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## ABSTRACT

The Internet has radically changed the business world and become increasingly central to our economic life. As the opportunities created by the Internet are growing rapidly, new trading companies sprung up overnight at a similar pace. For the case of manufacturing firms in developing countries however, the awareness campaign of the advantages of the Internet usage is still undervalued. As for Madagascar, the country has been saddled with timid access to internet, added with the high cost of the Internet, which seem to occlude firms from reaping the benefits.

*Keywords:* internet, export, manufacturing firm, madagascar, technology, trade.

*Classification:* JEL CODE: M10

*Language:* English



London  
Journals Press

LJP Copyright ID: 146441  
Print ISSN: 2633-2299  
Online ISSN: 2633-2302

London Journal of Research in Management and Business

Volume 22 | Issue 1 | Compilation 1.0



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# An analysis of the relationship between the Internet and Export: Evidence from Madagascar's Manufacturing Firm

Dr. Domoina Lalaina Andonirina Felana, ANDRIANIONY<sup>α</sup>  
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## ABSTRACT

*The Internet has radically changed the business world and become increasingly central to our economic life. As the opportunities created by the Internet are growing rapidly, new trading companies sprung up overnight at a similar pace. For the case of manufacturing firms in developing countries however, the awareness campaign of the advantages of the Internet usage is still undervalued. As for Madagascar, the country has been saddled with timid access to internet, added with the high cost of the Internet, which seem to occlude firms from reaping the benefits.*

*This study empirically analyzes the relationship between the Internet and manufacturing firm's exports, using data from the World Bank. Deploying an OLS model to examine the connection, the result has shown a positive and significant relationship between the access to the Internet and manufacturing firm's export in Madagascar. Besides, the results are robust, it is more pronounced when firms export to developed countries than developing countries.*

**Keywords:** internet, export, manufacturing firm, madagascar, technology, trade.

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## I. INTRODUCTION

Besides labor skills, logistic issues and development of an internationally competitive product quality, the challenges faced by companies are linked to the knowledge and clear understanding of the market. To meet these challenges and sustain the export performance, manufacturing companies can adopt an innovative scheme of competitive intelligence. Information and Communication Technology (ITC) can serve as an engine to gather necessary information on the market. According to N. Tamilselvan et al. (2012), Samara et al. (2014) ICTs is defined as information that has its impact in development. It offers plenty of options that companies can take advantage of and grab new opportunities.

However, though the hectic revolution of the Internet has been subject to the academic research extensively carried out with the fact that today's technology is more complex than when it first started in the 60s, the study on the influence that the Internet has on international trade is yet underrated. Precisely, research works have been more focused on the impact of the Internet on other variables such as the unemployment rate, company's productivity and salary than anything else (Bertschek et al. (2016)). This study will then emphasize on the impact of the Internet on international trade, precisely on manufacturing firm's exportation.

Being the most revolutionized of our days, the Internet holds a very important place as one of the most successful examples of the benefits sustained in research and development of IT

infrastructure both in investment and commitment. Thanks to the Internet, both individuals and firms can benefit from this fascinating technology, (Caroline F. and Diana W., 2004). According to the survey conducted by Therese Wood (2020), companies have significantly increased their resource allocated to online activities including search optimization and social network, around \$299 billion allocation in 2019 against \$156 billion in 2015 (Therese Wood, 2020). Seeing the benefits from the use of the Internet, developing countries have started to allocate resources to reinforce their export activities. However, there is still a gap between the relative importance of the different media and the spending. Prior studies suggest that the technological infrastructure and internet capabilities of the firm significantly have some impact on export revenues, as seen in the Greek SMEs, (Yannis A. and Albertos C., 2009). Thus, the main question is:

- *Does Madagascar access to the Internet positively relate with the firm's export?*
- *Is the relationship between access to the Internet in Madagascar and manufacturing firm's exports more pronounced in developed countries than developing countries?*

For our observation, there has not been any empirical investigation that dealt with the impact of the Internet on export, using manufacturing firm's data for Madagascar or any African country. The motivation hidden behind this investigation is to provide empirical evidence of how the Internet has impacted the export rate of the manufacturing firms in Madagascar. In the present research is hoped to promote the use of the Internet at the manufacturing firm level, not limited to Madagascar but also to other developing countries that represent the same challenges.

