

# ***Access and use of ICTs in female-owned SMEs in selected Arab Countries and Brazil: A comparative study***

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## ***Abstract***

This research paper embarks on a comparative empirical study to investigate the impact that ICT plays on empowering women entrepreneurs in 5 developing/ emerging countries, namely Egypt, Jordan, Morocco, Algeria, and Brazil. The World Bank's Investment Climate Assessment Surveys (ICA), are the primary source for data, for the four Arab countries, and Brazil. The ICA database provides comparable enterprise level data based on similar sampling techniques. The results obtained from the empirical study reveal that in the selected Arab countries, the increase in female owned SMEs is associated with a decrease in the Internal Rate of Return. However, when we control for ICT in terms of ICT index constructed using the Principal component analysis technique (PCA), the female owned SMEs becomes statistically insignificant, as well as the ICT index. This implies that IRR is negatively associated with the female owners of the SME, and there is a no association between IRR and the access and use of ICT. In Brazil, however, neither gender nor ICT played any role in the profitability of SMEs. However, as for the other measure for economic performance, namely the labor intensity, the findings reveal that in the selected Arab countries, the ICT index has a positive, statically significant, association with labor-intensity, while in Brazil the usage of a Website has a negative, statistically significant, association with the labor-intensity.

Keywords: SMEs, females, Arab countries, Brazil, ICT, ICA survey

JEL-classification: J16, M13

## **1. Introduction**

Empowering women in developing countries, including the Arab countries, as well as in emerging countries such as Brazil, is considered a vital issue for social and economic development (Verheul et al 2007, Naser et al 2009). Female entrepreneurship represents a potentially valuable tool for promoting growth and elevating poverty (Klapper et al 2010). In this respect, it is important to refer to the Grameen Bank model and other micro-finance schemes that lend mainly to women, to buy cell- phones and provide mobile pay phone services (Teltscher 2002, Niethammer 2013). It is an established fact that one of the UN Millennium Development Goals is gender equality

and women empowerment, and it has been argued that ICT can be the vehicle to achieve this goal (Badran, 2010). In the realm of SMEs in the considered countries, female-owned firms represent 30-37 percent of all SMEs. Furthermore, jobs in small and medium enterprises (SMEs) account for more than half of all formal employment worldwide. (IFC 2013)

Historically, starting in the 1990, many SMEs in developing countries, albeit a smaller number, began to include modern information and communication technologies in their enterprises. This trend can result in an increase in the returns for enterprises and productivity. In addition it can make training and education more accessible for workers. This can eventually lead to increase of employability of low skilled workers. (IFC 2013)

Another vital motivation of present study is the fact that female- owned SMEs by using the Information and Communication Technologies (ICT), can move up the value chain and reach higher value –added products. Thus, owners of SMEs reach out to new technologies and innovations, while the latter require more skilled workers. (IFC 2013)

This progress can also result in reduction of poverty, especially since the majority of female owned SMEs are entering the business because of necessity and not opportunity. (GEM report 2012)

In some cases, business owners and managers, regardless of their gender, lack the requirements to manage and promote their businesses using new technologies. This results in limiting their potential for growth and job creation. Innovation and technology advances can be regarded as a solution for the obstacles facing SMEs, by promoting the skills of the labor force and in particular the female owners of SMEs.(IFC 2013)

In most developing countries, female-run enterprises tend to be undercapitalized, having poorer access to machinery, fertilizers, information, and credit than male-owned enterprises. Laws, regulations, and customs restrict women's ability to manage property, conduct business, or even travel without their husbands' consent.

Disparities also exist in women's workforce participation. Women are three times as likely as men to be hired informally, and are much more likely to be unpaid workers that contribute to the family's business. (WDR 2012)

Such discrepancies impair women's ability to participate in development and to

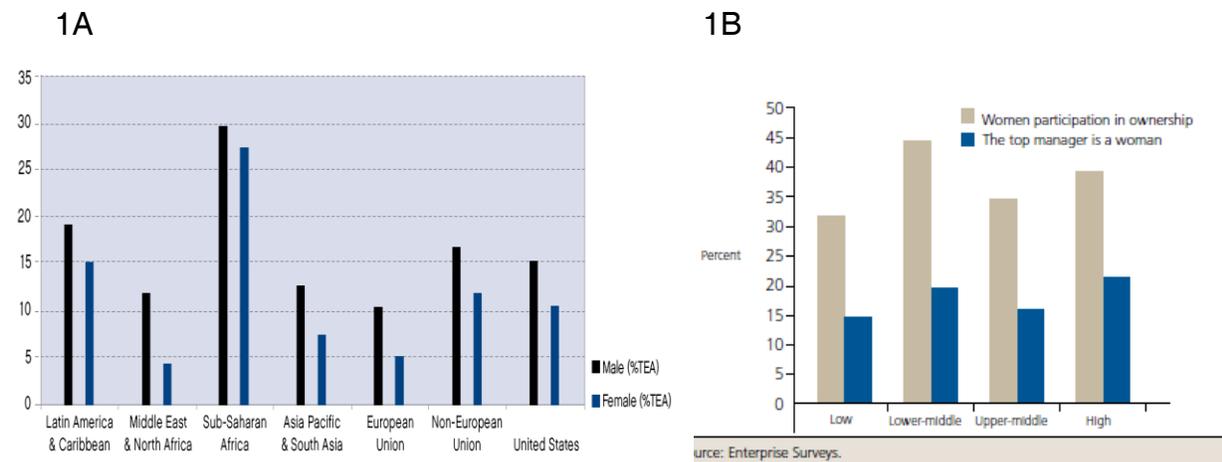
contribute to higher living standards. From a competitiveness perspective, women's disproportionately low participation in the workforce, can reduce the pool of applicants, distort the allocation of talent and productivity of human capital, thereby reduce the average productivity of the labor force. (World Bank, WDR 2012)

Recently, the increase in the number of female-owned enterprises is much higher than that of male counterparts in developed countries, according to Niethammer 2013. Furthermore, there is no evidence that women-owned enterprises fail at a faster rate. In this respect, it is important to mention that women, who start their business motivated by an opportunity, is higher in high-income countries than in low-/middle-income country groups, while in the latter region, women entrepreneurs are more likely to start their business just for necessity reasons. (Niethammer 2013)

A key impetus of the study at hand is the substantial percentage of female owned SMEs in emerging countries. Although they don't constitute the majority of SMEs owners in developing countries, but according to the IFC in 2013, female -owned small and medium enterprises (SMEs) represent 30 to 37 percent (8 million to 10 million) of all SMEs in emerging markets. Several case studies show that ICT can, and is actually, empowering women in developing countries (Badran 2010). For example, ICT provides women entrepreneurs with access to worldwide e-business channels, which can be operated 24 hours a day from home in real -time (Heeks, et.al. 2004 ;Schaefer Davis,2007; Brodman and Berazneva, 2007; Hilbert,M. 2011).

