Financial constraints, innovation and agri-food export performances in Sub-Saharan African countries

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Introduction

The performance of the financial sector and its ability to finance the economy are important factors of growth in modern economies. Levine (2005) suggests that there is a positive relationship between finance and economic growth. Access to finance is therefore one of the major challenges faced by firms specifically in developing countries. Most firms that cannot finance their activities through internal funds use external funds which can be very expensive in a context of imperfect financial markets. Financial constraints faced by firms can thus have drastic consequences on their performance in domestic and foreign markets through the reduction of investment opportunities, especially in innovation activities. In fact, while innovation can enhance firms competitiveness, it involves significant costs. Several studies found that financial constraints negatively affect firms innovation activities (Savignac, 2006; Gorodnichenko and Schnitzer, 2013; Hyytinen and Toivanen, 2005; Efthyvoulou and Vahter, 2016).

Producing for international markets involves fixed and variable costs, thus generating a much greater financial needs for exporting firms relative to firms producing only for the local market. In a context of imperfect financial markets, firms can have their export performance reduced because of the difficulty to raise funds. Financial constraints thus appear as a brake on internationalization of firms (Bellone et al., 2010; Manova, 2012).

The other issue most studied in the literature is the positive link between innovation and export performance of firms. The literature is almost unanimous on the positive link between these phenomenon (DiPietro and Anoruo, 2006; Roper and Love, 2002; Greenhalgh et al., 1994).

The main objective of this study is to question the effects of financial constraints in developing countries on the export performance of agri-food firms by distinguishing between direct and indirect effects through innovation. We focus on Sub-Saharan African countries because these countries are among the developing countries in which the financial markets are least developed, inducing firms in situations of financial constraints. In addition, agri-food firms in these

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countries are among the least performing in international markets, whereas the main economic activities in these countries are related to agriculture. Indeed, the production of low-cost agricultural products in these countries should make agri-food firms efficient as inputs are less expensive. If this trend is not observed, this could be due to the difficulties of financing innovation investments on the one hand and on the other hand those related to financing export activities.

Methodology and data

We used conditional mixed process (CMP) proposed by Roodman (2009) because, our variables of interest, namely, export performance, innovation, and financial constraints, are probably endogenous. Decisions to export and to innovate can also be made simultaneously, thus implying firm to be financially constrained. Using SUR (seemingly unrelated regression) could be interesting, but our dependents variables are of different nature, making CMP estimation more appropriate.

We apply this model on data from the World Bank's Enterprise Survey[1]. This database contains very rich information on the innovation, export and financial constraints at firm-level for several countries and year. Nevertheless the sampling method does not allow to observe the same firm from one year to another. In addition, data are not available for all countries at all the period. For reasons of compliance of the collection methods, we have opted for the 2013 data for which several Sub-Saharan African countries are presents. The final database contains 1 103 firms from 10 Sub-Saharan African countries[2].

Financial constraint is directly measured by asking a question to firm main decision-maker, who assesses how much firm is financially constrained. As indicated by Savignac (2006), this measure seems to be the most appropriate since it avoids the problems of interpretations related to indirect measures. Based on these responses, we defined financial constraints as dummy variable tak-

ing the value of 1 if firm declared that it has major or very severe financial constraints and 0 otherwise. Innovation activities include process and product innovations, which are the two main innovations identified in this study. We consider that a firm is innovative if it has undertaken both process and product innovation and if product introduced is new on the main market. This measure of innovation is conservative because some firms can declare they undertaken innovation even if this innovation is insignificant. Data on export also distinguish between the extensive margin (probability to export) and the intensive margin (share of exports in total production). Finally, our econometric model is a set of four equations.

(i) one equation explaining the probability of firms to be financially constrained by a vector of exogenous variables;

(ii) one equation explaining the probability of undertaking innovations by financial constraints and exogenous variables;

(iii) two equations explaining extensive and intensive margin respectively by product and process innovations, financial constraints and others control variables.

Results and discussion

Table 1 presents the results of our estimations. From these results, financial constraints negatively impact firm

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1 https://www.enterprisesurveys.org/portal/login.aspx
2 Democratic Republic of Congo, Djibouti, Egypt, Ghana, Kenya, Morocco, Tanzania, Tunisia, Uganda and Zambia

innovation. Computing marginal effect allows us to determine that when firm is financially constrained, the probability that it undertakes innovation decreases by 15.2%. Our results are similar to those in the literature suggesting that financial constraints reduce the probability to innovate (Savignac, 2008; Canepa and Stoneman, 2007; Silva and Carreira, 2012). According to García-Quevedo et al. (2018), financial constraints impact innovation at two staggered levels. At the first step, the lack of finance reduces the incentive for firm to undertake an innovation. In a second step, even if the firm manages to undertake an innovation, the financial constraints can compel it to abandon its project before its term.