## II. THEORETICAL FRAMEWORK AND LITERATURE REVIEW

Previous literature has shown different aspects on the impact of the Internet on international trade. Many researchers believe that the Internet stimulates international trade (Behzad S. et al

(2013), Alberto O., Shawn W. (2016)) by at least 0.2% increase in export per 10% increase in internet access (Caroline F., Diana W. (2004)). Crifo (2001) however, mentioned that the Internet, which constitutes a third industrial revolution, is the cause of persistent inequalities in most industrialized countries.

In a nutshell, the Internet is arguably the most powerful tool available today, and how it touches every most area can be proven. The Internet partakes in reducing the expense for manufacturing firms in terms of marketing and communication across borders (Caroline F. and Diana W., 2004). Proven necessity of the Internet is the pandemic situation in 2020, firms were forced to adopt new strategies in response to the situation to adequately address the unpredictable. The Internet affects the operational effectiveness and strategic positioning in a very different way (Michael E., 2001). Some emphasize on the role of the Internet in business strategy and its impact on the business profit (Soegoto and Rushaminidiwinata (2018) while some on the marketing capabilities, which has an impact on the international market performance (Liu et al., 2020). Either way, both results show a significant relationship.

Previous studies, however, did not show that the access to Internet will solve all manufacturing firm's problems but at least it would help them face such challenges as time management, cost reduction (Soegoto and Rushamidiwinata, 2018). Some problems like mastering your targeted market, knowing the distinctive product that fulfill the demand of customers and steps ahead from the competitors with the local and overseas production, are within reach, as stated by Van Z. and Muysken (2005), Sassi and Goaid (2013), Sayef B. and Sofien T. (2019). Some researchers like Salahuddin and Gow (2016) supported the claim on the significant, positive impact of the Internet on economic growth. Undeniably, the Internet has its place in economic growth.

Moreover, Najarzadeh R. et al. (2014) added that, apart from the influence on GDP, the Internet also has a significant, positive impact on labor productivity. In their study, which covered 28

OECD countries, Edward W. and Rajeev K. (2020) even found the result statistically low; however, the internet usage across the models were found to be positive. Kiel et al. (2017) mentioned that internet-triggered business model changes are offer-driven, particularly by production and process optimization within customers' production systems. Besides, Internet-marketing is a nonstop trending term that is evolving its scope every day, with a dethroned place in trade. Internet marketing has the capabilities to positively influence the availability of export information and then it influences the business network relationship and export market growth, as remarked by Bianchi and Mathews (2016) and Liu et al. (2020). For all these facts, Gholam A. et al. (2015), Gholam K. (2018) assumed that it would be necessary to acknowledge the fact that companies must take advantage of the Internet, to improve cost productivity, position the product or strengthen it and generate greater benefits for shareholders.

Additionally, the Internet breaks the odds of geographic (distance) (Caroline L. and Diana W., 2000), thus bridges the gap between manufacturing firms and consumers. While there is a large number of studies on the potential use of internet and firms, little has integrated their research on the relationship between the Internet and exporting, some raised the issues of relationship between the Internet and international trade (James E. (2001), Balamoune (2002), Clarke and Wallsteen (2007), Nuray T. (2001), Behzad S. et al (2013)). Among the few that center their research on the role of the Internet on export are Bennett (1997) and Hamill and Gregory (1997), who focus more on the use of the Internet and the challenges that firms need to overcome. Yannis H. et al. (2009), on the other hand, showed that the technological infrastructure and internet capabilities of firms have significant positive impact on export revenues. This supported the hypothesis that the Internet allows manufacturing firms to follow up with the products and services in demand to gain dominance over a niche, thus brings up their export revenues. Since the Internet has the capability to connect people, it has created the

possibility for exporter firms to extend their market using virtual export channels (VEC), supported Anna M. and Susan B. (2004).

According to Clarke and Wallsten (2007), there is a positive relationship between the access on the Internet and the export level of a country. The correlation is more accentuated from developing to developed countries. Some studies related to the impact of the Internet at the firm level still has not found (relevant) direct conclusion, rather, Akerman et al. (2018) has found that the information communication technology (ICT), on the other hand, increases the sensitivity of importing and exporting distance and the country's economic size. Caroline L. and Diana W., (2000), on the other hand, assume that internet use has more influence on trade for the least developed countries than the developing ones.

