeva et al., 2020). Nevertheless, the extent of these factors' influence).

Recently, new data sources have emerged, including the World Bank Enterprise Survey, which has been widely used to examine the elements affecting the determinants of innovations in developed economies (Fabrizio, 2009 ; Hajduova et al. 2021). These studies have uncovered a variety of specific business and industry factors that impact innovation in both developed and developing countries. To increase the absorption potential of regions, it is important to implement programs that support and enhance businesses and improve the on innovation, particularly in developing countries like Morocco, remain sun explored and requires further investigations. The aim of this study is to examine the innovative capabilities of enterprises, using the Probit regression approach, and to examine the key factors that influence businesses in Morocco in order to develop a management strategy that effectively supports their success.

Enhancing the innovation activities of companies for sustainable development by aligning them with the market needs and capabilities of economic entities is crucial (Zawis lak et al. 2018). Literature review indicates that topics such as the potential of companies and factors driving innovation, particularly in developing countries like Morocco, have not been extensively studied. Microeconomic empirical studies

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are scarce. When exploring these determinants, the emphasis is primarily on large firms and not on SMEs. Furthermore, the focus is on the decision-making process rather than technical and economic issues (Kireyeva et al. 2021).

Overall, the literature suggests that enhancing the innovation activities of firms is critical for sustainable development. However, there is a need for more research to understand the potential of firms, particularly SMEs, and the factors driving innovation, particularly in developing countries (Pinget et al. 2015; Heenkenda et al. 2022). By addressing this knowledge gap, policy-makers, researchers, and business leaders can create an enabling environment that fosters innovation and sustainable development.

The remainder of the paperis organized as follows: Section 2 briefly reviews the literature on innovation and its determinants. Section 3 discusses the econometric methodology and sources of data. Presentation of results and discussions are provided in Section 4. Section 5 concludes.

## 2. LITERATURE REVIEW

The rapid growth of innovation and the increasing interdependence of economies around the world have made the development of innovation an essential aspect of the global economy in the 21st century (Aslam et al. 2018; Pentang, 2021). As a result, many enterprises have adopted strategies to promote innovation in order to remain competitiveness. Innovation is widely recognized as having a significant impact on a enterprise's financial performance. It can lead to improvements in sales growth, market share, and profits, which in turn can positively influence the overall performance of the enterprise (Shashi et al. 2019; Kireyeva et al. 2021).

The Schumpeterian view of economic growth considers innovation as the driving force behind the creative destruction process that fuels economic transformation. According to this view, firms drive economic growth by introducing new products and technologies, which leads to the displacement of old and inefficient methods of production. This, in turn, leads to an increase in productivity, economic growth, and higher living standards. Schumpeter believed that this process of creative destruction is constant and ongoing, with new innovations continuously leading to the replacement of old methods of production.

This perspective was popularized by Solow (1957) and reinforced by new growth theory (Romer, 1990; Aghion and Howitt, 1992), which highlights the role of investment in R & D and knowledge accumulation in driving growth. However, there is uncertainty in the ability of firms to convert these investments in to successful innovation outcomes and their impact on firm performance. Innovation carries risk as it is difficult to predict the effect of new products, processes, or organizational changes on sales, employment, and productivity, as well as their impact on factor reallocation and firm entry and exit (Cirera & Sabetti, 2019; Goel & Nelson, 2022).

The adoption of innovation does not occur at the same time for all individuals or companies within an organization. It can vary significantly due to influences such as environment and capability. The adoption of new ideas depends on the combination of different factors within and outside of all types of networks (Rogers & Shoemaker, 1971). Zemplinerova and Hromadkova (2012) have identified two major traditional theories of innovation that focus on the relationship between market structure, business size and innovation. The first is Schumpeter's theory which suggests that large businesses or monopolistic businesses are more innovative due to their financial capability, making them more efficient and performative than small businesses or competitive businesses. The second is Arrow's (1962) theory which states that competitive businesses are more innovative than monopolistic businesses as they are in competition to conquer a market. Again, Rogers and Shoemaker (1971) and hiscoauthors noted that innovation, which represents a new idea developed by an individual, is different from diffusion, which generally occurs after innovation. However, Agarwal (1983) and Barnett (1953), among others, have argued that innovation and diffusion are closely related and occurs imultaneously in the innovation process, based on rationality rather than persuasion.