Figure 1A: The distribution of male/female enterprises according to region

Figure 1B: Women Participation in ownership and top management



Source: GEM Report 2012

In Figure 1A, according to the 2012 Global Entrepreneurship Monitor Report, (GEM 2012 Report), female entrepreneurship rates are significantly high in Latin America and the Caribbean region, and are relatively low in the Middle East and North Africa region. An important trend in this respect is that the number of female entrepreneurs reflects the general trend for entrepreneurship conditions in the specific country. In addition, Latin America and the Caribbean region are efficiency driven economies, while Middle East/North Africa (MENA) region contain predominantly factor-driven economies. (GEM report 2012). Figure 1B is taken from to the World Bank's Enterprise Surveys (ES). It depicts that for those females who are engaged in SMEs, female participation in ownership is much higher compared to the females in top management, especially in developing countries compared to other regions in the world.

Policymakers are progressively investigating and developing new ways of empowering women by promoting economic activity and growth among them in developing countries. Furthermore, the increased uptake of access ICTs such as access and use of the Internet and Broadband, having a website for the small businesses, using emails, etc. (ICA survey 2008), should be contributing to overall growth and increased productivity level of female-owned enterprises. This is quite important and relevant to empowering females in general and female-owned entrepreneurs per se, as those

SMEs that adopt these new techniques of doing business, enjoy a competitive edge compared to the rest of the SMEs, that don't incorporate ICT in their production technique. Other ways that ICT can contribute to the growth of the female-owned SMEs include tele-working, e-commerce, and outsourcing (Maier et al 2007).

On the macro- level, it has been well documented and researched , the vital role of ICT in development allowing the developing and emerging countries to leapfrog and excel in their economic and social development ( for example Badran 2007; Badran et al 2011, Qiang 2009, Steinmuller 2001). Thus the question becomes whether these technologies can help female-owned SMEs to overcome their disadvantages and become more productive and profitable entrepreneurs.

This research paper embarks on a comparative study based on empirical techniques to investigate the impact that ICT plays on empowering women entrepreneurs in 5 developing/ emerging countries, namely Egypt, Jordan, Morocco, Algeria, and Brazil. The majority of the empirical literature on entrepreneurship discusses solely the hurdles that male entrepreneurs might be confronting when establishing SMEs. (Bardasi et al 2011, Brush1992). Little empirical evidence investigated the impact of ICT services such as Internet access and use on the economic performance of female- owned SMEs.

In addition, studies that have investigated the gender dimensions and explored the topic of women entrepreneurs have concentrated on developed countries (Brush 1992), as well as the determinants of female entrepreneurs. (Verheul et al 2006).

Thus the research question of the present study can be summarized by the following:

Does ICT play a role in empowering women entrepreneurs in these Arab countries and Brazil, and what is the difference in ICT impact on entrepreneurship between the 2 regions? Examining the lessons learned from Brazil's experience.

It is worth noting that the present research has a twofold value added: it focuses on the research question of empowering female entrepreneurship in Arab countries and Brazil. Further, it adds a new dimension to the existing literature by focusing on the role that ICT is playing to empower these female owned SMEs in the two considered regions.

In the next section, we examine the main characteristics of female entrepreneurship in Brazil and in Arab countries. This is followed by a survey of the pertaining literature. Then, we present a description of the data and methods used to estimate the suggested indicators that measure the performance of female owned SMEs. Finally the results are discussed and analyzed. We conclude with a summary of the key conclusions and suggested policy recommendations.

## **2. Female Entrepreneurship in Brazil and Selected Arab Countries:**

In the outset, in the selected Arab countries combined female –owned SMEs constitute approximately only 15% of total entrepreneurs, while, females in developing countries own around 34.3 percent of small firms (IFC 2013). Thus the female –owned SMEs in the selected Arab countries are below the indicated level. However, in Brazil female owned SMEs are accounting for more than half of total SMEs owners. Secondly, females, per se, tend to own firms in the services sector and they are smaller in terms of sales, assets, profits, and employees. Finally, literature refers to the fact that entrepreneurs' wage gap between male and female is large ( (IFC 2013)

Female Entrepreneurship in Brazil constitutes an important benchmark for the female owned SMEs in other developing countries such as Arab countries. Most businesses in Latin America and in Brazil are micro and small enterprises. The motivation for most entrepreneurs in this region is the necessity or finance, rather than opportunity. Small enterprises in Latin America have a immense impact on job creation, and economic diversification. Middle class firms in Brazil specifically are recognized for being more involved in creating knowledge – based companies (i.e. new communications and software firms as well as internet related services, and other branches of applied electronics.). (World Bank 2013). The present paper draws attention to Brazil for the following facts; Brazil is one of the leading emerging countries ( BRICS), and it is a leader in entrepreneurship, with an estimated one in eight adults being “entrepreneurs.

Much of the business that occurs in Brazil is done by single business people either selling their homemade goods or providing their services. Also half of the entrepreneurs in Brazil are women (46%) in 2004, while 4 years ago it was only 29%. New programs have recently been started to help women to become even more involved in business. Opportunity based entrepreneurship and need based entrepreneurship are close to being equal ( GEM Report 2012)

One of the major hurdles in starting a new enterprise in Brazil is paperwork. Thus, bureaucracy in Brazil is considered a major hurdle. Despite this, Brazil ranks very high on the Global Entrepreneurship Monitor (GEM) list of countries with the highest entrepreneurial activity.(International Entrepreneurship.org).

