WORKING PAPER

Exporting and Workforce Skills-Intensity in the Egyptian Manufacturing Firms: Empirical Evidence Using World Bank Firm-Level Data for Egypt

by

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University of Lüneburg
Working Paper Series in Economics

No. 358

April 2016

www.leuphana.de/institute/ivwl/publikationen/working-papers.html

ISSN 1860 - 5508

Exporting and Workforce Skills-Intensity in the Egyptian Manufacturing Firms: Empirical Evidence Using World Bank Firm-Level Data for Egypt

(Ahmed Fayez Abdelgouad* April 2016)

Abstract

The World Bank's Enterprise Surveys (WES) for the manufacturing firms in Egypt are used to study the characteristics of exporting firms and the determinants of the exporting behavior in the Egyptian manufacturing sector in general and to investigate the link between the exporting activities and the workforce skills-intensity in the Egyptian manufacturing sector in specific. Several methods to estimate the probability and intensity of exporting are presented. The main findings indicate that firms in the manufacturing sector in Egypt which their workforce are characterized by higher levels of skills-intensity are more likely to export compared to other firms with lower levels of skills-intensity. Firms that hire female workers are more likely to export than other firms which do not employ women. Furthermore, firms that are larger in their size, have R&D departments, and owned by foreigners are more likely to export than others and have statistically significant effects on export intensity as well. The results suggest also that firms that are larger in their size are more likely to start to export than others.

Keywords: Exporting, Workforce skills, World Bank Enterprise Surveys, Egypt, Manufacturing

JEL Classification: J240, F14, F16

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I'd like to thank DAAD and the Egyptian Ministry of Higher Education for funding my scholarship. I'm also grateful to Katja Seidel, Inna Petrunyk, Antonia Arsova, Professor Christian Pfeifer and Professor Joachim Wagner for their comments and suggestions. The shortcomings are of course my own alone.

1. Introduction

It has been well established the critical role of exports as a driving force of economic growth and broader development. However, Egypt as a developing country lags behind its peers in respect of export growth in world merchandise trade.

Insert table 1 about here

Enterprises often cite lack of suitable skills as an important constraint for doing business. According to the World Bank Enterprise Survey for the Egyptian manufacturing sector 26.9 percent of manufacturing firms in in 2008 in Egypt identify labor skill levels as a severe constraint to the operation and growth of businesses[1]. There is almost a consensus on the important role of human capital intensity for the international competitiveness and growth of industries and the economy as a whole. This refers to the decisive role of policy measures that focus on improvements in the qualification of the workforce. Nevertheless, human capital intensity per se is not sufficient to make a successful exporter. That is why, studying the characteristics of exporting firms and investigating the determinants of the exporting behavior[2] of manufacturing firms is also crucial to enhance industrial growth and international competitiveness. Policy measures might be designed that either target firms with these characteristics to foster export activities, or to help firms that do not yet have these characteristics to build them to be exporters in the future (Wagner 2011).

Manufacturing firms in developed countries which are more skill-intensive in production are expected to have higher propensity to export. This argument is in accordance with the neo-classical trade theory where firms in developed countries would export products that are consistent with the comparative advantage of developed countries (Fakih and Ghazalian 2014). Egypt as a developing country is considered to be plausibly more abundant in low skilled workers compared to its exporting destinations. One important question in this context is whether the exporting firms in the manufacturing sector in Egypt are characterized by higher or lower skilled workers compared to the non-exporters. Furthermore, most of literature compares exporting firms to non-exporters at any given moment (e.g., for the US, see Bernard and Jensen (1999); for Germany, Bernard and Wagner (1997); for Colombia, Mexico, and Morocco, Clerides, Lach and Tybout (1998); for Taiwan and South Korea, Aw,

[1] 26.9 percent of firms reported very severe constraint, 14.04 percent of firms reported major constraint, 12.09 percent of firms reported moderate constraint, 5.52 percent of firms reported minor constraint and 42.01 percent of firms reported no problem at all.

[2] Direct exports only are considered because information about indirect exports (through a distributer) is available only in 2008.

Chung, and Roberts (1998)). Wagner (2002) compared not only non-exporters to exporters but also compared export starters to non-exporters. Wagner defined Export starters as follows: Plants that did not export for three years prior to year t, export in year t, and export in at least two years between t+1 and t+3 belong to the cohort of export starters in year t. According to data availability in this panel data set, I will define firms that start to export (export starters) as follows: firms that were not exporting in the previous year (t-1) and exporting in the current year (t) and in the subsequent year (t+1). It is worth noting that continuous exporters (firms that have exported in all years in the sample) and export stoppers (firms that were exporting but have stopped exporting) are both excluded from the analysis and non-exporters are kept as a reference group.

The main contribution of this paper is twofold:

1) It provides a new evidence for the relationship between the workforce skills-intensity and the exporting behavior of firms in the manufacturing sector in Egypt using the World Bank's Enterprise Surveys (WES) for the manufacturing firms in Egypt.
2) It does not only compare between the characteristics of exporters and non-exporters but it also analyzes the characteristics of exporting firms and investigates the determinants of the exporting to help firms that do not yet have these characteristics to build them to start exporting in the future.

The remainder of this paper is organized as follows: Section 2 and 3 summarize the theoretical background and the relevant literature respectively. Section 4 describes data. Section 5 presents the empirical strategy. Section 6 interprets the main findings and Section 7 concludes and extracts some policy recommendations that help enhance exporting activities in the Egyptian manufacturing sector at the firm level.

2. Theoretical background

The trade and labor market interactions were tackled in old and new international trade theories. Building on the Ricardian comparative advantage theory, the neo-classical Heckscher-Ohlin (H-O) trade theory (sometimes called 'old trade theory') stipulates that relative endowments of factors of production determine a country's comparative advantage. Bernard et al. (2006) stated that: "A key implication of the Heckscher- Ohlin trade model is that the industries produced in a country are a function of its relative endowments: in an open world trading system, relatively capital- and skill-abundant countries like the U.S. are

expected to produce a more capital- and skill-intensive mix of industries than relatively labor-abundant countries like China". A difficulty in using the Heckscher-Ohlin model to motivate an inquiry into plant behavior is that the model focuses on countries, factors and industries, not plants. One way to reconcile the model with observed plant heterogeneity is to assume plants produce a bundle of products within an industry". Manufacturing firms in the developed countries which are relatively capital and skill abundant countries are expected to produce products that are consistent with the comparative advantages they have than developing countries which are relatively labor abundant countries (Bernard et al. 2006). Given that Egypt is a country that is relatively less endowed in skilled workers compared to their export destination countries. Accordingly, the Egyptian firms have higher comparative advantage in exporting goods that use unskilled workers more intensively. This study is mainly devoted to test to what extent is this argument valid in the manufacturing sector in a developing country like Egypt.

Recent developments in the international trade theory, such as the works of Melitz (2003) and Yeaple (2005) focused attention on the role of firm heterogeneity within industries. Melitz model (2003) explains why various firms in the same industry have different exporting behaviors. In each industry a firm must pay a fixed entry cost to enter the market before observing its productivity. Firms enter the foreign market when revenues from doing so exceed the fixed costs of entry. Only firms with higher productivity exceeding a given threshold will be able to export. If their levels of productivity are too low to be profitable, they are forced to leave the market. Trade liberalization will force the least productive firms to exit and resources will be allocated towards the most productive ones that will continue in the market. Yeaple (2005) shows in a general equilibrium trade model in a perfectly competitive labor market that firm heterogeneity arises because firms choose to employ different technologies and hire different types of workers who vary in their skills levels. Based on the scarcity of skills in the labor market, employers decide to produce with technologies that differ in their characteristics. Suppose that a new technology was created that allows production at a lower unit cost relatively to an older technology. Given two workers that vary in their skills, the more skilled worker has an absolute advantage in both technologies and a comparative advantage in the newer technology.