Generally, there are indeed several determinants of innovation that are common to all firm, such as the age of a firm, its size, and strategic elements such as group membership and focus on foreign markets. Other factors include financial barriers to innovation, the level of market competition, the economic situation of a country, and the availability of R & D subsidies. According to Zemplinerova (2010) the variables which are expected to identify different determinants of the innovation process are sonumerous that the selection of the variable is very likely to influence the results of empirical studies.

A large literature has examined the determinants of innovation at the micro level. Using the Italian input-output table of intermediate goods, divided into 31 economic sectors, for the year 2000, Cerulli and Poti (2008) that R & D had a crowding out effect on innovation, resulting in a negative impact. Similarly, Mairesse et al. (2005) found a strong connection between R & D and innovation output, based on data collected from French manufacturing companies through the Community Innovation Survey (CIS) for the period 1998-2000.

Zemplinerova and Hromadkova (2012) analyzed a large firm-level data set from the Czech Statistical innovation surveys covering the period from 2004 to 2007. They found that innovation was positively related to firm size, but the efficiency of transforming innovation inputs into outputs decreased as firms got larger. Furthermore, their research showed that access to subsidies had a significant and negative impact on innovation output.

The financial stability of a firm has been found to play a crucial role in determining its innovative capabilities. Mahendra et al. (2015) performed a firm-level data analysis using the World Bank Enterprise Surveys (WBES), which were conducted from August 2009 to January 2010. They analyzed data from 1,444 firms, most of which were classified as small- and medium-sized enterprises (SMEs). The results indicated that access to financing significantly affects a company's ability to innovate and participate in related activities.

Additionally, using a representative manufacturing firms in Tunisia from 1997 to 2007, Choi (2017) observed that exporting industries tend to invest more in innovation. Strategic management has also been found to have a positive effect on business innovation in developed countries, as noted by Bhattacharya and Bloch (2004) in their survey of business activity in the Australian economy. They found that several variables, such as R & D activities, market structure, and the size of the enterprise, are beneficial for technology companies. Similarly, Wan et al. (2005) found a positive and significant relationship between the market size and the availability of organizational resources using data from 71 companies in Singapore.

Adedamola et al. (2016) investigated the factors that determine innovation in firms operating in Nigeria. They found that investment in research and development (R&D) and introduction to the market have a positive impact on innovation. Yunshi and Jiancheng (2007) revealed that in China, the success of global integration in terms of innovation is influenced by factors such as manufacturing know-how, financial strength, investment experience, and access to retail technologies and networks. Location is also a factor, with the cost of labor being a key benefit. Merono-Cerdan and Lopez-Nicolas (2017) analyzed data from a Spanish innovation community survey and found that reduced response time and costs, new business processes, and external connections are significant drivers of innovation. The authors also emphasized the benefits of international integration between China and Japan in terms of regional innovation. Abdu and Jibir (2018) analyzed data from the World Bank Enterprise Survey conducted in Nigeria and found that factors such as R & D, advanced training, competitiveness, size, type, and company activities have a positive impact on innovation.

In the same vein, Kireyeva et al. (2021) conducted a study using the World Bank Enterprises Survey (WBES) database on a sample of 1,296 enterprises for Kazakhstan to examine the relationship between innovation and a firm's ability to improve its products and services to meet the changing needs of its customers. The results of the study showed that factors such as the age of the firm, exporter status, type, sector, or activity all had a positive influence on the firm's tendency to innovations.

## 3. DATA AND METHODOLOGY

The study is based on firm-level data obtained from the World Bank Enterprise Surveys. These surveys cover many aspects of the business environment and have collected information from over 130,000 enterprises in 135 countries. These aspects can have either a positive or negative impact on businesses and play a significant role in the success or failure of private sector in an economy. The World Bank conducts surveys across a broad range of regions and includes various categories of firms. Our study focuses on the enterprise survey conducted in Morocco, which was administered to 1,096 firms between May 2019 and January 2020 using a standard methodology.

The World Bank enterprise surveys also offer crucial information regarding firm characteristics, such as size, age, sector, export activity, ownership, and actual location. In addition, data was collected from enterprises regarding their perception of the business environment including innovation activity. To do this, data was obtained from as many different firms as possible in Morocco in order to better understand the impact on innovation potential. The sample used in this study is stratified based on firm size, age, sector, and region, with firms being categorized into three sizes: small (5-19), medium (20-99), and large (100 or more).