Female-owned enterprises in Arab countries tend to choose the service business sector (Coleman 2002, Rob (2002), Dechant et al (2005). The size of their business is relatively small, and they are prone to employ fewer employees. The latter study has empirically proved that the average size of female owned enterprises in Bahrain and Oman is small. The number of personnel employed by the women entrepreneurs in both Bahrain and Oman ranges between two and 60 people. ( Naser et al 2009). Generally, the main features of the services sector is the low initial requirement of capital and thus low barriers to entry and easier way of starting a business.( Verheul et al 2007). In general services sector can provide better working conditions than agriculture, as well as more chances for women to be promoted professionally (IFC 2013). According to the latest GEM Report 2012, in the Middle East and North Africa region males have demonstrated four times the likelihood of entering a business compared to female. Women entrepreneurs in this region have large families, with an average of five people per household, and they operate primarily as one-woman businesses with no employees.

However, being a women entrepreneur in a developing country entails many hurdles that are worth investigating. These include limited access to credit, limited pool of human capital, hampering legal environment, and very expensive and complicated way to have access and use of ICT to promote their businesses. The latter , i.e. the impact of having access and use ICT for women owned SMEs, has not been well researched in

empirical studies, especially in developing countries, such as the above mentioned Arab countries and Brazil.

Other external factors that form an obstacle to Arab female entrepreneurship include family and community opinions and social norms (Badran, 2010). It is imperative in the context of the current research to highlight the relationship between women Entrepreneurship and business climate. From the Economic aspect, we find that women frequently face gender bias in the socioeconomic environment when it comes to establishing and developing their own enterprises and accessing economic resources. These not only disadvantage women, but also reduce growth potential, productivity, and performance of the economy as a whole. Gender-based inequalities impose significant development costs on societies. Women are active economic participants as business owners, workers, and managers globally. Apparently, there are positive correlations between women's representation on corporate boards and corporate performance, suggesting that women are good for business. Fortune 500 firms with the highest percentage of women corporate officers yielded on average 35.1 % greater return on equity and 34 percent greater return to shareholders than those with the lowest percentage of women corporate officers. (World Bank 2012, 2011)

### **3. Literature Review**

There are only few empirical studies investigating the impact of use and access of ICT in female-owned enterprises, needless to say this relationship in Arab or emerging countries.

One of the most notable recent paper in this area of research was developed by the World Bank team of researchers, Bardasi et al 2011. The paper discusses the performance gaps between male and female owned enterprises using the ICA surveys but it is confined to three regions – Eastern Europe and Central Asia, Latin America, and Sub-Saharan Africa. They report that on average female owned enterprises are significantly smaller in terms of overall sales than those of their male-owned enterprises in each region. The concentration of women and men in specific industrial sectors follows very similar patterns in all regions, and there was no strong evidence of credit

constraints. Some exceptions were found in Latin America region. They conduct an empirical analysis using multiple regression model to estimate their model. They also examine gender gaps in firm growth over a 3-year period, both in terms of employment and sales. In addition, they measure the gender gap and its impact on productive efficiency in terms of the revenue that they generate from given inputs.

Another paper that discussed the gender aspect in firm performance is the paper by Robb et al 2012. Although, in their paper, they focus on the US, many important conclusions are revealed regarding the impact of gender on SMEs performance. They come to the conclusion that female in the US are not in a disadvantage status in terms of necessary skills and financial resources to open their enterprise. Thus, according to this study, there is no empirical evidence that female-owned SMEs underperform male-owned ones because they are smaller or because female in the US prefer to take fewer risks. Gender has no impact on the performance of the firm, and that the differences within each gender are much larger than the average differences between the 2 genders. The study controls for performance measures such as 4-year closure rates, return on assets, and a risk adjusted measure in addition, other demographic differences such as industry, experience and hours worked.

Papers that have tackled the ICT impact of female-owned SMEs are scarce. One study by Martin et al 2005, investigated how ICT and the Internet influence the development of women entrepreneurs in UK using qualitative techniques. This paper's main focus is on female -owned ICT small enterprises. The latter found that female -owned SMEs gained advantage by experimenting with new ideas at work and at home. ICT and the Internet empowered female-owned SMEs where they became more autonomous and organized in their work. New business opportunities were explored with the help of ICT. Outsourcing, for example, were considered an important option to the female-owned ICT firms, where emphasis was put on new ideas and innovation.

In general, ICT enabled these female entrepreneurs to become low-cost producers, specializing for differentiation and reach more markets due to the adoption of the Internet in their businesses, making ICT a key factor in their improved performance and

running the business. Examples of new techniques such as tele-working and e-commerce were cited in this research.

Finally, an important paper (Chowdhury et al 2003) focuses on measuring the effect of ICT on the economic performance of SMEs in three East African countries: Kenya, Tanzania and Uganda. The study uses diffusion of ICT among East African SMEs is both industry and country specific, where industries covered in the analysis include food processing, textile and tourism. In their empirical analysis, they tackle three performance indicators: internal rate of return, labor productivity, and domestic and export market expansion. Data obtained from ICA surveys covers East Africa, especially Kenya and Tanzania. The survey was carried out from November 1999 to May 2000 and includes enterprises from three sectors: food processing, textiles and tourism. The entire sample includes 300 enterprises. The distribution is 150 enterprises from Kenya and Tanzania each, distributed equally among the three sectors. In the selection of enterprises, the survey followed a simple random sampling procedure where the sample enterprises are randomly selected from major commercial corridors in the countries. Findings reveal that investment in ICT has a negative impact on labour productivity and a positive impact on general market expansion. However, such investment does not have any significant impact on enterprises' return, nor does it determine enterprises exporter (non-exporter) status. (Chowdhury et al 2003)

Thus we can conclude that there exists a knowledge gap, and an ambiguous analysis, regarding the relationship between female owned SMEs performance, and the role that ICT is playing in empowering them. ICA surveys were used before by several studies to investigate the performance of SMEs across various regions. However, a new perspective that addresses gender dimension and furthermore how ICT can be a tool or a vehicle used to empower female-owned SMEs, was not previously rigorously researched or examined using the ICA surveys.