3. Literature Review

There is indeed a wide stream of empirical literature that examines the determinants of the exporting behavior of manufacturing firms in many countries and regions, for example Bernard and Jensen (2004), Alvarez and Lopez (2005), Molina and Muendler (2009) , Martinez-Zarzoso (2012), Fakih and Ghazalian (2014). For an excellent survey of 51 studies published between 1991 and 2011 for firm characteristics and export activities in Germany, see Wagner (2011). Using a linear probability framework, Bernard and Jensen (2004) examined the factors that increase the propensity to export of manufacturing firms in the United States to provide an answer to the research question: why some firms export? They found that firms with better quality of labor are expected to enter the export market. Fakih and Ghazalian (2014) used the World Bank's Enterprise Surveys via a country-specific effect model with country variables to examine the factors that determine the probability of exporting and the export intensity of manufacturing firms located in the MENA region. The main results indicated that private foreign ownership, ICT use, and firm size have significant positive effects on the probability of exporting and on the export intensity of manufacturing firms in the MENA region and the relative labor compositions of firms in terms of skilled production workers (skilled production workers over total production workers) tend to exert negative effects on firms' propensity to export. Fakih and Ghazalian (2014) showed that their results confirm the neo-classical Heckscher-Ohlin (H-O) trade theory. The authors' analysis was confined to total production workers by comparing skilled to unskilled production workers only without considering the characteristics of the permanent workers. Controlling for the skill levels of the permanent workers (in terms of schooling and training) may lead to different evidence.

Alvarez and Lopez (2005) extracted different evidence from Chile. They found that increasing access to export markets increase productivity and exporting firms in Chile are characterized by higher levels of skill-intensity in production compared to non-exporters. These results disagree with the comparative advantage of Chile which is relatively abundant in unskilled labor. Martinez-Zarzoso (2012) investigated the link between exporting activities and productivity using the World Bank's Enterprise Surveys datasets for Egyptian and Moroccan manufacturing firms and using a probit equation. She found that exporting status depends on firm characteristics, lagged productivity, sales, employment, capital endowment, sector and geographical characteristics and skill intensity which measured by dividing the number of workers with secondary or tertiary education over the total number of workers.

Wagner (2012) used a large representative panel of enterprises from German manufacturing industries to shed new light on the role of highly qualified employees for exporting. The author introduced an evidence of the quality of the average wage in a firm as a proxy variable for the qualification of the workforce3. His results point to the decisive role of human capital intensity and highly qualified employees for exporting. Wagner (2001) introduced important evidence concerning the relationship between firm size and exports: Firm size is neither necessary nor sufficient for exporting in each and every industry or country. His results also show that the importance of the role of other factors (human capital, research and development, and innovative products) differ between industries.

Kiendrebeogo (2012) investigated the relationship between exporting and productivity by checking the self-selection process hypothesis which assumes that exporters prepare themselves by being more productive before starting to export versus the learning-by-exporting hypothesis which argues that firms learn by exporting and therefore become more productive during the process of exporting.[4] The author divided exporters into two groups: export starters and export-continuers. Export starters are defined as firms that did not export in year t-1 and export in year t while export continuers are firms that exported in year t-1 and continue to export in year t. In order to test for the self-selection hypothesis, Kiendrebeogo (2012) compared the productivity performances between today's exporters and non-exporters one year before starting to export. The hypothesis of learning-by-exporting is tested by comparing the performance of export-continuers and non-exporters one year after continuers start to export. It is worth noting here that the author used only the log of average wage as a proxy of firm's human capital although the panel dataset used provide rich information about the human capital of both the workforce and the top managers in terms of the educational attainment level. Pfeifer (2015) used the same panel dataset to investigate the link between productivity of firms also with the human capital (in terms of schooling and experience) but only for the top managers.

Table 2 summarizes the main findings of empirical studies conducted using World Bank Enterprise Surveys (WBES) to analyze both export activities and workforce characteristics.

Insert table 2 about here

[3]Average wages and the ratio of white collar to total employees were used also by Bernard and Jensen (2004) to proxy for workforce quality.

[4] There is a wide stream of empirical literature that examines this relationship in the developing countries. For example, Clerides et al. (1998), Tybout (2000), Alvarez (2005), Martinez- Zarzoso (2012).

Molina and Muendler (2009) found that Brazilian manufacturing firms with more highly educated workers or with more skill-intensive occupations are more likely to be exporters than non-exporters. The authors compared not only between exporters and non-exporters but also among exporters themselves. They found little variation among exporters in their observed workforce composition in terms of both schooling and occupations. Meanwhile and using the workers' prior job history and their experience at other former exporters as a proxy to unobserved skills, Molina and Muendler (2009) found evidence that former exporter workers possess unobserved skills that are associated with exporter performance and that hiring workers with an exporting background from prior employers is an important predictor for firms to start to export in the future. Human capital of the workforce is an important determinant of establishment productivity (Black and Lynch 1996). Firms which employ more-educated workers are more productive. This is consistent with a human capital theory where more-skilled workers make the firm more productive (Haltiwanger et al. 1999). Of course, human capital of the workforce in terms of the educational attainment (schooling/university) is an important driver of productivity of firms. Nevertheless, human capital intensity per se again is not sufficient to make a successful exporter (Wagner 2011). That is why, studying the characteristics of exporting firms and investigating the determinants of the exporting behavior in this study is crucial.

4. Data and descriptive statistics

The World Bank's Enterprise Surveys (WES) for the manufacturing firms in Egypt for the survey years 2004, 2007 and 2008 are used to study the characteristics of exporting firms and the determinants of the exporting behavior in the Egyptian manufacturing sector in general and to investigate the link between the exporting activities and the workforce skill intensity in the Egyptian manufacturing sector in specific. The World Bank's Enterprise Surveys collect data from key manufacturing and service sectors in different regions all over the world. One of the main advantages of these surveys is that the questions are identical through firms across all countries. The survey for firms from the Egyptian manufacturing sector is unique at least in the Middle East and North African (MENA) region. First, the World Bank has successfully conducted three waves (2004, 2007 and 2008) in Egypt instead of only one or two waves as for other countries. Second, approximately one thousand firms are interviewed in each wave and this sample size is larger than for most other countries, especially developing countries in the (MENA) region (Abdelgouad et al. 2015).

The surveys gather information about export status, total sales, different firm characteristics and the workforce composition for example as shown in the summary statistics. The survey is carried out in an unbalanced panel design at the establishment level. All establishments in the data employ more than 5 workers. The number of observations in the estimation sample is 3056 observations for 1634 firms.

Insert table 3 and 4 about here

As shown in table 3 in the summary statistics 25.62 percent out of all firms surveyed in Egypt are direct exporters and 30 firms are export starters (3.05 percent of total number of 982 firms). This number of export starters increases to be 89 firms (9.06 percent of total number of 982 firms in case of adopting a broader definition for export starters with only two-year windows. In other words, if we are concerned only with those firms that were not exporting in year t-1 (2006) and started to export in year t (2007). It is worth noting here that the whole panel dataset is exploited in the first and second empirical parts of this paper for estimating both the probability of exporting and the export intensity of firms while only a cross section analysis was adopted for estimating the export starters in year 2007. More details about the estimation strategy will be found in the next section. In terms of educational attainment the share of permanent workers who have secondary education, some university degree or higher level of education together over the total number of permanent workers is 55.57 percent. Table 4 presents summary statistics for all the independent variables of interest used in the empirical analysis.

5. Estimation Strategy

The primary objective of this study is to investigate the link between the exporting activities and the workforce skills-intensity in the manufacturing firms in Egypt. The second objective is to identify the characteristics of exporting firms and the determinants of the exporting behavior in the Egyptian manufacturing sector. The estimation strategy is divided into three parts. In the first part the probability that a firm is exporting will be modeled in a binary-choice framework where the dependent variable takes the value of 1 if the firm is engaged in exporting activities and 0 otherwise. In the second part, the intensity of exporting (how much firm exports) will be estimated. Export intensity is defined as the fraction of the total value of exports from the total value of sales. Tobit model and fractional logit model introduced by Papke and Wooldridge (1996) are used to estimate the exports/sales ratio, which is a percentage variable with usually many observations at the lower limit.