### III. HYPOTHESIS

What is interesting about the Internet and its underlying technology is that it keeps changing over time. The change started to overtake in mid Gen Z where smartphones and tablets were more cherished than newspapers, and employees were merging phone and computer. According to the Global Digital report in 2019, internet users all over the globe were growing at a rate of more than 11 new users per second. The same reports added that in 2016, the number of internet users around the world were estimated to be around 3.3 billion up from 100 million users in late 1990s. The number continued to increase, as it registered 4.39 billion in 2019, in which 3.48 billion were using the Internet to have access to social media, that was an increase of 9% compared to the previous year. In the same year, the internet as a percentage of total world's population represented 57%, with 52% which were mobile internet users. However, according to the Global report in 2019, social media use was still far from evenly distributed across the globe, African only represented 38%.

Table 1 summarizes Madagascar internet user's performance compared to other African countries. Lagging behind with timid performance, yet

companies started to weigh the benefits out of the use of the Internet. As for the case of Madagascar, the internet use for firms is growing at slower pace, with modest performance. According to the CIA World Factbook, Madagascar counted 1.066 million internet users in 2016, which represented 4.3% of internet penetration compared to the number of Madagascar population, and represented 0% of the world's internet users. Drawing back to 2006, the internet penetration represented only 0.6% of the total population with only 114,379 internet users. The communication company has tried to offer customers the best offer for them to have access at least on social media like Facebook, in which most of the people made use of the Internet and started business. This has increased the share of the internet users to 10% in 2018 against 0.4% in 2003, an increase of more than 30%, (Figure 1).

The explanations given above concerning the relevance of the internet usage in this technological era posit that the use of the Internet has been helpful to various nations and different sectors of economies. Yet, there is no empirical evidence shown on how the Internet has impacted firms exports in Madagascar. Madagascar, being a developing country, is, however, saddled with a lot of limitations on internet usage. These may include inadequate telecommunications infrastructure, whether in terms of availability or in terms of communication quality due to the obsolescence or saturation of existing networks. Yet, we cannot downplay the impact of the level of internet the country has currently on firm's export and performance. A critical examination of the impact of internet usage by firms in Madagascar on the organizations' export will enable the various stakeholders in the country to put forth measures to improve the internet connectivity in firms.

According to Fink et al. (2005), the usage of internet platforms reduces the communication costs between the exporting and importing countries. Similarly, Gnanon and Iyer (2018), posited that the use of internet reduces the ill effects of geographical inaccessibility on countries' incorporation into the world trade in commercial services. Ibrahim et al. (2019), Gani

and Clemes (2013) also established in their respective studies that internet has a significant positive impact on export. They expounded that progresses in digital information technology considerably impact export as it allows quickening in the creation of new markets, networks, and trade dealings among fresh trading partners. Thus, current telecommunication level and quality as well as internet connectivity has helped to build the reputation of various firms especially through advertisement on the firms' websites which has boosted their export. Against these backdrops, it can therefore be postulated that access to internet has a positive impact on Madagascar's exports. This leads to the first hypothesis which is:

*H1: There is a positive relationship between access to the Internet and firm's exports in Madagascar.*

Secondly, the level of exports to both developed and developing countries is also affected by the level of the internet usage taking place in these countries. It is, therefore, imperative to further analyze the extent to which the use of the Internet impacts firms' export to both developing and developed countries. The level of communication, access to inputs and retail distributors in overseas markets is determined by the level of information and communication technology tools used in those foreign nations. Based on this, firms can align their communications and exports towards nations with accessible internet connectivity and higher export opportunities in order to maximize their revenue. As such, the penetration into the markets of emerging and developed countries requires analysis of how these countries import or patronize goods from Madagascar. Intuitively, nations with better information and communication technologies, present Madagascar with enhanced communication between firms as well as other exporting opportunities. Thus, it is expected that firms will export more to countries with advanced technology and internet connectivity than countries without such technological advancement. We, therefore, hypothesize that:

*H2: The positive relationship between access to internet and firm's exports is more pronounced in developed countries than developing countries.*

#### IV. METHODOLOGY AND DATA COLLECTION

This study employs a quantitative research approach to arrive at its main objective, which is to analyze the impact of the Internet on export of enterprises in Madagascar. In doing so, secondary data will be used, given the fact that they are already assembled and more accurate with less biased sources. Due to the lack of accessibility and availability of information, however, we could only use the data from 2009. To test the hypothesis specified in the study, all data were obtained and calculated based on the World Bank Enterprise survey's data.