## 4. Research Methodology

### Data:

This research uses the World Bank's Enterprise survey or the Investment Climate Assessment Survey (ICA), as the source for data, for the four Arab and emerging countries, namely Egypt (ICA 2008) , Jordan (ICA 2006) , Morocco (ICA 2007) , Algeria (ICA 2007), and Brazil (ICA 2009). The ICA database provides comparable enterprise level data because it uses similar sampling techniques (ES Global sampling methodology). The definition of SMEs is uniform across all sectors in the Investment Climate Assessment (ICA) Survey in all sectors, in which small firms have 5-19 employees, medium –size firms are ones with 20-99 and firms with 100 or more employees are classified as large.

The samples are constructed using a process of stratified random sampling from a national registry of firms, which implies that only registered firms (i.e., formal firms) are included in the sample. Further, the sampling methodology for the survey generates samples that are representative of the manufacturing and service sectors as a whole. The sample of firms in each country is stratified by size, sector and location, using simple random sampling or random stratified sampling.( Bardasi et al 2011). One of the points of strength of the ICA surveys include identifying the gender of the principal owner of the enterprise, the size of the firm and its age thus far. Another outstanding fact about these investment surveys include is their completion on a regional level. Thus we can compare countries or a group of countries of 2 different regions such as the Arab countries and Brazil. The Enterprise Surveys cover small, medium, and large companies. The surveys are conducted to a representative sample of firms in the non agricultural formal private economy. Uniform methodology of implementation and a core questionnaire are the basis of the Global methodology under which most Enterprise Surveys (ES) have been implemented since 2006. Indicators created from surveys following the ES Global methodology are comparable across countries and survey years. The topics covered in Enterprise Surveys include infrastructure, trade, finance, regulations, taxes and business licensing, corruption, crime and informality, finance, innovation, labor, and perceptions about obstacles to doing business. The

qualitative and quantitative data collected through the surveys connect a country's business environment characteristics with firm productivity and performance. (<http://www.enterprisesurveys.org>).

Services sector in the ICA survey includes the following industries (commercials, information technology, construction and building, tourism services and transportation, restaurants and others). The Brazil survey includes both the manufacturing and the services sector. This is due to the fact that ICT is used by both manufacturing and services sectors in Brazil, which is different than in Arab countries. The manufacturing sector in Brazil (food, textiles, garments, shoes and leather, chemicals, machinery & equipment, auto parts, furniture and other manufacturing) and the services sector (construction, wholesale, retail, hotels and restaurants, transportation and others).

The Enterprise Surveys provide indicators that describe several dimensions of technology use and innovation. ICT indicators shed light on the use of information and communications technologies (ICT) in business transactions. ICT, such as the Internet, is considered an important tool for all firms, especially SMEs. ICT tools should empower enterprises, especially SMEs, so that they can arrive at national and international markets at lower cost. (ICA Report 2012)

The questions that are extracted from the individual level survey will be used for this study to construct the ICT index. These questions are the following:

1. The establishment uses E-mail to communicate with clients or suppliers
2. The establishment uses Website to communicate with clients or suppliers
3. The establishment has high speed internet connection at its premises
4. The establishment uses internet to make purchases
5. The establishment uses internet to deliver services to clients
6. The establishment uses internet to do research and develop ideas on products and services.

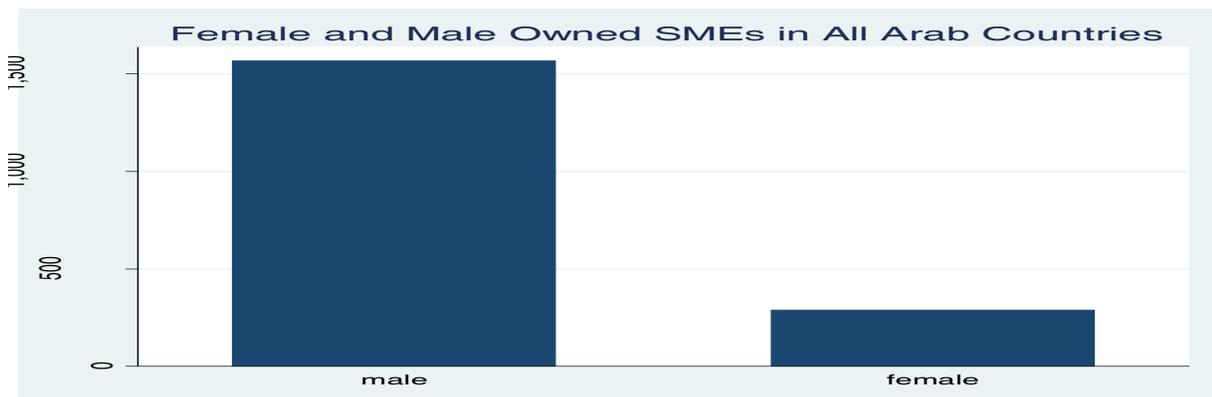
The performance of the enterprise is measured using two different indicators, namely the internal rate of return and the labor productivity.

By adhering to similar sampling techniques and questionnaires, these data sources yield comparable enterprise-level data. In the empirical analysis we use cross sectional country level data for selected Arab countries and Brazil. Caveats in this analysis include important differences in cultural and institutional aspects across these regions. (Bardasi et al 2011)

## 5. Data Analysis:

Preliminary analysis of the data of the four Arab countries: Jordan, Egypt, Morocco and Algeria, reveals the dominance of male entrepreneurs in selected Arab countries under study, compared to Brazil. In the latter, we observe that the female owned SMEs outweigh the male owned SMEs in number.