The same strategy adopted in the first and second parts will be applied in the third part to estimate at first the probability that a firm is *an export starter* and how much do they export. To account for unobserved time invariant firm heterogeneity, there are several potential estimation strategies for this binary-choice framework using ordinary least square (OLS), including pooled linear regression (POLS) as well as random effects linear regression (REOLS) and fixed effects linear regression (FEOLS). The Pooled OLS regression is consistent if the regressors are uncorrelated with the error term. Pooled OLS typically overstates the precision gains, leading to underestimated standard errors and t-statistics that can be greatly inflated. Pooled OLS is consistent if the fixed effects model is appropriate. Fixed effects model allows for unobserved individual heterogeneity that may be correlated with regressors. The random effects estimator exploits also the special features of panel data. The random effects estimator is fully efficient under the random effects model, though the efficiency gain compared to pooled OLS need not be great. Random effects model is inconsistent if the fixed effects model is the correct model (Cameron and Trivedi 2005). Hausman test can be run afterwards to determine whether fixed or random effects model is more consistent. It is worth noting here that linear probability specification is not often the first choice for binary choice problems as the predicted probabilities may be outside of the 0-1 range nevertheless such specifications are important as robustness checks and to get stronger evidence.

To avoid the previous shortcoming of linear methods, a random effects nonlinear probit model will be also estimated together with the average marginal effects[5]. Probit model is a binary dependent variable model which is an example of limited dependent variable models (LDV) whose range of values is substantively restricted (Wooldridge 2009). The panel dataset allows estimating a random effects probit model, which exploits the serial correlation in the error terms generated by unobserved heterogeneity. It should be mentioned here also that no consistent fixed effects models can be estimated for probit and tobit models in short panels that is why only random effects probit model can be estimated that exploit the between and the within variance. (Abdelgouad and Pfeifer 2014). Now we will describe our strategy to estimate the exports/sales ratio. In fact, various methodologies have been used in the literature to model the exports/sales ratio.

5 While in the linear regression model, the ME equals the relevant slope coefficient, greatly simplifying analysis, there are two kinds of MEs that could be computed. Marginal Effects at the Means (MEMs) which are computed by setting the values of X variables at their means, and then seeing how a change in one of the Xk variables changes P(Y = 1). With Average Marginal Effects (AMEs) a marginal effect is computed for each case, and the effects are then averaged. Many prefer AMEs because they provide a better representation of how changes in Xk affect P(Y = 1). 13 In. 14 For more information, see Greene (2003, 764-773)

These various methodologies can be categorized into one-step and two-step approaches. In a one-step approach both the limit observations (the non-exporters) and the rest are used to estimate one equation that models the export/sales ratio empirically, while a two-step approach models the decision to export or not, and the decision how much to export (given that exports are positive) separately. It is not an easy mission to find variables that are important for the yes/no decision while not important for the how much decision, and vice versa that is why two-step methodology to estimate the export/sales ratio is not appropriate. Tobit model accounts for potential censoring of export/sales ratio at 0 percent and 100 percent by applying a two-limit variant to take care for both the lower (zero) and the upper (100 percent) limits of the export/sales ratio distribution. For more details, see Wagner (2001, p. 231) who stated: "Tobit is simply not made for a situation when the endogenous variable is bounded to be zero or positive by definition- it is appropriate when the value of the variable can be less than a lower limit but observations with such values of the variable are not observed because of censoring". However, tobit model allows us to compute marginal effects for the extensive margin, i.e., for the probability of reporting a positive export/sales ratio, and marginal effects for the intensive margin, i.e., for the expected export/sales ratio in percent conditional on a positive export/sales ratio (McDonald and Moffitt, 1980). Marginal effects are informative means for summarizing how change in an outcome is related to change in the explanatory variables in nonlinear models.

Another estimation model is the quasi-likelihood method developed by Papke and Wooldridge (1996) to take into account the bounded nature of fractional dependent variables between zero and one. These boundaries are established by definition and not by censoring (Wagner, 2001). For the sake of robustness checks and models to get stronger evidence, we decided to show and interpret the results of both tobit and fractional logit which surprisingly do not differ so much. As mentioned before in section one *export Starters* are defined as follows: firms that were not exporting in the previous year (t-1) and exporting in the current year (t) and in the subsequent year (t+1). Export starter is measured also as a dummy dependent variable that takes the value one if the firm is an export starter and zero otherwise. To check our results, a broader definition for export starters in 2007 was later on adopted using two-year windows only. According to this definition, export starters are firms that did not export in year t-1 (2006) and export in year t (2007).

A cross section analysis was adopted for estimating the export starters in year 2007 by observing the characteristics of firms and the composition of their workforces in year 2004 by taking the lagged values of all the explanatory variables for one period [6]as shown in the next equation:

$$Y_{2007} = \beta_0 + \beta_1 X_{2004} + \varepsilon$$

Where:

Y_{2007} refers to firms that were not exporting in 2006 and started to export in 2007 and continued to export in 2008.

X_{2004} represents a row vector of variables that control for the characteristics of firms and the workforce composition

The workforce skills intensity is the main independent variable of interest and will be measured in terms of the educational attainment level. Since education might be a poor proxy for the skill intensity in developing countries in general and in Egypt in specific[7], training is also included as a dummy variable which shows whether or not firms offer internal or external training to their permanent workers. The independent variables can be categorized in two main groups as follows:

- *Characteristics of firms' workforce composition:*

- *Share of primary schooling:* permanent workers (males and females) who have completed primary level of education over the total number of permanent workers.
- *Share of preparatory or incomplete secondary schooling:* permanent workers (males and females) who have completed preparatory level of education or did not complete secondary level of education over the total number of permanent workers.
- *Share of secondary schooling:* permanent workers (males and females) who have completed secondary level of education (including vocational education) over the total number of permanent workers.

6 The lagged values for one period of all explanatory variables in 2007 will give the desired values for year 2004. Remember that our dataset is unbalanced dataset with gaps in year 2005 and 2006.
7 According to the recent Global Competitiveness Report 2013/2014, Egypt occupies the last rank out of 148 countries in the quality of primary education indicator and ranks 118 in the higher education and training indicator.

- *Share of university degree or higher schooling:* permanent workers (males and females) who have some university degree or higher level of education over the total number of permanent workers.
- *Training* (dummy): equal one if a firm offer internal or external training to its permanent worker and zero otherwise.
- *High qualified manager (dummy):* Equal one if top manager has Ph.D. degree or did a post graduate degree and zero otherwise

- *Female employment share:* number of permanent female workers over the total number of permanent workers.
- *Temporary employment* (dummy): equal one if a firm is hiring a temporary employee and zero otherwise.
- *Unionized workforce (dummy):* equal one if worker is affiliated to a trade union and zero otherwise.

- *Firm Characteristics:*
- *Firm size:* by categorizing firms into small-size firms (50-100 workers), medium-size firms (100-1000 workers) and large-size firms (higher than 1000 workers).
- *Ownership share:* by categorizing firms into four categories: foreign ownership, private ownership, government ownership, and Arab ownership.
- *R&D* (dummy): equal one if there exists an own R&D department in the firm and zero otherwise.
- *Firm age* (years): measured by the number of years since the establishment of the firm.
- Branch (dummy): equal one if the firm has other branch or factory and zero otherwise.
- In addition to regional dummies (23 regions), sector dummies (9 sectors), and year dummies (3 years).

6. Empirical Results

The results of POLS, FEOLS, REOLS and the random effects probit model together with their average marginal effects are presented in Table 5.

Insert table 5 about here

Across all models there is concrete evidence that firms which employ higher skilled workforce (i.e. in terms of education and training) are more likely to be exporters. POLS, REOLS and FEOLS estimates[8] reveal that when the share of workers with a university degree increase by one percentage point, firms are more likely to export by these percentage points (0.108), (0.098), and (0.131) respectively. The size of the average marginal effect in the random effects probit regression is (0.822) which means that, holding all other explanatory variables constant, the probability that firms export increase by that amount when the share of the higher skilled workers increase by one skilled worker. All these results are statistically significant at the 5 percent level across all models. The previous results are not in line with previous results of Fakih and Ghazalian (2015) who found using the same dataset different evidence for the MENA region including Egypt. They found a significant negative relationship between the ratio of skilled production workers and the probability to export. The authors referred in their results that they found some evidence that confirm the neo-classical Heckscher-Ohlin (H-O) trade theory arguing that MENA countries are relatively less endowed in skilled workers compared to their export destinations and that they possess a higher comparative advantage in exporting goods that use unskilled workers. The authors' analysis was confined to total production workers by comparing skilled to unskilled production workers and neglected the characteristics of the permanent workers. My results are in line with the results of Alvarez and Lopez (2005) who found that exporting firms in Chile are characterized by higher levels of skill intensity compared to non-exporters.