The first line of table 1 shows that innovation has a positive effect on extensive and intensive margins. Indeed, innovative (product and process) firms are 24.3% more likely to enter export markets than non innovative firms. In addition, innovation increases the share of exports in total production by 17.1 percentage points. Two reasons can explain this situation. The first reason is that innovative firms, by improving the quality of their products can enter export markets where quality standard is established. The second reason is that by increasing, their productivity through process innovation firm can improve their cost competitiveness on foreign markets. These results corroborate the theoretical predictions of Melitz (2003) model. These predictions tell us that more productive firms are those that can enter foreign markets and those that export more in markets on which they already operate. Empirical studies at firm and country level argued that innovation (product and process) has positive effect on extensive and intensive margins (WU et al., 2015; Uyar and Oralhan, 2017). However, some authors as Hao et al. (2016) found that there is a U-sharped re-lationship between innovation and export performances. As our measure of innovation is not continuous we are not able to test the validity of this finding in our data.

The third line of table 1 gives the direct effects of financial constraints on extensive and intensive margins. We find that financial constraints reduce the probability of exporting by 20.3%. However, we failed to find a significant effect of financial constraints on intensive margin. This is plausible as firms have to bear very high fixed costs before they can start exporting (Alessandria and Choi, 2007) making financial constaints more detrimental for firms willing to start export activities. Thus, firms already operating in foreign markets do not reduce their export even if they are financially constrained. Similar results are found by Bellone et al. (2010) who argued that financial constraints have no impact on the volume of exports for French firms but decrease extensive margin.

We also computed indirect and total effects of financial constraints on intensive and extensive margins. The indirect effect is calculated by multiplying innovation effect by those of financial constraints. Then total effect is obtained by summing the direct effect and the indirect effect via innovation. These effects are negative for both extensive and intensive margins (1). As expected, the total effect for intensive margin is small (reduction of share of exports by 2.6 percentage points). We also found that financially constrained firms are 24% less likely to enter a foreign market than other firms when we take into account the indirect effects. This effect remains less than that of Minetti and Zhu (2011) who found that financial constraints reduce the probability of exporting by 39% for Italians firms.

Table 1 also shows interesting results on the effects of

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3 Firm size is defined by the number of employees as follows: Small size (number of employees less than 20), average size (number of employees between 20 and 99), large size (number of employees greater than or equal to 100). We defined small size as the reference point in the estimation process

some control variables on firms export performance and innovation namely R&D, and firm size[3]. Thus, firms investing in R&D increase their chance to introduce new (or to improve) product and process by about 20%. It thus affects firms export performance through innovation. In some studies, innovation is approximated by R&D expenditure as these variables are assumed to be positively correlated. There is a large literature suggesting a positive impact of R&D on innovation both theoretically and empirically. While firm size does not affects intensive margin, it is an important factors of the probability of firm to enter export markets. Indeed, medium sized and large sized firm have respectively 6.9% and 25.8% more chance than small sized firm to enter export markets. Otherwise, we found an inverted U-shape relation between firm size an innovation. Indeed, medium sized firms are 10.4% more likely to innovate than small and large sized firms.

Table 1 Results: Innovation and financial constraints effects on export performances

Variables	Marginal effects		
	Extensive	Intensive	Innovation
Innovation	0.243*** (0.080)	0.171* (0.100)	
Financial Constraints	-0.203* (0.107)	0.069 (0.191)	-0.152* (0.084)
Medium Sized	0.069** (0.030)	-0.038 (0.079)	0.104*** (0.031)
Large Sized	0.258*** (0.052)	0.028 (0.107)	0.044 (0.039)
R&D			0.198*** (0.028)
Financial Constraints (Indirect effects)	**-0.037**	**-0.026**	–
Financial Constraints (Total effects)	**-0.240**	**-0.026**	**-0.152**
Observations	1 103	1 103	1 103
Country fixed effect	Yes	Yes	Yes
Industry fixed effect	Yes	Yes	Yes

Standard errors in parentheses
∗∗∗, ∗∗, ∗: significant at 1%, 5% and 10% respectively

Conclusion

In this study, we estimated the effects of financial constraints on agri-food export performance Sub-Saharan African countries. The analysis highlighted two main findings. First, innovative firm are more likely to enter export markets. They are also able to export more on markets on which they already operate. Second, the results show that financial constraints are detrimental for agri-food export in Sub-Saharan African countries. These effects are of two types. The

direct effects due to the fixed costs that firm have to bear before exporting and the variable costs during export activities on one hand and the indirect effects due to the reduction in the incentive to innovate one the other hand. These results suggest that financial access policies combined with incentive policies to invest in R&D are necessary to boost agri-food export performances in Sub-Saharan African countries. Innovation policies should be more efficient if medium sized firms are targeted.

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