Figure2: Female and Male owned SMEs in selected Arab countries



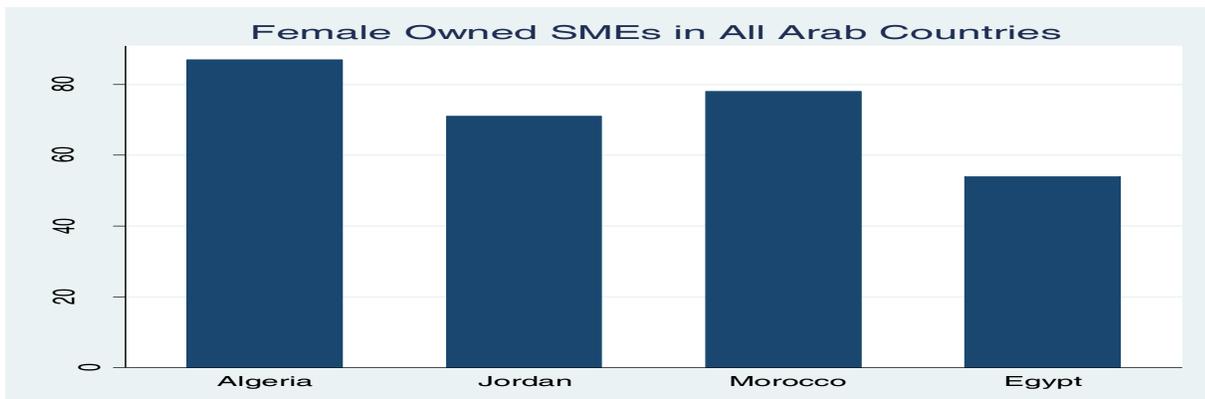
Source: ICA surveys

Figure 3: Female and Male - owned SMEs in Brazil



Source: ICA surveys

Figure 4: The breakdown of female –owned SMEs in the selected Arab countries



Source: ICA surveys

Analyzing the breakdown of the female owned SMEs on a country level; we become aware that they are the highest in Algeria, followed by Morocco, Jordan and finally Egypt. This is an expected result, since Egypt is the mostly populated country of the four Arab countries investigated.

Table one: The distribution of SMES owners in Selected Arab Countries and Brazi, based on Gender:

Country	Male	Female
Algeria	483	84
Jordan	364	64

Morocco	477	64
Egypt	134	53
Brazil	486	614

On the other hand in Brazil, we find that female owned SMEs are much more (614 SMEs) compared to male – owned ones (486 SMEs). We also notice that the major type of enterprises in the selected countries is SMEs.

Figure 5: The distribution of Enterprises based on size in the selected Arab countries:

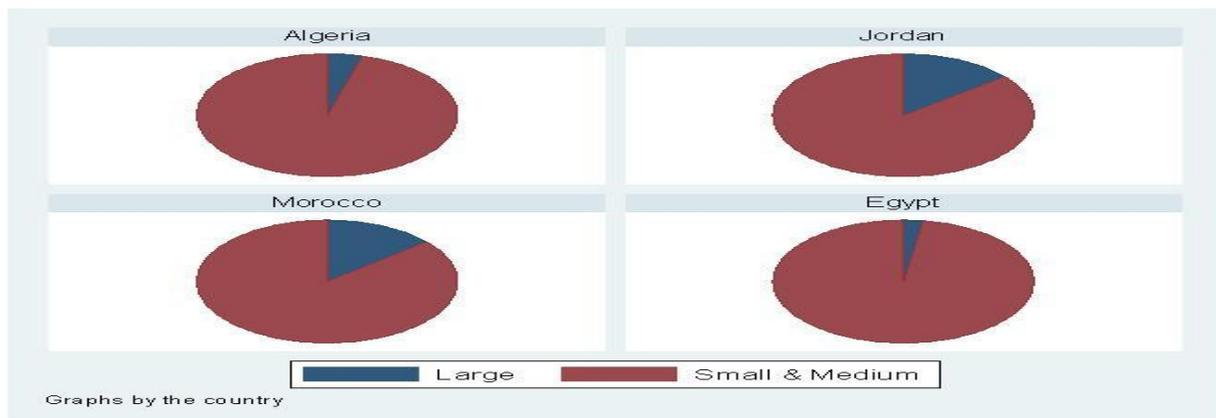
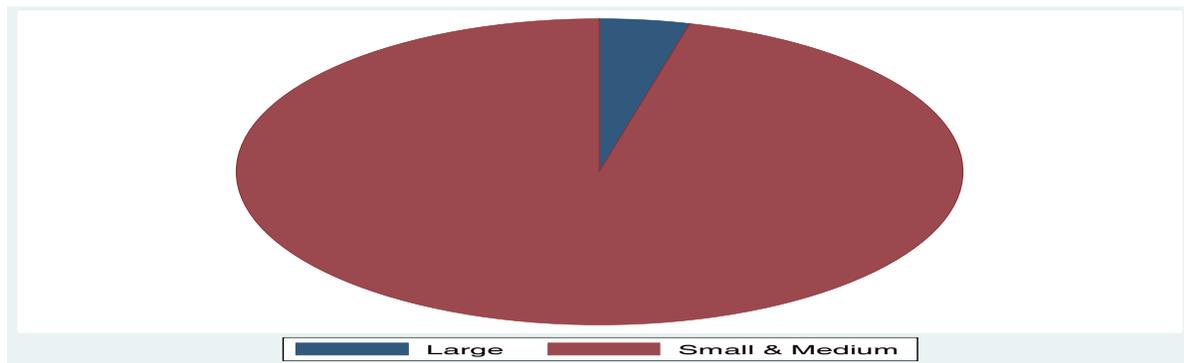


Figure 7: The distribution of type of enterprise based on size:



Source: ICA surveys

Moving to the ICT indicators, Jordan is ranked the first in terms of the usage of high speed internet access, usage of Internet for making purchases, usage of Internet for doing research on new products, and usage of the web to communicate with customers. However, when it comes to using emails to communicate with clients, Morocco ranks number one. (Table 2 ) Brazil, on the other hand shows different results. Number of females who are connected to the connection in Brazil are higher compared to male. However, in the rest of the ICT indicators, the male are leading the access and use of Internet. (Figure 8)