Firms that provide internal or external training programs for their workers are 5.1 percentage points, 4.5 percentage points more likely to export as shown in the POLS and in the REOLS regressions respectively. The results are statistically significant at 10 percent in the POLS and at 5 percent in the REOLS and the size of average marginal effect in the random effects probit regression is (0.035) in the random effects probit regression and statistically significant at 5 percent. These results provide additional evidence that firms which employ higher skilled workforce in the manufacturing sector in Egypt are more likely to be exporters.[9] Moreover, all models except the FEOLS refer to an interesting result concerning the share of female workers: Firms that adds one female worker to its workforce are more likely to export by the following amounts (0.099), (0.104), and (0.609) in POLS, REOLS and the random effects probit model. All results are statistically significant at 5 percent.

[8] It is worth noting that Hausman test was run and the p value is 0.0487 which suggests that fixed effects model is more consistent than random effects model.

9 Because it may be argued that education alone is a poor proxy for measuring skills in a developing country like Egypt.

These results are in line with the results of Fakih and Ghazalian (2015) that MENA's manufacturing firms engaged in exporting activities have higher proportions of female workers compared to non-exporting firms and with the results of Al-Azzawi (2014) that exporting industries are more likely to hire female workers. These results also are consistent with the results of Abdelgouad and Pfeifer (2015) that exporting firms and especially firms with longer export experience are also more likely to employ females and have a higher female employment share, which points to potential international spillover effects, such as, learning and adapting management practices that also promote female employment (Abdelgouad and Pfeifer, 2014). All models except the FEOLS indicate also that firms with higher qualified managers are more likely to export than firms with lower qualified managers (in terms of educational attainment) by 3.12 percentage points, 2.5 percentage points in POLS and REOLS and the size of average marginal effects of the random effects probit model is 7.5 percentage points. The results are statistically significant at 10 percent in the POLS regression and at 5 percent in the random effects probit regression. These results are also in line with the results of Pfeifer (2014) who found a positive correlation between productivity in the Egyptian firms in the manufacturing sector and top managers who have some kind of university degree.

Concerning the firm characteristics, across all models and in terms of the number of permanent workers firms that are larger in their size is more likely to export. Firms that employ more than 50 workers and less than 100 workers are more likely to export than firms that employ less than or equal 50 workers. All results are statistically significant at 1 percent. These results are in line with previous studies that exporting firms are characterized by larger size than no-exporters (e.g., Bernard and Jensen, 2004, Alvarez and Lopez, 2005, and Fakih and Ghazalian, 2014). Firms that have R&D departments are more likely to export than other firms that do not have. All results are also statistically significant at 1 percent across all models. Firms that owned by non-Arab foreigners are also more likely to export than firms owned by domestic and Arab owners. All results are statistically significant at 5 percent. These results are consistent with those found in some previous studies (e.g., Aitken et al., 1997, Bernard and Jensen, 2004, Alvarez and Lopez, 2005 and Fakih and Ghazalian, 2014). These results are in line with a recently published study Abdelgouad, et al. (2015) that firms in the manufacturing sector in Egypt with foreign ownership are significantly more productive and have higher capacity utilization than purely Egyptian owned firms.

Furthermore, non-Arab foreigners are expected to have stronger networks to export in foreign markets, hence more information about exporting to foreign markets. To sum it up, the previous results suggest that firms in the manufacturing sector in Egypt which their workforce are characterized by higher levels of skill intensity are more likely to export compared to other firms with lower levels of skill intensity. Firms that hire female workers are more likely to export than other firms which do not employ women. Furthermore, firms that are larger in their size are more likely to export than firms with lower size. Firms that have R&D departments are more likely to export than other firms that do not have. Finally, Firms that owned by foreigners are also more likely to export than firms owned by domestic or Arab owners. Now we turn to interpret the results of the determinants of export intensity of manufacturing firms.

Insert table 6 about here

As mentioned before, export intensity is defined as the fraction of the total value of exports from the total value of sales. The estimation is carried out using tobit and fractional logit model of Papke and Wooldridge (1996). The estimated coefficients and the corresponding marginal effects are displayed in Table 6. Across the two models, firms that are larger in size, (younger) in age, have higher qualified managers, hire more female workers, provide training programs for their employees, have R&D departments, owned by non-Arab foreigners have statistically significant effect on export intensity. Tobit model results only reveal a positive and statistically significant effect of permanent workers with a university degree on export intensity. The average marginal effect on the probability to export of 9.11 percentage points and 4.36 percentage points higher intensity to export. All results are statistically significant at 5 percent. Finally, the results of the export starters using OLS and probit regressions are presented in tables 7 and 8.

Insert tables 7 and 8 about here

The results indicated that Firms that are larger in their size in 2004 are more likely to start to export in 2007 by 4.39 percentage points and by 9.63 percentage points for firms that employ more than 100 workers and less than 1000 workers (medium size firms) and firms that employ more than 1000 workers (large-size firms) respectively in OLS regressions results and by 10.74 percentage points and 53.81 percentage points in the probit regression for medium and large size firms respectively.

The OLS results are statistically significant at 5 percent and the probit results are statistically significant at 10 percent. If the broader definition of export starters is adopted, more significant results could be obtained as shown in table 8. Firms that are medium in their sizes, have R&D departments, have other factories or branches and have higher qualified managers in 2004 are more likely to export in 2007. All results are statistically significant at conventional levels.

7. Conclusion

The empirical results suggest that firms in the manufacturing sector in Egypt which their workforce are characterized by higher levels of skill intensity are more likely and more intense to export compared to other firms with lower levels of skill intensity. This result casts doubts on the argument that firms in less developed countries like Egypt, which is relatively abundant in unskilled workers, exports products that are consistent with this comparative advantage. The results reveals also that firms that hire female workers are more likely to export than other firms which do not employ women. Firms that are larger in their size are more likely to export than firms with lower size. Furthermore, firms that have R&D departments are more likely to export than other firms that do not have and firms that owned by foreigners are also more likely to export than firms owned by domestic and Arab owners. All results are statistically significant at the conventional levels. Firms that are larger in their size, have R&D departments, and owned by foreigners have statistically significant effects on export intensity as well. The results suggest also that firms that are larger in their size are more likely to start to export than others. Industrial, trade, investment and labor market policies should be designed in light of these determinants of exporting activities. This might help enhance trade at the firm level in the manufacturing sector in Egypt. This can be achieved by adopting a strategy that seeks to upgrade the skills levels of the workforce in the manufacturing sector in Egypt via designing efficient training programs that target lower skilled workers to increase the competitiveness of firms in the exports market. Furthermore, the positive effects of hiring female workers on firms' exporting activities suggest that the international competitiveness of the Egyptian firms in the export market might be improved via adopting policies that target increasing women employability in the manufacturing sector in Egypt.

This can be achieved by removing all barriers that hinder female participation in the Egyptian labor market (i.e. better transportation networks and more decent nursery schools etc.)[10] The positive effects of foreign ownership on firms' exporting activities reveal the significant role of investment policies that are needed to improve the ease of doing business in the Egyptian manufacturing sector by removing the conventional barriers of foreign direct investment (i.e. starting a business, getting credit and electricity etc.). The empirical results shed lights also on the positive effects of firm size and firms that possess R&D department on firms' propensity to export. This study lends itself to investigate the impact of trade liberalization on the demand for skilled workers. The impact of entering the export market could be analyzed in the future to test whether exporting activities stimulate the demand for higher skilled workers in the Egyptian manufacturing sector (i.e. the role of "skill enhancing trade").