The study adopted the purposive sampling technique which permits the researcher to elect specific subjects from the population that will come up with the most extensive information about the phenomenon being studied. Accordingly, enterprises located in an export processing zone were excluded from the target population purposely to control the reverse causality from export to the Internet, which will

$$Exp_{or}_i = f(INT_i, X_i) \dots \dots \dots (1)$$

Where  $Exp_{or}_i$  is total exports of the firm  $i$  in the said period of time (2009).  $INT_i$  is the use of any internet platform or media by firm  $i$ .  $X_{it}$  represents the vector of number of control variables of firm  $i$ .

$$Exp_{or}_i = \alpha_0 + \beta_1 INT_i + \beta_2 FA_i + \beta_3 FS_i + \beta_4 FO_i + \beta_5 AF_i + \beta_6 PC_i + e_i \dots \dots \dots (2)$$

$Exp_{or}_i$  represents the total exports of the firm  $i$  in the said period of time.  $INT_i$  the use of any internet platform or media by firm  $i$ ,  $FA_i$  represents the firm's age,  $FS_i$  is the firm size,  $FO_i$  firm ownership.  $AF_i$  represents the firm's access to finance.  $PC_i$  is the firms' production capacity.

As an empirical strategy, a two stage least square model will be estimated purposely to test the complete removal of the endogeneity in the model

cause endogeneity problems in the model to be estimated. Hence, clouding the test of the hypotheses of the study. Based on the above premise, 440 enterprises were selected as the main study samples out of the 477-target population or total enterprises enshrined in the enterprise survey data on Madagascar for the period of 2009.

#### V. EMPIRICAL MODEL AND STRATEGY

We deploy an ordinary least square (OLS) model to examine the correlation between the internet usage and exports of enterprises in Madagascar using firm level data from the world bank enterprise survey. This reason being that the possible reverse causation endogeneity that could have risen in the model is eliminated upon excluding the firms established in the export zones. Therefore, the empirical framework (OLS) is constructed based on the determinants of exports identified from the related literature reviewed (Kimura & Lee, 2006; Nyahoho, 2010; Van der Marel, et al. (2014); Anand et al. 2012).

In addition, several control variables are included to control the firm characteristics that have the potential of influencing both export and the use of the Internet by firms in Madagascar. These variables are the firm age, firm size, firm ownership, access to finance, and production capacity. Thus, the model is specified as follows:

although the OLS is expected to give a robust correlation between Internet use and export even to the inclusion of the additional variables that might affect both Internet use and export. Export will be the explained variable while the Internet will be the main independent variable, the rest of the variables can be seen in Table 2.

The study expounds that if the Internet has made it easier for businesses to enter new markets by reducing communication and search costs, then it

may also have made it easier to export goods and services. Thus, internet usage by firms is projected to positively influence firm's exports. Furthermore, internet usage by firms in Madagascar is anticipated to have greater impact on firm export to developed countries than to developing countries. The reason for this is that the benefits of Internet access upsurge as the firm's customers and suppliers connect (i.e., there are network externalities).

Using 440 observations, the summary statistics is first described (Table 3), by using mean, standard deviation, minimum and maximum values. The total number of the variables employed in the model are seven with Export as the dependent variable, INT for the main independent variable and the rest of the variables as a control measure.

The variable FO (foreign ownership) is average at 0.3877 percent with a maximum of 1 (see Table 3) which implies enterprises with foreigners with the highest share of ownership and zero otherwise. Thus, barely 4 percent of the enterprises under the study are owned by private foreigners. Equally, the variable FA or the enterprises in the study have an average age of 20.903% with a minimum age of 5 years and maximum of 132 years. This suggests that the firms understudy are fairly aged and have the experience to widen or broaden their market share. In addition, the firm size (FS) measured by the number of permanent full-time employees is averaged at 78.550% with a minimum of 3 and a maximum of 1841. This suggests that the firms in the study are relatively big considering the average number of full-time employees hired by the enterprises.

Production capacity (PC) has an average value of 50.566 percent with a minimum value of 11 and a maximum value of 1781 (Table 3). Production capacity as measured by the number of permanent, full-time production workers suggest that the enterprises understudy possess a relatively huge capacity to produce more product of all things being equal. Moreover, the variable access to finance (AF) is average at 2.1373 percent with a minimum value of zero and maximum value of 4. This outcome suggests that on the average, the enterprises under the study face fairly

moderate challenges or hurdles in accessing finance or credit. Firm competition is averaged at 0.6683 with a minimum of zero and maximum of one.