Table two: The ICT indicators in ICA surveys

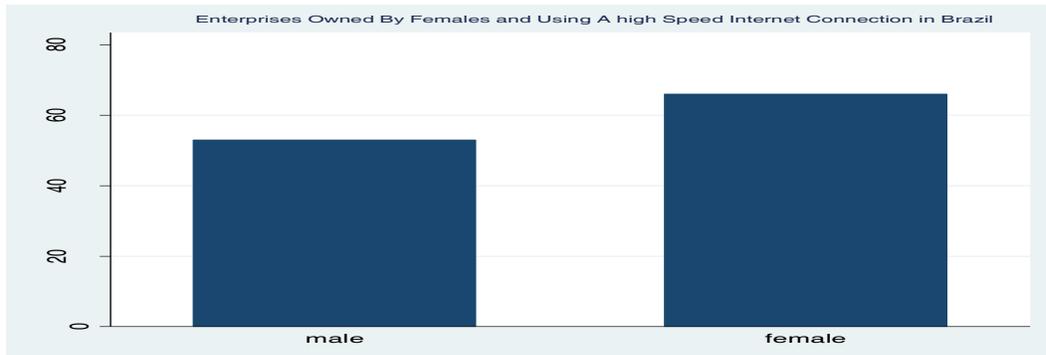
Country	The establishment uses Website to communicate with clients or suppliers	The establishment uses E-mail to communicate with clients or suppliers	The establishment has high speed internet connection at its premises	The establishment uses internet to make purchases	The establishment uses internet to deliver services to clients	The establishment uses internet to do research and develop ideas on products and services
Algeria	197	372	93	39	44	63
Jordan	229	291	230	175	105	107
Morocco	246	554	57	35	35	39
Egypt	163	163	100	118	118	127
Brazil	1145	1702	180	135	123	152

Source: ICA Surveys

ICT variables statistics in Brazil reveal that the having a website and using email to contact clients is the most techniques of applying the ICT tools on the firm level especially for SMEs in Brazil. The rest of the ICT questions present very moderate usage of ICT, namely, whether the establishment has high speed internet connection at its premise, the establishment uses internet to make purchases, whether the establishment uses internet to deliver services to clients, and finally whether the establishment uses internet to do research and develop ideas on products and services.

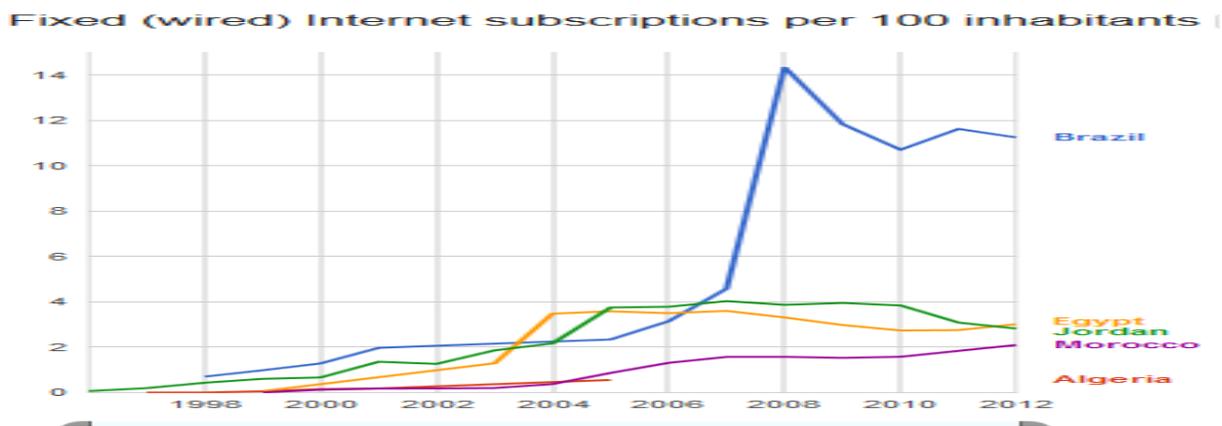
Hence, we can conclude that male outnumber females owned SMEs in all the ICT variables, except for the usage of high Speed Internet Access.

Figure 8: Enterprises owned by females and using high Speed Internet Access in Brazil



Source: ICA surveys

Figure 9: Fixed Internet subscriptions per 100 inhabitants in selected Arab countries and Brazil:



Source: www. ITU.int

In this respect, it is worth noting that these findings are consistent with the general performance of the ICT sector in the respective Arab countries. According to the ITU data in 2008 and 2009, Jordan was leading the selected Arab countries in terms of Internet penetration rate, while Brazil had a surge in Internet penetration rate, as in the depicted figure (Figure 9). However, as for Morocco, one possible explanation for

Morocco leading in email usage as a mean of communication with clients, according to the ICA survey, is maybe due to cultural reasons.

## 6. The Empirical Model:

The present paper is based on the same research methodology applied by Chowdhury et al 2003 in "Use of ICTs and the Economic Performance of SMEs in East Africa". The new dimension added to the previously mentioned study, is conducting a comparative study between 2 different countries, where lessons learned can be drawn from Brazil's experience. The second additional dimension to the proposed study, is focusing on women entrepreneurs in both countries, thus giving attention to the gender dimension and women empowerment.

An ICT index is constructed using the questions pertaining to the following ICT and R&D services, given that R&D uses ICT quite intensively using the Principle Component Analysis Technique, as discussed previously.

We will measure the impact of using and spending on ICT for female owned firms on the following 2 economic performance indicators for the countries under study:

A: The internal rate of return for female-owned SMEs in Arab countries and Brazil

B: Labor intensity and labor productivity of female-owned SMEs in Arab countries and Brazil

The Internal rate of return is our dependent variable, and it will be measured using the following formula: Revenue minus Variable costs divide by aggregate capital stock. Then, to measure the impact of ICT on female owned enterprises on the IRR the following equation will be estimated using OLS:

$$\text{IRR} = \beta_0 \ln A + \beta_1 \ln (K / Y) + \beta_2 \ln(\text{ICT} / K) + \beta_3 \ln(\text{EQ} / K) + \beta_4 \text{Female Owned SMEs} + \beta_5 \text{ICT index} + \varepsilon \quad (1)$$

The first indicator, namely the Internal Rate of Return (IRR), is regressed on aggregate capital intensity, the ratio of ICT capital to total capital and the ratio of non-ICT capital to total capital (Ernst et al 1992), in addition, we include other control variables such as

female owned SMEs and ICT index in Arab countries. In Brazil's regression model, we control for using Website to communicate with clients and suppliers variables as a proxy for ICT variables discussed previously, since there are a huge number of missing values in the rest of the ICT variables in Brazil's ICA report. The method of estimation is OLS, and the regression is a level – log Regression.