[10] For more details, please see (Abdelgouad and Pfeifer 2014)

References

Abdelgouad, A.F. (2015) "Determinants of Using Fixed-Term Contracts in the Egyptian Labor Market: Empirical Evidence from Manufacturing Firms Using World Bank Firm-Level Data for Egypt". *Journal of Empirical Economics*, 4(1): 29-48.

Abdelgouad, A.F., Pfeifer, C. and Weche Gelübcke, J.P. (2015) "Ownership structure and firm performance in the Egyptian manufacturing sector". *Economics Bulletin*, 35(4): 2197-2212.

Abdelgouad, A.F. and Pfeifer, C. (2014) "Determinants of Female Employment in Egyptian Firms". *The Empirical Economics Letters, 13(12):1267-1275.*

Aitken, B., Hanson, G. and Harrison, A. (1997) "Spillovers, Foreign Investment, and Export Behavior". *Journal of International Economics*, 43(1–2): 103–132.

Al-Azzawi, S., (2014) "Trade liberalization, industry concentration and female workers: the case of Egypt", IZA Journal of Labor policy, 3:20 (URL: http://www.izajolp.com/content/pdf/2193-9004-3-20.pdf).

Alvarez, R., and López, R.A. (2005) "Exporting and Performance: Evidence from Chilean Plants". *Canadian Journal of Economics*, 38(4): 1384–1400.

Araújo, B., Bogliacino, F., and Vivarelli, M. (2009) "The Role of "Skill Enhancing Trade in Brazil: Some Evidence from Microdata". IZA Discussion Paper No. 4213.

Aw, B. Y., Sukkyun C.,Mark J. R. (1998) "Productivity and the decision to export: micro evidence from Taiwan and South Korea". National Bureau of Economic Research Working Paper No. 6558.

Balchin, N. and Edwards, L. (2008) "Trade-related business climate and manufacturing export performance in Africa: a firm-level analysis", Paper presented at the 2008 Conference of the African Econometric Society (AES), Pretoria, South Africa. Available at: http://www.africametrics.org/documents/conference08/day2/session5/balchin_edwards.pdf

Bernard, A. B., Wagner, J. (1997) "Exports and success in German manufacturing". *Weltwirtschaftliches Archiv* 133: 134-157.

Bernard, A. B., J. Bradford J. (1999) "Exceptional exporter performance: cause, effect, or both?". *Journal of International Economics* No. 47.

Bernard, A.B., and Jensen, J.B. (2004) "Why Some Firms Export?" *The Review of Economics and Statistics*, 86 (2): 561–569.

Bernard, A.B., Jensen J.B. and Schott, P.K. (2006) "Survival of the Best Fit: Exposure to Low- Wage Countries and the (Uneven) Growth of US Manufacturing Plants". *Journal of International Economics*, 68(1):219-237.

Black, S. E. and Lynch, L. M. (1996) "Human-Capital Investments and Productivity". *The American Economic Review*, 86(2):263-267.

Cameron, A. C. and Trivedi, P. K. (2005) " Linear Panel Models: Basics. In: *Microeconometrics*. pp. 697-742. Cambridge University Press.

Clerides, S.K., Lach, S. and Tybout, J.R. (1998) "Is Learning by Exporting Important? Micro-Dynamic Evidence from Colombia, Mexico, and Morocco". *Quarterly Journal of Economics*,113(3): 903–947.

Fakih, A., Ghazalian, P. (2014) "which firms export? An empirical analysis for the manufacturing sector in the MENA region". *Journal of Economic Studies* 41(5):672–695.

Fakih, A., and Ghazalian, P. (2015) "Female Labour Force Participation in MENA's Manufacturing Sector: The Implications of Firm-Related and National Factors", *Journal of Economic Change and Restructuring*, 2015, 48 (1): 37-69.

Haltiwanger, J. C., Lane, J.I., and Spletzer. J. R. (1999) "Productivity Differences across Employers: The Roles of Employer Size, Age, and Human Capital". *The American Economic Review*, 89(2):49-98.

Kiendrebeogo, Y. (2012) "Export Activity and Productivity: New Evidence from the Egyptian Manufacturing Industry" Document de travail de la série Etudes et Documents E 2012.20, Centre d'études et de recherches sur le développement international (CERDI).

Suarez Burguet, C., Martinez-Zarzoso I. and Para, M.D. (2012) "Learning Networks in South Mediterranean Countries" Available at: http://www.etsg.org/ETSG2012/Programme/Papers/35.pdf

Martinez-Zarzoso, I. (2012) "Exporting and Productivity: Evidence for Egypt and Morocco", Center for European, Governance and Economic Development research, Discussion Paper number 136.

McDonald, J.F., and Moffitt, R.A. (1980) "The uses of Tobit analysis". *Review of Economics and Statistics*, 62: 318-321.

Melitz, M. J. (2003) "The Impact of Trade on Intra-Industry Reallocations and Aggregate Industry Productivity". *Econometrica*, 71(6):1695-1725.

Meschi, E., Taymaz, E. and Vivarelli, M. (2011) "Trade, Technology and Skills: Evidence from Turkish Microdata". *Labour Economics*, 18: 60-70.

Molina, D. and Muendler, M. (2009) "Preparing to Export". University of California-San Diego. Unpublished Manuscript available at: http://www.economics.uci.edu/files/docs/thdworkshop/s10/muendler.pdf

Ottaviano, G., and Martincus, C.V. (2011) "SMEs in Argentina: Who are the Exporters?" *Small Business Economics*, 37(3): 341–361.

Papke, L.E., and Wooldridge, J.M. (1996) "Econometric Methods for Fractional Response Variables with an Application to 401(k) Plan Participation Rates". *Journal of Applied Econometrics*, 11(4): 619–632.

Parra, M.D.,Martinez-Zarzoso and I., Suarez Burguet, C. (2014) "Businees environmental constraints for Egyptian firms" Available at: http://www2.uah.es/iaes/sermed/Parra_Martinez_Suarez.pdf

Parra, M.D.,Martinez-Zarzoso I. and Suarez Burguet, C. (2013) "Imports, Innovation and Egyptian Exports" Available at: http://www.uibcongres.org/imgdb/archivo_dpo12628.pdf

Parra, M.D. and Martínez-Zarzoso, I. (2015). "Imported Inputs and Egyptian Exports: Exploring the Links" *Economics: The Open-Access, Open-Assessment E-Journal*, Available at: http://www.economics-ejournal.org/economics/journalarticles/2015-38

Pfeifer, C. (2015) "The nexus between top managers' human capital and firm productivity". *Applied Economics Letters*, 22(12):982-986.

Roberts, M. and Tybout J. (1997) "The Decision to Export in Colombia: An Empirical Model of Entry with Sunk Costs". *The American Economic Review*, 87(4): 545-564.

Seker, M. (2010) " Rigidities in Employment Protection and Exporting". World Bank Policy Research Working Paper 5323.

Seker, M. (2012) "Importing, Exporting, and Innovation in Developing Countries". *Review of International Economics*, Vol. 20(2), pp. 299-314.

Wagner, J. (2001) "A Note on the Firm Size – Export Relationship". *Small Business Economics*, 17(4): 229–237.

Wagner, J. (2002) "The causal effects of exports on firm size and labor productivity: First evidence from a matching approach". *Economics Letters*, 77: 287-292.

Wagner, J. (2011) "Exports and Firm Characteristics in German Manufacturing Industries". *Applied Economics Quarterly, 57(2):107-143 and 145-160.*

Wagner, J. (2012) "Average wage, qualification of the workforce and export performance in German enterprises: Evidence from KombiFiD data". *Journal for Labour Market Research*, 45(2):161-170.

Wagner, J. (2015) "Firm age and the margins of international trade: Comparable evidence from five European countries". *Economics Bulletin*, 35(1): 145-158.
Wooldridge, J. M. (2009) "Introductory Econometrics: A Modern Approach". 4th edn, Mason, OH: South-Western CENGAGE Learning.

Yeaple, S. R. (2005) "A Simple Model of Firm Heterogeneity, International Trade, and Wages". *Journal of International Economics*, 65 (1): 1-20.