Lastly, export of enterprises to advanced or developed countries (ADEX) is average at 0.1156 percent with a minimum of zero, meaning no export to advanced nations was taking place and a maximum of 100 percent of annual export revenue was generated by developed nations (Table 3). Similarly, the enterprises under consideration averagely reported 0.0344 percent of annual export revenue to neighboring countries (EMEX) with a minimum of zero percent and maximum of 100 percent export revenue to developing countries (Table 3). Juxtaposing the export by the enterprises to the two different classification of nations reveals that on the average, enterprises in the study export more to the advance nations than the emerging nations.

## VI. ANALYSIS

For over, at least, the past 20 years, the internet has taken over not only our society, but our economy. This leads to the fact that the Internet is considered as the most visible aspect of globalization. Thanks to the Internet, companies can now easily reach out to cross-border customers and have access to data in the remote areas.

The variables here-in given, referring to Table 4, were specifically subjected to multicollinearity tests using the Pairwise Correlation Matrix. As seen from table 4, the correlation between the independent variables is not that strong, except for the correlation of the dependent variable and the independent variables together. In general, a correlation coefficient of 0.7 particularly among the explanatory variables are deemed to be high and suggestive of the fact that the presence of multicollinearity exists among the variables. However, the results from the correlation test showed that all the other variables recorded low correlation coefficients among themselves since none of the correlation exceeds the 0.7 threshold. As a thumb rule, very serious multicollinearity exists if the correlation among two or more



explanatory variables is greater than 0.8 (Hair et al. 2010). Hence, the multicollinearity is deemed absent among the regressors or better still minimal among the explanatory variables in the study.

### 6.1 Regression test

We performed further tests to find out how the correlation between exports and Internet use differs among the developing and developed countries, and explored to see whether or not it was robust for controlling the other firm characteristics variables. Therefore, a preliminary test was undertaken to test whether the Internet was endogenously determined or not. Using the Wu-Hausman endogeneity test, it was established that the Internet was not an endogenous variable though our instrument variable was rightly specified.

The OLS model was estimated over the two stage least square model using firm level data from the enterprise survey data. As part of ensuring the robustness of the model, the robust standard error was estimated purposely to cater for possible heteroskedasticity and serial correlation in the residuals. The results of the estimation are presented in table 5.

From the results, it is evident that a statistically positive significant relationship exists between the Internet and export at five percent level of significance. Thus, a percentage increase in the usage of the Internet by the firms under review results in 0.0580 percent increase in export of the firms.

For the rest of the variables, almost all the control variables for the firm heterogeneity characteristics are significant at either 1 percent or 5 percent level of significance with the exception of Access to Finance (AF) and Firm Competition (FC), which are barely insignificant. Also, Firm Size (FS) as a control variable is found to be positive and empirically significant at 95 percent confidence interval across the three estimated models.

In contrast, a negative but insignificant relationship was found between the control

variable Access to Finance and export of firms. This outcome implies that an increase in the barriers to credit or finance will result in a decrease in firm export. However, this outcome was found to be fairly insignificant in the study as evident in the results given above. The possible reason for the insignificance of the variable could be as a result of the few number of firms, which face major challenges in accessing external credit. The study findings in the models 1, 2 and 3 further revealed that more than 85 percent variation in export is explained by the explanatory variables as exposed by the R-square in table 5. Hence, the results from the models are more reliable since the model is also free from auto correlation and heteroskedasticity.

### 6.2 Robustness Test

For robustness check, an alternate proxy for internet usage was utilized. As such, a continuous variable was estimated by adding up the number of internet media platforms (for example website and email) deployed by the various enterprises for their online engagement. The results from the robustness test are in consonance with the baseline model results. Therefore, the results are not substantially or statistically different from the main results. In short, the outcome of the study is robust even to the estimation of alternate proxy for internet usage, as can be described in the table 6.

It is expected that as the number of internet platforms used by the enterprise increase, there should be a corresponding increase in the impact of the Internet on firms' exports. The results from the robustness test are exactly in line with this study expectation and most importantly consistent with the baseline model results. Column model 1 in table 6 shows the result of the effect of the internet usage by firms on aggregate export as percentage of total sales. From the results, it is evident that there is still a statistically positive significant relationship between the internet and export. Thus, a percentage increase in the usage of internet by the firms under review results in 0.0901 percent increase in exports of the firms. However, comparable to the baseline model results, the robustness test result of the

internet usage has bigger coefficient. This mirrors exactly the expectation that, as the number of internet platforms increases, the impact of the Internet on export increases further accordingly. By implication, the increase in the internet media platforms give the firms greater access to the universe or global market; this pushes the existing impact on export higher.