The second performance indicator for measuring the impact of ICT in female owned SMEs is the Labor intensity variable. In order to measure the impact of ICTs on labor intensity in female-owned enterprises, a similar relationship can be derived. Applying a Cobb-Douglas production function and assuming constant returns to scale and the following equation will be estimated:

$$\ln(L / Y) = \alpha_1 + \alpha_2 \ln(K / Y) + \alpha_3 \ln(\text{ICT} / K) + \alpha_4 \ln(\text{EQ} / K) + \alpha_5 \text{Female Owned SMEs} + \alpha_6 \text{ICT Index} + \varepsilon \quad (2)$$

where the independent variable is  $(L / Y)$ , which measures labor intensity. Method of estimation is OLS, where the regression is a log-log Regression. In the selected Arab countries, we control for the ICT index, while in the case of Brazil we control for one of the ICT variable, namely the establishment uses Website to communicate with clients or suppliers, for the same reason stated previously.

Prior to running the regression analysis, a correlation matrix of the variables was prepared. Table 1 in appendix shows the means, standard deviations, and Tables 2 and 3 show the correlations of the variables used in subsequent regression for SMEs in the selected Arab countries and Brazil. The pair wise correlations were not large enough to warrant concern about possible multicollinearity problems.

In order to estimate the previous multiple regression models using ordinary least square (OLS), we verified the 5 assumptions of OLS, namely; linearity, constant variance (Homoscedasticity), Multicollinearity, weak exogeneity, and independence of errors then we pooled the data and performed the regressions.

Model 1 captures the impact of female owned SMEs and ICT among other control variables on the profitability of the SMEs i.e. the internal rate of return in the selected

Arab countries ( Egypt, Jordan, Morocco, Algeria). The model is overall significant with probability of F statistics equal to zero. For the Arab countries all predictors in the model 1A have a significant economic and statistical impact on IRR except for the Non ICT capital, which is statistically not significant. We notice that the female owned SMEs have a negative association with the internal rate of return or simply their profits are lower compared to male - owned SMEs.

In model 1B, the ICT index is controlled for in the regression in addition to the female – owned SMEs explanatory variable. We notice that the coefficients for the ICT index and the female –owned SMEs are statistically insignificant.

Model 2 captures the impact of female owned SMEs on labor intensity. There were log transformations to most of the variables in addition to the dependent variable as per the literature (Ernst 1992). This is a log –log regression where the estimated parameters are elasticities.

Results reveal that the female owned SMEs have a negative association with the labor intensity. However this association is not statistically significant. The ICT index is statistically significant, and has a positive impact on the labor intensity in the selected Arab countries.

As for Brazil we find in Model (2A), where the dependent variable is the Internal Rate of Return (IRR), and we controlled for female –owned SMEs and having a web site, we find that there is a negative, not statistically significant, association between the IRR and the female owned SMEs, and there is a positive, not statically significant, association between using a website by the SMEs and their IRR.

The labor intensity model reveals that all the controlled variables are statistically significant, except for the female –owned SMEs. However, there exists a negative, statistically significant, association between the labor intensity and having a website to communicate with clients or suppliers.

## 7. Analysis of the Results

In the selected Arab countries, the increase in female owned SMEs is associated with a decrease in Internal Rate of Return. However, when we control for ICT in terms of ICT index constructed using the Principal component analysis technique (PCA), the female

owned SMEs becomes statistically insignificant, as well as the ICT index. This implies that IRR is negatively associated with the female owners of the SME, and there is no association between IRR and the access and use of ICT. In Brazil, however, neither gender nor ICT played any role in the profitability of SMEs.

However, as for the other measure for economic performance, namely the labor intensity, the findings reveal that in the selected Arab countries and in Brazil, the ICT index has a positive, statically significant, association with labor-intensity, while in Brazil the usage of Website has a negative, statistically significant, association with the labor-intensity.

The female ownership of SMEs seemed to impact only the internal Rate of Return in the selected Arab countries and it has a negative association. On the other hand we can conclude that gender plays no role on the economic performance of the SMEs in Brazil.

In order to understand the impact that ICT plays on the labor intensity as a measure for economic performance of SMEs, it is worth mentioning that the impact of ICT on labor intensity, can be positive or negative. As worker productivity, who works in SMEs, increases, fewer workers are needed to produce one unit of output. If the firms do not change the amount of goods they produce, productivity leads to losses in jobs, which is a negative effect of productivity growth and thus on labor intensity. However, if we conclude that there is a positive impact and productivity increases, this is due to the fact that an increase in productivity reduces the cost of production per unit. Thus the price of goods decreases and consumers are able to buy more goods, which also increases the demand for these goods. In addition, firms become more competitive in prices at the international level, which could result in increased exports and global demand for their goods. As a result, firms can sell and produce more, and therefore may end up expanding and hiring more workers (IFC 2013). However, in the long-term, job growth and productivity are positively correlated. Investing in training can help raise firms' profits and labor market outcomes due to positive productivity returns from worker education, especially in the long run. With respect to the control variables, controlling for the enterprise's age did not turn out to be significant in any case, and the results of

the analysis were similar to those showed in Table 6. Thus, it was decided to not include it in the models of regression.

## **8. Conclusion and Policy Recommendations**

This empirical study reveals that female-owned SMES have a negative and significant association on the internal rate of return in Arab countries, while gender plays no role in SMEs performance in Brazil. ICT shows a positive association with IRR in the selected Arab countries, while negative association in Brazil. Thus, we can conclude that in Brazil ICT replaces, or substitutes, labor and this results in reducing labor intensity, while in the selected Arab countries, ICT leads to an increase in labor intensity. We thus can conclude that due to various and numerous constraints that women face in Arab countries, such as access to commercial credit, lack of required ICT skills, social norms, among other things, female-owned SMEs tend to be less profitable and less productive.

One of the main hurdles facing the female- owned SMEs include the skill mismatch for the owner as well the employees in the enterprise. It is a serious problem that threatens the potential of SMEs, especially in developing countries. It can be ascribed to the deficiency in the education sector and lagging behind important advances in technology.

Furthermore Entrepreneurs fall into the trap of weakness to recognize the benefits from upgrading and updating their skills according to recent technological advances, such as new technologies in Internet access and mobile communications, usage of smart phones, social media, to promote their businesses. Thus female owned SMEs could help themselves if they invest more in human capital, updating their skills and using new technologies to improve their business performance.