Based on the data collected from the World Bank Enterprise Surveys, Table **1** shows the classification of enterprises in Morocco by size. There were 1,096 surveyed enterprises in Morocco, out of which38.14% (418) were small firms, 34.22% and 27.65% (375 and 303 firms respectively) of surveyed enterprises were medium and large firms, respectively. The distribution of firms based on sector shows that the manufacturing sector accounts for 42.24% of the firms and services sector accounts for 57.76%.

**Table 1. Frequency Distribution of Firms by Size and Sector.**

| Characteristic | Number Offirms | In Percentage (%) |
|---|---|---|
| Large | 303 | 27.65 |
| Medium | 375 | 34.22 |
| Small | 418 | 38.14 |
| Manufacturing | 463 | 42.24 |
| Services | 633 | 57.76 |

Source: World Bank Enterprise Surveys (2019).

To measure innovation, werely on four indices from the WBES which are: the introduction of new or significantly improved products/services in the last three years (*product*); the adoption of new/significantly improved methods of producing products/delivering services (*process*); the organization spent on R&D in the last three years (*R&D*); if establishment uses technology licensed from a foreign-owned company (*Foreign license*).

Table **2** shows that ent on R&D and technology licensed from a foreign- owned company account for the largest enterprises (35.52% of the total sample), followed by product innovation companies (4057%), and improved methods technology innovation companies (3.9%). Thus, it can be seen that the most innovative are small and medium-sized enterprises, whereas large enterprises are the least innovative. As for the firm sector, the most innovative ones are manufacturing sector. Thus, it can be concluded that small and medium enterprises or manufacturing sector enterprises are the drivers of innovation in Morocco.

**Table 2. Frequency Distribution of Innovation Outcomes by Size and Sector.**

| Characteristic | Large | Medium | Small | All |
|---|---|---|---|---|
| Process | 29.27 | 46.34 | 24.39 | 3.9 |
| product | 44 | 24 | 32 | 4.75 |
| R&D | 25 | 38.89 | 36.11 | 17.01 |
| Foreign license | 35.98 | 36.51 | 27.51 | 18.51 |

| | Manfacturing | Services |
|---|---|---|
| Process | 60.98 | 39.02 |
| product | 56 | 44 |
| R&D | 48.15 | 51.85 |
| Foreign license | 55.03 | 44.97 |

Source: World Bank Enterprise Surveys (2019).

The Prob it model is used to study the determinants of innovation considering that variables are binary dummy variables. Therefore, the prob it model is defined as:

$$Prob\ (innov) = \beta_0 + \beta_1 lab_{prod_i} + \beta_2 age_i$$
$$+\beta_3 size_i + \beta_4 training_i + \beta_5 fdi_i$$
$$+\beta_6 export_i + \beta_7 manuf_i + \beta_8 medium_i + \beta_9 small_i$$
$$+\beta_{10} informal_i + \beta_{11} finance_i$$
$$+\beta_{12} educ\_inadeq_i + \varepsilon_i$$

The dependent variable is a binary taking value 1 if firm *i* is an innovator which is measured by different indicators of innovation we presented before (product, process, R&D and foreign license). *Lab_prod* measures labour productivity by dividing gross sales to total number of workers engaged by a firm. The variable of size (*size*) represents the total number of permanent full-time employees at end of last fiscal year. The age of the firm (*age*) is the difference between the year of establishment of the firm and the year of survey conducted. *Training*is a dummy variable that takes the value 1 if the enterprise has organised training programmes for its full-time employees and 0 otherwise. We consider foreign ownership (*fdi*) and export status (*export*) by measuring the share of participation and volume of export as percentages. A value of 1 is assigned when these factors are present in an enterprise, and a value of 0 otherwise. The firm characteristics include binary variables for whether the firm perceives in formal competition (*informal*), finance constraint (*finance*) and in adequately educated work force (*educ_inadeq*) as major or severe obstacles. Finally, the Sector (*manuf*) and size of the firms (*medium and small*) are taken into account in order to capture the heterogeneity of innovation between firms.

## 4. EMPIRICAL RESULTS

Table **3** contains the estimated marginal effects of the probit models on the determinants of innovation (process innovation, product innovation, spending on R & D; foreign license) at the firm level in Morocco. The results of the Probit model analysis on process innovation reveal that firm size and formal training are significant factors that impact a firm's likelihood of introducing a new or significantly improved method/process.

Model 1 suggests that as the size of a firm increases, the probability of the firm engaging in process innovation decreases. This can be attributed to various factors, such as increased bureaucracy, sluggish decision-making processes, and a tendency to rely on existing business models (Rajapathirana & Hui, 2018; Koo & Cozzarin, 2021). On the other hand, investing in formal training appears to have a positive impact on the adoption of new and improved production methods. In particular, it was found that continuing e ducation increases the probability of the adoption of new/significantly improved methods of producing products/delivering services by 39.62%.