In addition, the results from model 2 and 3 still show a significant positive relationship between the firms' internet usage and export with greater impact of the Internet on export to advanced economies.

Accordingly, a unit increase in internet usage results in 0.0305 percent and 0.0863 percent increase in exports to developing and developed countries respectively. This outcome is plausible because Internet access is more common among enterprises in developed countries than developing nations and, as such, an increase in the internet platform engagement by firms in developing countries like Madagascar will provide them with greater access to interact with the global market. This outcome is parallel to the outcome received from the study baseline results.

Furthermore, the results of the control variables in the robustness test also remain empirically significant across the 3 models estimated, and most importantly they maintain the same direction of effect on export. Hence, the baseline results show that the connection between Internet use and exports is robust even to the inclusion of additional variables, which might affect both Internet use and export.

## VII. INTERPRETATION AND CONCLUSIONS

For a decade now, internet has allowed countries to transform the way they trade by cutting cost of exporting. Though Madagascar is saddled with timid internet usage, we cannot downplay the impact the internet has currently on the firm's export and performance. Moreover, the result is relevant for firms to know the extent to which their internet usage is impacting their export to different economies in order to help concentrate on the area that needs improvement.

The findings showed a positive and significant relationship between the access to internet and firms' export, which supported our Hypothesis 1. It can be interpreted that the Internet offers a greater platform to access the universe by creating a global market for traded goods through the sharing of information globally. As such, the use of internet by the firm reduces the fixed costs of finding markets and buyers, hence the export boost. These results are consistent with the study's main hypothesis and the findings of Freund and Weinhold (2004), who argued that the Internet could lessen costs "both directly through organized exchanges with numerous buyers and sellers and indirectly through powerful search engines, which enable sellers to inform buyers of prices promptly. The low percentage can be interpreted as fear of challenges and lack of knowledge. Apart from the price, which is close to out-of-reach, firms also have less knowledge about the features of the Internet. That being the case, they cannot see far, but the situation in the country; they have forgotten that they can expand their business outside the country and put their product outside. The lack of quality content also added to the disinterest. Also, most business owners might not be technology savvy because the idea of creating content for their companies is sophisticated and time consuming for them.

The variables, access to finance and firm competition's outcome connote that, as firms increase in age, they acquire more experience, which help them to widen or broaden their market share. Hence, experienced firms have deeper understanding and knowledge about foreign markets. Likewise, firm competition was found to be positive on export though barely significant. By implication, when firms face high competition in their area of establishment, they are forced to seek markets outside their current territory in order to survive. Equally, an empirically positive association was found between export and firm ownership, which is a binary variable with 1 for foreign ownership and 0 for private domestic ownership, or otherwise. Per obtained result, moving from a domestic, private ownership of the firm to a foreign ownership leads to an increment function in export. Possible interpretation of the

outcome is that most often than not foreign owners already have some existing market network outside the walls of Madagascar, and thus are well-able to link up countries and market the products across borders.

Larger firms have greater resources and capabilities, which enable them to compete more efficiently and effectively in foreign markets than smaller firms. This outcome is in line with the finding of Nadkarni and Perez (2007), who argued that smaller firms, especially in their early phase of internationalization, suffer from lack of experience operating in the foreign market. In addition, production capacity as a control was also found statistically positive and significant at 1 and 5 percent level of significance. Thus, a unit increase in the production capacity of the firms is more likely to result in an upward movement in the exports of the firms. As firms utilize more of their capacity, they can reduce the overall cost of their operations by spreading their overhead costs across more output. With the reduction of the cost of exporting, they can feed their new markets with their additional plant or human capital capacity.

Further analysis accepted our hypothesis 2, which assumed that the impact of the Internet on exports is more pronounced when firms export to developed countries than developing countries. From the results, a unit increase in internet usage by the firms lead to 0.0498 percent increase in export to advanced countries. Juxtaposing the impact of the internet usage on export to the two distinct countries reveals that the effect of internet usage of firms has a relatively greater influence on the export to advanced countries than developing countries.