Table 1: Some Non-OECD countries in World Merchandise Trade, 2013 (Selected countries) (Billion dollars)

Exporters	Value	Rank
South Africa	96	27
Argentina	82	32
Philippines	57	39
Bangladesh	29	46
Egypt	28	47
Pakistan	25	48
Morocco	22	50

Source: https: https://www.wto.org/english/res_e/statis_e/its2014_e/its2014_e.pdf

Table 2: Summary of empirical studies on export activities and workforce characteristics using World Bank Enterprise surveys.

Study	Data	Methods	Main Findings
Fakih and Ghazalian (2014)	4386 manufacturing firms located in eight Arab countries in the MENA region (Algeria, Egypt, Jordan, Lebanon, Morocco, Oman, Syria, and Yemen) in different years between 2002 and 2010 (2029 manufacturing firms in Egypt in two years only 2007and 2008).	Probit and fractional logit. A country-specific effect model with country variables.	Private foreign ownership, information and communication technology, and firm size are positively related to the probability and intensity of exporting of MENA manufacturing firms, while government ownership and the relative labor compositions of firms in terms of skilled production workers and in terms of non-production workers are negatively related to the probability of exporting.
Martiniz-Zarzoso (2012)	2316 Egyptian firms and 1539 Moroccan firms for only 2 years 2004 and 2007.	Both propensity score matching (PSM) using a Probit equation and differences-in differences (DID) matching estimator.	The Egyptian exporters are larger and more productive than non-exporters. Exporting is positively correlated to labor productivity In contrast, no differences are found in labor productivity between

			Moroccan exporters and non-exporters. The results support the self-selection hypothesis for Egyptian firms, but not for Moroccan firms
Fakih and Ghazalian (2015)	3619 manufacturing firms located in eight Arab countries in the MENA region (Algeria, Egypt, Jordan, Lebanon, Morocco, Oman, Syria, and Yemen) in different years between 2002 and 2010. Manufacturing firms in Egypt are in two years only 2007and 2008).	Fractional logit, Probit and Tobit models (as robustness checks).	Private foreign ownership and exporting activities are positively correlated to overall female employment rates. The empirical results that implemented for female non-production employment rates show positive effects of private foreign ownership but these effects are smaller in magnitude compared to the corresponding effects on overall female employment rates in MENA region.
Murat Seker (2012)	Data from 43 developing countries. 16722 manufacturing firms in 2002, 2005, and 2008 for Eastern Europe and the Central Asia region and in 2006 for Latin America and Caribbean region.	OLS, random effects Probit model	Firms are divided into four distinct groups: two-way traders, exporters-only, importers-only, and non-traders. The empirical results show that two-way traders grow faster and innovate more than any other group of firms and they are followed by the exporters-only.
Youssouf Kiendrebeogo (2014)	Unbalanced panel of 1655 manufacturing firms having at least 10 employees over the period 2003-2008. Indirect exports are not considered.	Logit model and propensity score matching (PSM)	The author finds that labor productivity and total factor productivity are significantly higher for exporters than for non-exporters and that export premium is driven by a learning-by exporting process rather than just a self-selection of more productive firms into

			exporting. The author refers also to an inverted U-shaped relationship between export intensity and productivity, suggesting the existence of a "threshold of exporting" in the manufacturing firms in Egypt.
Edwards and Balchin (2008)	3585 manufacturing firms in 8 African countries - Egypt (977 firms in 2004 only) ,Kenya, Madagascar, Mauritius, South Africa, Tanzania and Zambia between 2002 and 2005	Probit model	Across the eight African countries, exporters are larger in size than non-exporters; value-added per worker of exporters is higher than non-exporters. Exporting firms are younger, have higher share of foreign ownership, and have higher levels of skill intensity (measured as the ratio of permanent skilled production workers to total employment).
Parra et al. (2014)	2429 observations (554 firms) for years 2004, 2005 and 2007.	OLS and OLS fixed effects	Larger firms, exporting firms and foreign firms are less affected by the business environmental obstacles than small, domestic and non-foreign firms in Egypt.
Parra and Martinez-Zarzoso (2015)	1890 observations (519 firms) from 2003 to 2007	OLS, Panel probit model with random effects and panel tobit model	Firms involved in export and import activities have higher productivity, are larger, own more capital and invest more than domestic-only firms. Both export and import activities are significantly interrelated and sunk cost are higher for import than for export activities in Egypt.
Marquez-Ramos et al. (2012)	2316 observations (695 firms) in 2004 and 2005.	Pooled regression	The use of foreign intermediate inputs as a proxy for production networks is positively correlated with the decision to export but does not

			affect the amount exported. Furthermore, innovation and adoption of new technologies are positively correlated with both the decision to export and the amount exported in Egypt.
Parra et al. (2013)	2316 observations (695 firms) in 2004 and 2005	Logit and Tobit models	Innovation and importing activities are positively correlated with the decision to export (extensive margin) and the amount exported (intensive margin) in Egypt.
Pfeifer (2015)	2891 observations for 1583 firms in an unbalanced panel in years 2004, 2007 and 2008 (1287 observations for balanced panel of 429 firms as robustness check).	OLS (Pooled and fixed effects linear regressions)	Positive correlation between productivity in manufacturing firms in Egypt and firms managed by top managers who have some kind of university degree, more experience in management activities, and foreign experience in management jobs.
Abdelgouad and Pfeifer (2014)	2914 observations for 1593 firms in 2004, 2007 and 2008.	Pooled and random effects Probit and Tobit regressions	Exporting firms in the Egyptian manufacturing sector and especially firms with longer export experience are more likely to employ women and have a higher women employment share. Results suggest also that female employment is positively correlated with firms managed by top managers with a university degree and with foreign experience in management jobs.
Abdelgouad (2015)	2672 observations for firms in 2004, 2007 and 2008.	Probit and tobit models	Empirical results revealed that demand changes had no effects on using temporary employment in the manufacturing firms in Egypt.

Seker (2010)	1552 observations for 943 firms in the manufacturing sector	probit	Using 26 countries in Eastern Europe and Central Asia region, firms that cannot create new jobs due to rigid labor market regulations are less likely to export.

Table 3: Detailed Descriptive statistics for all variables in all specifications

		Mean	Standard deviation
Dependent variables			
Export status	Overall	0.2562	0.4366
	Between		0.3918
	Within		0.2384
Export/Sales ratio	Overall	0.0968	0.2338
	Between		0.2070
	Within		0.1275
Export starters	Overall	0.0305	0.1721
	Between		0.1721
	Within		0
Explanatory Variables:			
Share primary schooling (%)	Overall	0.1170	0.1547
	Between		0.1247
	Within		0.1055
Share preparatory or incomplete secondary Schooling (%)	Overall	0.1782	0.1764
	Between		0.1425
	Within		0.1199
Share secondary schooling (incl. vocational) (%)	Overall	0.3842	0.2277
	Between		0.1900
	Within		0.1486
Share university degree (%)	Overall	0.1715	0.1485
	Between		0.1296
	Within		0.0892
Training of workers (dummy)	Overall	0.1825	0.3863
	Between		0.3361
	Within		0.2429
High qualified manager (dummy)	Overall	0.7732	0.4188
	Between		0.3601
	Within		0.2408
Share female employment (%)	Overall	0.1673	0.2197
	Between		0.1990
	Within		0.1105
Temporary employment (dummy)	Overall	0.3121	0.4634
	Between		0.3857
	Within		0.3012

Unionized employment (dummy)	Overall	0.2454	0.4304
	Between		0.3690
	Within		0.2749
Government ownership (%)	Overall	3.169	16.876
	Between		16.201
	Within		7.9081
Private domestic ownership (%)	Overall	92.234	24.992
	Between		23.655
	Within		11.944
Foreign ownership (%)	Overall	2.010	12.633
	Between		11.830
	Within		6.7130
Arab ownership (%)	Overall	1.961	12.329
	Between		10.326
	Within		7.3056
Firm age (years)	Overall	22.457	16.965
	Between		15.272
	Within		8.3677
R&D department (dummy)	Overall	0.2185	0.4133
	Between		0.3600
	Within		0.2525
Other branches (dummy)	Overall	0.2195	0.4140
	Between		0.3477
	Within		0.2583

Data source: World Bank enterprise survey, Egypt, 2004/07/08.