Model 2 in Table **3** also provides important insights into the determinants of product innovation at the firm level in Morocco. The findings reveal that size, formal training, foreign ownership, and the level of education of the work force are significant factors that impact a company's ability to innovate.

Like the results from Model 1, increasing firm size is found to have a negative effect on product innovation. As a company grows, its chances of introducing new or improved products decrease. Formal training, on the other hand, is shown to have a positive impact on product innovation. The results suggest that investing in formal training can increase a company's chances of introducing new or significantly improved products or services.

Foreign ownership and the level of education of the workforce were also found to be significant determinants of product innovation. The results show that increasing foreign ownership by a percentage point has a positive impact on product innovation, with a 0.06 percentage point increase in capabilities to innovate. Conversely, an in adequately educated work force was found to decrease a firm's ability to innovate, with a 0.48 percentage point reduction in capabilities to innovate.

In addition, the results indicate that smaller and medium-sized firms face significant challenges in their ability to innovate and introduce new products. Compared to larger firms, small and medium-scale firms are less likely to invent new products, with a reduction of 43.4 and 43.49 percentage points, respectively. One possible explanation for this disparity could be a lack of resources and support for smaller and medium-sized firms. Larger firms may have more resources and support systems in place, such as R & D departments and access to finance, that enable them to pursue product innovation more effectively (Schaeffer, 2015; Nguyen et al. 2020).

Model 3 provides important insights into the factors that influence investment in R & D at the firm level in Morocco. The results show that manufacturing firms are more likely to spend on R&D than service firms, with a difference of 0.33. This highlights the importance of the manufacturing sector in driving technological innovation and competitiveness in Morocco.

In addition to sector, Model 3 indicates that formal training, foreign ownership, and informal sector competition are significant determinants of investment in R & D at the firm level. Formal training is found to have a positive impact on investment in R & D, indicating the importance of continuous learning and up skilling for companies that want to remain competitive and innovative.

Foreign ownership is also found to have a positive impact on investment in R & D. This suggests that foreign ownership can bring additional resources, expertise, and support for R & D initiatives, which can help companies to innovate more

effectively. Informal sector competition is also found to be a significant determinant of investment in R & D. The results suggest that increased competition from informal sector firms can drive formal sector firms to invest more in R&D in order to remain competitive (Amin, 2021; Hlioui et al. 2022).

**Table 3. Marginal effects of Probit Models on Determinants of Innovation.**

| Variables | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| | **Process** | **Product** | **R&D** | **Foreign License** |
| Lab_prod | 0.1374<br>0.1133 | 0.0229<br>0.0962 | 0.0091<br>0.0867 | -0.0618<br>0.0702 |
| Age | -0.0057<br>0.0069 | -0.0048<br>0.0061 | -0.0052<br>0.0049 | -0.0009<br>0.0038 |
| Size | -0.0032*<br>0.0019 | -0.0016*<br>0.0009 | -9.81e-06<br>0.0003 | -0.0005<br>0.0004 |
| Training | 0.3962**<br>0.18215 | 0.2605*<br>0.1560 | 0.4693***<br>0.1397 | 0.7867***<br>0.1089 |
| Fdi | 0.3293<br>0.2407 | 0.0684***<br>0.1908 | 0.3335*<br>0.1872 | 0.2486*<br>0.1418 |
| Export | -0.0449<br>0.2300 | 0.6965<br>0.1721 | -0.2508<br>0.1814 | 0.3208**<br>0.1291 |
| Manufacturing | -0.0917<br>0.1825 | 0.0993<br>0.1555 | 0.3350**<br>0.1381 | 0.0146<br>0.1090 |
| Medium | 0.0106<br>0.2871 | -0.5322**<br>0.2357 | 0.3087<br>0.2025 | -0.1568<br>0.1542 |
| Small | -0.6463<br>0.3548 | -0.4349*<br>0.2452 | 0.1092<br>0.2105 | -0.3851**<br>0.1692 |
| Informal | 0.0409<br>0.2232 | 0.2270<br>0.1824 | 0.2701*<br>0.1604 | 0.2896**<br>0.1290 |
| Finance | -0.3807<br>0.2891 | -0.3201<br>0.2190 | -0.3098<br>0.1982 | -0.4363**<br>0.1607 |
| Educ_inadeq | 0.1577<br>0.2330 | 0.4812**<br>0.1799 | 0.2238<br>0.1747 | 0.2106<br>0.1354 |
| Constant | -2.2463***<br>0.7244 | -1.7852***<br>0.6074 | -1.5594***<br>0.5096 | -.9726**<br>0.4209 |
| Prob > chi2 | 0.0124 | 0.0000 | 0.0001 | 0.0000 |
| Pseudo R2 | 0.1024 | 0.1212 | 0.0830 | 0.1287 |
| Pseudo log-likelihood | -112.0414 | -154.5472 | -214.9538 | -347.0293 |