It is worth noting that in Brazil, policy makers made concrete milestones in empowering women in the Brazilian society, in terms of giving mothers financial support conditional on them being responsible for their children's health and education progress (Bolsa Familia program). This resulted in Brazilian women contributing more to the economic development of their country and having more chances to succeed in their businesses.

Only through the existence of the political will, women can be empowered to play a major role in their countries' development process.

Policy makers in Arab countries face the critical responsibility of addressing some policy relevant issues, such as incorporating the women's entrepreneurial dimension in the formation of all SMEs-related policies. This can be done by ensuring that the impact on women's entrepreneurship is taken into account in the design stage of SMEs related policies. It is thus recommended that ICT policies drafted by the designated governmental entities should support the women entrepreneurship in Arab countries. The awareness of gender issues is important when considering strategies to improve the business environment and promote private sector development. Mainstreaming gender and creating greater economic opportunities for women has compelling economic reasons, to the extent that inequalities impose development costs on the society.

Thus, suggested steps to enhance women's participation in economic activities in Arab countries include the following

- Continuing to improve the business environment and giving females in Arab countries more responsibilities in the society as well as financial support. (Drawing from the Brazilian experience).
- Addressing norms, traditions and legal discrimination,
- Encouraging women to join the labor force; Improving employment conditions for female workers,
- Increasing women's access to finance, including access to Microcredit.
- Enhancing vocational training for girls and training for female workers.
- Eliminating Digital Illiteracy among women, and raising awareness of the merits of incorporating ICTs in the management of SMEs.
- Giving incentives to women entrepreneurs who already adopt new technologies in their businesses, such as tax reductions or cash loans to upgrade their businesses.

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### Annex 1:

Table 3:Correlation Matrix:

	IRR	Ln L/ Y	Ln K/Y	Ln ICT /K	Ln Non ICT/K	FSMES	ICT Index
IRR	1.0000						
Ln L/Y	0.1180	1.0000					
Ln K/Y	0.4012	0.5473	1.0000				
Ln ICT/K	-0.1935	0.1630	-0.5031	1.0000			
LN Non ICT /K	0.1698	-0.3329	0.0761	-0.6646	1.0000		
FSMEs	0.0653	-0.0133	0.0479	0.0133	0.0647	1.0000	
ICT Index	0.0688	0.1892	0.1077	0.0643	-0.1084	0.2351	1.0000

Table 4: Descriptive Statistics

Variable	Obs	Mean	Std.Dev.	Min	Max
IRR	929	-40.87816	1251.523	-101540.99	32847.36
Ln K/Y	1085	-3.027191	2.309253	-9.400566	6.327937
Ln ICT/K	976	-2.008448	2.123184	-9.723474	0
Ln Non ICT/K	841	-0.2260372	0.474148	-5.433059	0
Ln L/Y	1757	-12.12837	0.474148	-25.04858	2.690088
FSMES	1754	0.1510832	0.3582321	0	1

Table 5: Dependent variable Internal Rate of Return: (IRR) in female owned SMEs in Selected Arab Countries

Model (1A)

Level –Log Regression

Explanatory Variables	Parameter	t-statistics	P- value
Constant	152.2638***	4.29	0.000
Ln K/y	34.66043***	5.69	0.000
lnICT/K	20.6042***	2.90	0.004
Ln Non ICT /K	25.00185	1.35	0.179
FSMES	-69.28906***	-3.08	0.002

Number of observations: 472

Adj-Rsquared= 10%

Prob&gt;F=0.000

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

Table 6:

Model ( 1B): Dependent Variable: Internal Rate of Return (IRR) in female –owned SMEs in Selected Arab Countries controlling for ICT Index:

Level-Log Regression

Explanatory Variables	Parameter	t-statistics	P- value
Constant	113.8147***	2.77	0.007
Ln K/y	27.57132***	4.47	0.000
Ln ICT/K	14.8127	1.53	0.129

Ln Non ICT /K	0.1142882***	2.32	0.022
FSMES	2.356242	0.10	0.922
ICT Index	1.73022	0.19	0.849

Number of observations: 111

Adj-R squared: 17%

P>F-stat: 0.000

\* $p < 0.1$ .

\*\* $p < 0.05$ .

\*\*\* $p < 0.01$

**Table7 :**  
**Model 2: Dependent ln ( Labor intensity)**  
**Log-Log Regression**

Explanatory Variables	Parameter	t-statistics	P- value
Constant	-2.887595***	-3.24	0.000
Ln K/y	1.165607***	9.54	0.000
lnICT/K	0.2102365***	5.05	0.000
Ln Non ICT /K	0.2102365	0.29	0.769
FSMES	-0.6092088	-1.50	0.137
ICT Index	0.2741077*	1.70	0.093

Number of observations: 107

Adj-Rsquared= 52%

Prob>F=0.0000

\* $p < 0.1$ .

\*\* $p < 0.05$ .

\*\*\* $p < 0.01$ .

## **Brazil:**

Table

8:

Model ( 2A): Dependent Variable: Internal Rate of Return (IRR) in female –owned SMEs in Selected Brazil controlling for Web :

Explanatory Variables	Parameter	t-statistics	P- value
Constant	3224.431	3.52	0.000
Ln K/y	1163.33***	7.27	0.000
lnICT/K	-45.92594	-0.16	0.874

Ln Non ICT /K	847.5376***	3.55	0.000
FSMES	-730.9831	-1.37	0.172
Web	35.07294	0.06	0.950

Number of observations: 467

Adjusted R-squared: 10%

P>F-stat.=0.0000

\* $p < 0.1$ .

\*\* $p < 0.05$ .

\*\*\* $p < 0.01$

Table9:

Model (2B): Dependent Variable: Labor Intensity (Ln L/Y) and controlling for female –owned SMEs and having a website :

Explanatory Variables	Parameter	t-statistics	P- value
Constant	-9.627593***	-41.42	0.0000
Ln K/Y	0.5930852***	14.43	0.0000
lnICT/K	0.1551133**	2.06	0.0400
Ln Non ICT /K	0.2281846***	3.80	0.0000
FSMES	0.2039671	1.50	0.135
Web	-0.6261691***	-4.32	0.0000

Number of observations: 541

Adjusted R-squared: 35%

P>F-stat.=0.0000

\* $p < 0.1$ .

\*\* $p < 0.05$ .

\*\*\* $p < 0.01$