Table 4: Descriptive statistics for all variables in all specifications

	Mean	Standard deviation
Dependent variables		
Export status	0.2562	0.4366
Export starters	0.0305	0.1721
Export/Sales ratio	0.0968	0.2338
Explanatory Variables:		
Share primary schooling (%)	0.1170	0.1547
Share preparatory or incomplete secondary Schooling (%)	0.1782	0.1764
Share secondary schooling (incl. vocational) (%)	0.3842	0.2277
Share university degree	0.1715	0.1485
Training of workers (dummy)	0.1825	0.3863

High qualified manager (dummy)	0.7732	0.4188
Share female employment (%)	0.1673	0.2197
Temporary employment (dummy)	0.3121	0.4634
Unionized employment (dummy)	0.2454	0.4304
Government ownership (%)	3.1692	16.87
Private domestic ownership (%)	92.234	24.992
Foreign ownership (%)	2.010	12.633
Arab ownership (%)	1.9614	12.329
Firm age (years)	22.45	16.965
R&D department (dummy)	0.2185	0.4133
Other branches (dummy)	0.2195	0.4140
51-99 employees	0.1040	0.3054
100-1000 employees	0.2723	0.4452
> 1000 employees	0.0517	0.2214
2007 (dummy)	0.3213	0.4670
2008 (dummy)	0.3658	0.4817

9 sectors of main activities (dummies): garments, textiles, machinery & equipments, chemicals, electronics, metal, non-metal, agro, other. 23 regional governorates (dummies): Cairo, Alexandria, Port Said, Suez, Damietta , Dakahliya, Sharkiya, Qualyubia, Kafr-El-Sheikh, Gharbiya, Menoufiya, Beheira, Ismailia, Giza, Bani-Suef, Fayoum, Minya, Assuit, Souhag, Qena, Aswan, Loxur, South Saini.

Data source: World Bank enterprise survey, Egypt, 2004/07/08.

Table 5: Estimation results for export status

	POLS	FEOLS	REOLS	Probit (Prob (Y>0))	
				coefficient	average marginal effects
Log of average wage	0.0050 (0.0056)	0.0123* (0.0073)	0.0048 (0.0054)	0.0373 (0.0305)	0.0063 (0.0051)
Share primary schooling (%)	-0.0694 (0.0493)	0.0106 (0.0622)	-0.0565* (0.0477)	-0.3813 (0.3598)	-0.0648 (0.0612)
Share preparatory or incomplete secondary Schooling (%)	0.0217 (0.0424)	0.0193 (0.0536)	0.0176 (0.0411)	0.3031 (0.2881)	0.0515 (0.0489)
Share secondary schooling (incl.	0.0357 (0.0366)	0.0988** (0.0482)	0.0511 (0.0357)	0.4606* (0.2553)	0.0783* (0.0432)

vocational) (%)					
Share university degree	0.1082** (0.0541)	0.2190*** (0.0731)	0.1315** (0.0529)	0.8225** (0.3335)	0.1399** (0.0560)
Training of workers (dummy)	0.0515** (0.0187)	0.0225 (0.0243)	0.0454** (0.0181)	0.2063** (0.0972)	0.0351** (0.0164)
High qualified manager (dummy)	0.0312* (0.0172)	0.0063 (0.0243)	0.0255 (0.0171)	0.4423** (0.1326)	0.0752** (0.0226)
Share female employment (%)	0.0995* (0.0352)	0.0645 (0.0538)	0.1049** (0.0355)	0.6095** (0.2123)	0.1037** (0.0357)
Temporary employment (dummy)	-0.0200 (0.0142)	-0.0212 (0.0188)	-0.0211 (0.0139)	-0.1146 (0.0873)	-0.0195 (0.0147)
Unionized employment (dummy)	0.0240 (0.0164)	0.0062 (0.0211)	0.0230 (0.0158)	0.1020 (0.0892)	0.0173 (0.0151)
Government ownership (%)	0.0010 (0.0009)	0.0006 (0.0013)	0.0009 (0.0009)	0.0034 (0.0045)	0.0005 (0.0007)
Private domestic ownership (%)	0.0019 (0.0008)	0.0022 (0.0012)	0.0020 (0.0008)	0.0069 (0.0042)	0.0011 (0.0007)
Foreign ownership (%)	0.0047*** (0.0010)	0.0062** (0.0014)	0.0048*** (0.0009)	0.0192*** (0.0051)	0.0032*** (0.0008)
Arab ownership (%)	0.0030** (0.0010)	0.0025 (0.0014)	0.0028** (0.0009)	0.0100** (0.0049)	0.0017** (0.0008)
Firm age (years)	-0.0008** (0.0004)	-0.0002 (0.0006)	-0.0006 (0.0004)	-0.0037 (0.0026)	-0.0006 (0.0004)
R&D department (dummy)	0.2030*** (0.0181)	0.1920*** (0.0243)	0.1957*** (0.0177)	0.7865*** (0.0954)	0.1338*** (0.0145)
Other branches (dummy)	0.0052 (0.0169)	-0.0229 (0.0232)	0.0010 (0.0167)	0.0296 (0.0927)	0.0050 (0.0157)
Firm size categories (dummies, reference 5- 50 workers)					
51-99 employees	0.1942*** (0.0225)	0.1869*** (0.0329)	0.1909*** (0.0224)	1.0875*** (0.1279)	0.1976*** (0.0279)
100-1000 employees	0.3391*** (0.0183)	0.3076*** (0.0301)	0.3336*** (0.0186)	1.5735*** (0.1189)	0.3407*** (0.0259)
> 1000 employees	0.5311*** (0.0358)	0.5543*** (0.0616)	0.5309*** (0.0363)	2.2986*** (0.2174)	0.5749*** (0.0592)
Survey year (dummies, reference 2004)					
2007	-0.0045 (0.0168)	-0.0050 (0.0169)	-0.0036 (0.0152)	-0.0765 (0.0982)	-0.0130 (0.0167)
2008	-0.0065 (0.0178)	-0.0208 (0.0200)	-0.0077 (0.0165)	-0.0888 (0.1042)	-0.0151 (0.0176)
Sector (9 dummies)	Yes	yes	yes	Yes	yes
Region (23 dummies)	Yes	yes	yes	Yes	yes

Notes: standard errors in brackets. Significant at the * 10, **5 and ***1% level, respectively.
Data source: World Bank enterprise survey, Egypt, 2004/07/08. Sample: Unbalanced panel (N=3054; n=1634)

Table 6: Estimation results for export intensity using fractional logit and tobit models and their average marginal effects