The use of the Internet as explained earlier helps to ease communication both within and across borders. The availability of data and information about individuals and firms across the globe, enables organizations to reach out to other stakeholders for business transactions. In this way, firms in Madagascar are able to have direct access to individuals and companies for exports without having to establish a presence in foreign countries. We assume that the government has its own responsibility to raise the public's awareness

of the importance of the Internet for firms and find a better strategy to minimize the access cost for firms. In fact, since the open up strategy adopted by the Madagascar government, the island has been actively promoting its exports, but not to its potential. As a matter of fact, the country has full potential to compete with the outside world, yet the lack of technology has made this competition hard, if not impossible to cope with. At least, with the help from the government, the agriculture sector along with service sectors can take advantage of the use of internet.

To sum up, these results are limited in their scope and practicality to help Madagascar companies, but with the lessons drawn from the present research, other countries having the same situation as Madagascar can learn from the findings. We can assume that firms can invest in their internet usage in order to increase exports which, in return, has the ability to increase the firm's benefits. Moreover, the internet connection in Madagascar has potential for progress, the government then should find a solution on making the data available for researchers to further their study. Nonetheless, researches are in favor of the company thus to the development of the country.

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Table 1: Internet user statistics for African countries

African countries	Population (2020 Est.)	Internet user		Penetration (% of Population)	Internet growth % of 2000-2019
		2000	2019		
Benin	12,123,200	15,000	3,801,758	31.4%	25%
DRC	89,561,403	500	7,475,917	8%	1,500%
Eritrea	3,546,421	5,000	293,343	8%	5,766%
Ethiopia	114,963,588	10,000	20,507,255	17%	204,972%
Ghana	31,072,940	30,000	11,737,818	37%	39,026%
Kenya	53,771,296	200,000	46,870,422	87%	23,335%
Madagascar	27,691,018	30,000	2,643,025	9.5%	8,710%
Mali	20,250,833	18,800	12,480,176	61%	66,284%
Mauritius	1,271,768	87,00	852,000	67%	879%
Rwanda	12,952,218	5,000	5,981,638	46%	119,5%
Senegal	16,743,927	40,000	9,749,527	58%	24,274%
South Africa	59,308,690	2,400,000	32,615,165	55%	1,259%
Zimbabwe	14,862,924	50,000	8,400,000	56%	16,700%

Source: Author's creation based on Internet World Stats, usage and population statistics, 2020

Table 2: Variable description and measurement

Variable	Notation	Measurement	Source
Export	Expor	Summation of firms indirect and direct exports	WBES
Internet	INT	Dummy: 1 if firms use any internet platform for operations and 0 otherwise.	WBES
Firm age	FA	Survey year - official registration year of firms.	WBES
Firm size	FS	Aggregate number of firms' employees.	WBES
Firm ownership	FO	Dummy: 1 if firm is owned by a foreigner and 0 if otherwise.	WBES
Access to finance	AF	Number of obstacles faced by firms in access to finance.	WBES
Production capacity	PC	Total number of production employees.	WBES
Firm Competition	FC	Dummy: 1 if firms have competitors in the local country and 0 otherwise	WBES

Table 3: Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Expor	440	0.1588	0.347	0	100
INT	440	0.7685	0.422	0	1
FO	440	0.3877	0.487	0	1
FA	440	20.903	20.34	5	132

An analysis of the relationship between the Internet and Export: Evidence from Madagascar's Manufacturing Firm

FS	440	78.550	180.53	3	1841
PC	440	50.566	163.501	11	1781
AF	440	2.1373	1.4771	0	4
FC	440	0.6683	0.331	0	1
ADEX	440	0.1156	0.3130	0	100
EMEX	440	0.0344	0.1691	0	100

Table 4 : Correlation Matrix

	Expор	INT	FO	FA	FS	PC	AF	FC
Expор	1							
INT	0.184***	1						
FO	0.217***	0.218***	1					
FA	0.132**	0.0172	-0.0131	1				
FS	0.392***	0.192***	0.226***	-0.0147	1			
PC	0.399***	0.129**	0.201***	-0.0732	0.434***	1		
AF	-0.0475**	0.0538	0.124**	0.00535	0.0510	0.0503	1	
FC	0.008*	0.132	0.142	0.00122*	0.0416	0.0115	0.0401*	1

\*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$

Table 5: The effect of Internet usage on Export

	(1)	(2)	(3)
VARIABLES	Expор	EMEX	ADEX
INT	0.0580** (0.021)	0.0283** (0.012)	0.0498** (0.020)
FA	0.0019*** (0.046)	0.0001** (0.039)	0.0012*** (0.043)
FO	0.0908*** (0.034)	0.0125** (0.020)	0.0689** (0.031)
FS	0.0020** (0.021)	0.0019** (0.023)	0.0017** (0.021)
AF	-0.0204* (0.011)	-0.0012* (0.005)	-0.0156* (0.010)
PC	0.0005*** (0.033)	0.0002** (0.023)	0.0008*** (0.024)