Source: authors calculation. Note : *: p<0.1; **: p<0.05; ***: p<0.01.

The findings of Model 4 in Table **3** suggest that there are several key factors that influence the adoption of technology licensed from a foreign-owned company by firms in Morocco. These factors include formal training, foreign ownership, export status, and competition from the informal sector. On the other hand, the results indicate that small-sized firms and financial constraints act as deterrents to the use of technology licensed from a foreign-owned company.

The positive impact of formal training on the adoption of technology licensed from a foreign- owned company highlights the importance of equipping employees with the necessary skills and knowledge to effectively utilize new technologies (Dostie, 2014). Foreign ownership and export status are also shown to be significant determinants of technology adoption, suggesting that firms that are owned by foreign investors or involved in international trade may be more likely to adopt cutting-edge technologies to remain competitive in their respective markets (Saggi, 2002; Antràs & Yeaple, 2014). In addition, the influence of informal sector competition highlights the importance of keeping up with the evolving land scape of business, as well as the need for firms to continuously adapt and innovate to stay ahead of their competitors.

However, the results also suggest that small-sized firms and financial constraints can act as barriers to the adoption of technology licensed from a foreign-owned company. This highlights the need for policy makers and other stake holders to address these challenges and provide support for smaller firms to adopt new technologies and remain competitive in an increasingly digitized economy (Ayyagari et al. 2011; Das et al. 2018).

## 5. CONCLUSION

The importance of innovation in expanding industrial activities and improving the overall performance of an economy has been recognized since the 19th century industrial revolution by economists and historians. A country's or a firm's support for innovation is often considered a key factor in increasing productivity at the micro-economic level and economic growth at the macro-economic level.

The determinants of innovation play a vital role in shaping a firm's product and production updates, including their direction, potential, and speed. It is essential to consider the overall strategy of the enterprise, as well as the specific determinants unique to the firm and its environment when formulating innovation strategies. These determinants can range from access to finance, market demand, competition, government regulations, and other factors. A comprehensive understanding of these determinants is crucial for promoting firm performance and developing effective innovation strategies, especially in developing countries. By taking into account these determinants, firms can position themselves for success and sustained growth in an increasingly competitive global market place.

The business environment in many developing countries, including Morocco, presents significant challenges for small to medium-sized firms. These challenges often include limited financial resources, a lack of skill edlabor, and in adequate infrastructure, which can create barriers to innovation.

Additionally, unfavorable government policies and regulations can further impede the innovation activities of these firms. Despite these obstacles, many firms in Morocco are still making significant efforts to undertake innovative endeavors. They are leveraging their limited resources and capabilities to introduce new products, processes, and business models. These innovations are helping them to remain competitive, increase their market share, and enhance their overall performance.

The main objective of this study was to examine the key determinants of firm innovation in Morocco using data from the WBES. To achieve the study goals, binary Probit regression model is used. The study produced some stylized facts about innovation in Morocco. First, it established that the main determinants of product, process, R & D investment and foreign certification innovation were firm size, formal e ducation, and informal sector competition. Foreign ownership was also a significant factor affecting firms' innovation. Second, the status of being an exporter was also an important factor influencing the use of foreign certification. Third, small and medium-sized enterprises were less likely to innovate than large firms, while firms in the manufacturing sector were more likely to innovate than service sector firms.

The policy implications of the study are that any firm wishing to be innovative must pay close attention to formal education, firm size, foreign ownership, and informal sector competition. Specifically, for firms to enhance innovation, they must also be committed to attracting foreign investments, making them stronger in terms of innovation. Any public policy aimed at encouraging innovative behavior of firms should also encourage small and medium-sized enterprises, as well as bolster manufacturing firms, particularly as they are major sources of innovation.

## CONFLICT OF INTEREST STATEMENT

The authors declare that they have no conflict of interest.

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