	Fractional logit	Average marginal effects	Tobit	Average marginal effects(AMEs)	
				lEs prob(Exp>0)	AMEs E(Exp share|Exp>0)
Log of average wage	0.0685 (0.0458)	0.0051 (0.0034)	0.0144 (0.0108)	0.0049 (0.0036)	0.0023 (0.0017)
Share primary schooling (%)	-0.5271 (0.4788)	-0.0393 (0.0356)	-0.0805 (0.1342)	-0.0273 (0.0456)	-0.0130 (0.0218)
Share preparatory or incomplete secondary Schooling (%)	0.5750 (0.4216)	0.0428 (0.0315)	0.1892* (0.1059)	0.0642* (0.0359)	0.0307* (0.0171)
Share secondary schooling (incl. vocational) (%)	0.4941 (0.3679)	0.0368 (0.0274)	0.2533** (0.0941)	0.0860** (0.0318)	0.0411** (0.0152)
Share university degree	0.1351 (0.4425)	0.0100 (0.0330)	0.2685** (0.1172)	0.0911** (0.0396)	0.0436** (0.0189)
Training of workers (dummy)	0.3237* (0.1208)	0.0241* (0.0090)	0.0752** (0.0332)	0.0255** (0.0112)	0.0122** (0.0053)
High qualified manager (dummy)	0.4308* (0.2237)	0.0321* (0.0166)	0.1629** (0.0499)	0.0553** (0.0167)	0.0264** (0.0080)
Share female employment (%)	0.7308** (0.2331)	0.0545** (0.0172)	0.3166*** (0.0765)	0.1075*** (0.0257)	0.0514*** (0.0123)
Temporary employment (dummy)	-0.0662 (0.1127)	-0.0049 (0.0084)	-0.0682** (0.0315)	-0.0231** (0.0106)	-0.0110** (0.0051)
Unionized employment (dummy)	0.0640 (0.1106)	0.0047 (0.0082)	0.0373 (0.0314)	0.0126 (0.0106)	0.0060 (0.0051)
Government ownership (%)	-0.0020 (0.0081)	-0.0001 (0.0006)	-0.0003 (0.0016)	-0.0001 (0.0005)	-0.00005 (0.0002)
Private domestic ownership (%)	0.0036 (0.0082)	0.0002 (0.0006)	0.0013 (0.0015)	0.0004 (0.0005)	0.0002 (0.0002)
Foreign ownership (%)	0.0157* (0.0084)	0.0011* (0.0006)	0.0063*** (0.0018)	0.0021*** (0.0006)	0.0010*** (0.0002)
Arab ownership (%)	0.0042** (0.0087)	0.0003 (0.0006)	0.0020* (0.0018)	0.0006 (0.0006)	0.0003 (0.0002)
Firm age (years)	-0.0092** (0.0041)	-0.0006** (0.0003)	-0.0021** (0.0009)	-0.0007** (0.0003)	-0.0003** (0.0001)
R&D department (dummy)	0.7840*** (0.1198)	0.0584*** (0.0089)	0.2605*** (0.0329)	0.0884*** (0.0109)	0.0423*** (0.0052)
Other branches	-0.0904	-0.0067	-0.0166	-0.0056	0.0026

(dummy)	(0.1207)	(0.0090)	(0.0335)	(0.0113)	(0.0054)
Firm size categories (dummies, reference 5- 50 workers)					
51-99 employees	1.1126***	0.0629***	0.4492***	0.1782***	0.0717***
	(0.2039)	(0.0134)	(0.0483)	(0.0211)	(0.0079)
100-1000 employees	1.7275***	0.1261***	0.6286***	0.2704***	0.1060***
	(0.1715)	(0.0122)	(0.0421)	(0.0184)	(0.0068)
> 1000 employees	2.1818***	0.1894***	0.8373***	0.3737***	0.1495***
	(0.2263)	(0.0267)	(0.0684)	(0.0305)	(0.0135)
Survey year (dummies, reference 2004)					
2007	-0.0846	-0.0063	-0.0245	-0.0083	-0.0039
	(0.1416)	(0.0106)	(0.0349)	(0.0118)	(0.0056)
2008	-0.0492	-0.0037	-0.0296	-0.0100	-0.0048
	(0.1488)	(0.0112)	(0.0373)	(0.0126)	(0.0060)
Sector (9 dummies)	Yes	Yes	Yes	Yes	Yes
Region (23 dummies)	Yes	Yes	Yes	Yes	Yes

Note: standard errors in brackets. Significant at the * 10, **5 and ***1% level, respectively.
Data source: World Bank enterprise survey, Egypt, 2004/07/08. Sample: Unbalanced panel (N=3054; n=1634)

Table 7: Estimation results for export starters in 2007

	OLS	probit	Average marginal effects
Log of average wage	0.0034	0.2122	0.0111
	(0.0047)	(0.2066)	(0.1099)
Share primary schooling (%)	- 0.0033	- 0.3015	- 0.0158
	(0.0368)	(1.1213)	(0.0590)
Share preparatory or incomplete secondary Schooling (%)	0.0123	0.8244	0.0433
	(0.0337)	(0.9796)	(0.0517)
Share secondary schooling (incl. vocational) (%)	0.0041	- 0.2318	- 0.0121
	(0.0282)	(0.9602)	(0.0505)
Share university degree	0.0473	1.7477	0.0919
	(0.0522)	(1.4938)	(0.0795)
High qualified manager (dummy)	0.0150	0.6582	0.0346
	(0.0142)	(0.5192)	(0.0279)
Share female employment (%)	- 0.0138**	- 0.2257	- 0.0118
	(0.0310)	(0.8434)	(0.0443)
Temporary employment (dummy)	- 0.0037	0.0631	0.0033
	(0.0120)	(0.0357)	(0.0188)
Unionized employment (dummy)	- 0.0005	- 0.2986	- 0.0157
	(0.0152)	(0.4726)	(0.0249)
Firm age (years)	- 0.00009	- 0.0033	- 0.0001
	(0.0003)	(0.0114)	(0.0006)
R&D department (dummy)	- 0.0203*	- 0.5092	- 0.0267
	(0.0174)	(0.5349)	(0.0283)
Other branches (dummy)	0.0220	0.4762	0.0250
	(0.0161)	(0.3881)	(0.0207)
51-99 employees	0.0041	0.3280	0.01535
	(0.0189)	(0.5313)	(0.0294)

100-1000 employees	0.0439*** (0.0187)	1.2070 (0.4879)	0.1074 (0.0639)
> 1000 employees	0.0963*** (0.0437)	2.9324 (1.2182)	0.5381 (0.3130)
Sector (9 dummies)	Yes	Yes	Yes
Region (23 dummies)	Yes	Yes	Yes

Note: standard errors in brackets. Significant at the * 10, **5 and ***1% level, respectively.
Data source: World Bank enterprise survey, Egypt, 2004/07/08. Sample: (N=982; n=30). All explanatory variables are lagged one period.

Table 8: Estimation results for export starters in 2007 (Broader definition[11])

	OLS	probit	Average marginal effects
Log of average wage	0.0080 (0.0077)	0.0997 (0.0859)	0.0101 (0.0087)
Share primary schooling (%)	0.0240 (0.0604)	0.2273 (0.7057)	0.0230 (0.0715)
Share preparatory or incomplete secondary Schooling (%)	0.0044 (0.0555)	0.3891 (0.6623)	0.0394 (0.0671)
Share secondary schooling (incl. vocational) (%)	0.0118 (0.0464)	0.1485 (0.5809)	0.0150 (0.0589)
Share university degree	0.0558 (0.0859)	0.7980 (0.9326)	0.0809 (0.0947)
High qualified manager (dummy)	0.0397 (0.0234)	1.07323 (0.4563)	0.1088 (0.0468)
Training of workers (dummy)	0.0166 (0.0310)	0.2174 (0.2651)	0.0220 (0.0268)
Share female employment (%)	0.0463** (0.0510)	0.3981 (0.4965)	0.0403 (0.0503)
Temporary employment (dummy)	0.0286 (0.0198)	0.3837 (0.2138)	0.0389 (0.0217)
Unionized employment (dummy)	- 0.0083 (0.0250)	- 0.1577 (0.2443)	-0.0160 (0.0247)
Foreigners	- 0.0743 (0.0477)	- 0.7587 (0.5476)	- 0.0769 (0.0556)
Firm age (years)	0.00008 (0.0006)	0.0012 (0.0060)	0.0001 (0.0006)
R&D department (dummy)	0.0478* (0.0286)	0.4172 (0.2373)	0.0423 (0.0240)
Other branches (dummy)	0.0673 (0.0265)	0.5216 (0.2265)	0.0529 (0.0229)
51-99 employees	0.0367 (0.0310)	0.3814 (0.2851)	0.0395 (0.0335)
100-1000 employees	0.0728*** (0.0308)	0.5043 (0.2672)	0.0565 (0.0340)
> 1000 employees	0.0547*** (0.0718)	0.3859 (0.5931)	0.0401 (0.0746)

[11] A broader definition for export starters in 2007 using only two-year windows. Firms that did not export in year t-1 (2006) and export in year t (2007).

Sector (9 dummies)	Yes	Yes	Yes
Region (23 dummies)	Yes	Yes	Yes

Note: standard errors in brackets. Significant at the * 10, **5 and ***1% level, respectively.
Data source: World Bank enterprise survey, Egypt, 2004/07/08. Sample: (N=982; n=89). All explanatory variables are lagged one period.

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