An analysis of the relationship between the Internet and Export: Evidence from Madagascar's Manufacturing Firm

FC	0.0002*	0.0002*	0.0001
	(0.062)	(0.083)	(0.098)
Constant	0.0952***	0.0158**	0.0537**
	(0.030)	(0.018)	(0.022)
Observations	440	440	440
R-squared	0.895	0.852	0.873

*Robust standard errors in parentheses*

\*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$

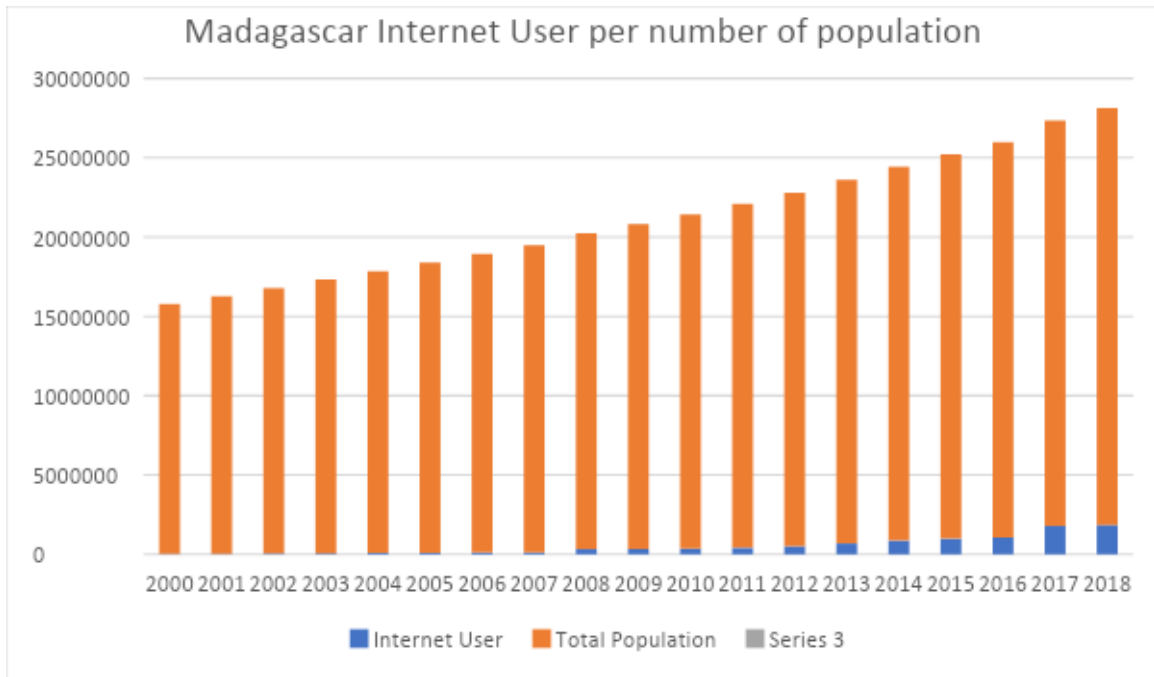
*Table 6: Robustness check on the effect of Internet usage on Export*

	(1)	(2)	(3)
VARIABLES	Expor	EMEX	ADEX
Internet	0.0901***	0.0305**	0.0863***
	(0.030)	(0.015)	(0.025)
FA	0.0020***	0.0002**	0.0013***
	(0.047)	(0.035)	(0.045)
FO	0.0954***	-0.0147*	0.0700**
	(0.035)	(0.019)	(0.032)
FS	0.0002**	0.0002**	0.0002**
	(0.031)	(0.022)	(0.022)
AF	-0.0204*	-0.0015*	-0.0157*
	(0.011)	(0.005)	(0.010)
PC	0.0005**	0.0002**	0.0009***
	(0.034)	(0.023)	(0.025)
FC	0.0006*	0.0001*	0.0009*
	(0.090)	(0.088)	(0.075)
Constant	0.1237***	0.0132	0.0704***
	(0.032)	(0.017)	(0.025)
Observations	440	440	440
R-squared	0.906	0.856	0.882

*Robust standard errors in parentheses*

\*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$





Source: Author's creation based on the data collected from INSTAT

Figure 1: Evolution of Madagascar internet user per total number of populations