"Export Performances and Export Learning in the Tunisian manufacturing Industry: Evidence from Firm Panel Data".

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As demonstrated in recent empirical litterature on firms'export performances, the international market for goods acts as a screen that selects firms access according to both internal and external factors influencing their productivity. This paper focuses particularly on production costs as a key factor that differenciates non exporting from exporting firms. In a first stage, a general framework is proposed to introduce basic conditions favouring foreign markets access. Average production cost is then taken as a key variable that explains firm's behaviour with regard to export markets access both for non exporting and differing exporting profiles (exporters, entrants, quitters and switchers). In a second stage, the paper adresses the issue of learning through exporting assumed to reinforce firm's competiveness. This issue is explored using two approches: the first one is based on probit and conditional maximum likelohood estimates explaining the relationship between export decision conditional to production factor costs and spillovers contribution generated by exporting activity and foreign direct investments in the local economy. After showing that only exporting activity could be a source of spillovers, a structural component of spillovers absorption is then introduced through the representation of a learning process linking average cost decrease to cumulative export volumes and earlier export markets participation. Using the Arellano and Bond technique, we find that firm's access to export markets relies significantly on past realisations of average costs and insignificantly on learning export process. These results are confirmed for Tunisia using manufacturing micro panel data covering the period 1997 -2001.

Keywords: export performance, exporting profiles, average production cost, spillovers, learning process.

JEL Classification : F14; C23; C51; D24

I. Access to international markets: a brief overview.

Exporting firms behaviour has been much debated over the last years with a particular focus on successfull cases of export strategies such as east asia countries (Hahn, 2004). Through the many empirical studies there is a consensus to say that exporting activity reduces mainly to a market selection process in wich only more productive exporting firms stay in race (Aw & al.,1997). In this process, productivity competition appears to be exclusively the matter of exporters entering and leaving an international market which makes constant and strong pressures on production costs. But one should ask: are non exporting firms to be excluded from international market participation?

As underlied in Driemer & al. (2002), a *good firm for exporting* is not necessarily the one that has experienced export activity. It could be a non exporting firm that chooses the best decisions in terms of investments, learning, technogy, material choice, quality of human factor...in order to sell its production abroad.

Moreover, international markets access would not depend only on market selection processes or microeconomic performances criteria. This is because firms by themselves could self select. For example, firms would behave as such if, in case of export experience failure, they would incur sunk costs on new and specific physical investissments (new equipments, promotion expenses, distribution channels) made before engaging in export activities. In this context, a deeper analysis of the participation decision to international markets deserves more attention since, as supported by Bernard and Jensen (1999), firms had to experience these markets to better understand their mechanisms and rules and then insure to themselves the best conditions and the right strategy to stay in race.

In a broader sens, accessing international markets could be explained by factors that affect international trade in general. From geographical considerations such those analysed in new theories of international trade untill the more recent litterature on strategic trade off between exporting or creating foreign plants in export platforms (Brainard, 1997; Redding and Venables, 2002; Ekhom & al.; 2003;), it appears that the local export activity in a given country could be positively or negatively affected.

Hence, Tunisia, for example, would experience positive impact on its local export activity if MNEs tradoffs are in favour of creating new foreign plants in Tunisia in order to benefit from its trade agreements with the EU. However, Tunisia would not stimulate its export activity because of logistical impediments and insufficient competiveness of its transport industry (Amino & Salama, 1994). In fact, a strong support for this idea is given by a recent litterature confirming the negative relationship between transportation costs and international trade (Clark & al., 2004).

Spillovers themselves seem to be a non negligeable mechansim that could facilitate international markets access. A wide empirical litterature based on efficiency frontiers tried to estimate the contribution of FDI spillovers to firm's technical efficiency (Harrisson & Haddad, 1984, V.Kathuria, 2000). When confirmed, the spillovers linked to FDI presence are interpreted as a good support that sustains firm's productivity increase which, in return, increases the probability of exporting. In a similar context, another set of empirical studies explored the idea that spillovers could be generated by the intensity of export activity itself (Aitken & al., 1997).

But, because some econometric investigations lead to a mechanical interpretation of spillovers effects, the introduction of a learning process becomes necessary (Clerides & Tybout, 1998) in order to avoid any statistical inferences and to insure that spillovers absorption capacities exist. Other contributions to this debate also confirm the role of export information agencies through the diffusion of information as well as spillovers linked to good products reputation and specialization patterns (Nicita & Olarreaga, 2000, Hausmann & al., 2005)

Focusing now on the tunisian case, one should remind the conditions under which Tunisia has been promoting international market access. After the adoption of the fiscal incentives policy scheme for off-shore activities and lunching the upgrading program (PMN)[1], Tunisia is, in a recent period, experiencing a new alternative to stimulate international market access through Export Development Programs (EDPI and EDPII) fiancially supported by the World Bank[2]. The principal component of these programs consists in the EMAF (Export Market Access Fund) which was engaged for development purposes and which, since its creation, has been facing a strong demand due to the partial

[1] . The positive contribution of this program to firm's efficiency was evaluated in Goied and Jendoubi (2007).

[2] . According to the World Bank report n°40404-TN, the EDPII financial contribtion will be of 6 millions US$ over five years (2005-2010) instead of the 3.6 million US$ previously annonced.

financial support offred both for new export entrants and firms looking to expand their export activities.

After this brief overview on the main determinants of international market access, one should ask to what extent should tunisian firms rely on themselves to increase their probability of exporting and/or to rely on possible learning effects generated by exporting activities?

To answer this question, our study will be organized as follows: in section 2 we present the main determinants of export activity taking in account a set of basic micreconomic variables supposed to increase export probability. Learning effects assumed to enhance firms competetiveness will be presented and discussed in section 3. Further econometric investigations made in section 4 will allow to determine the main spillovers source and the learning process representation favouring their absoption. Section 5 will conclude.

II- Statistical and econometric analysis sustaining export behaviour

In this section, we rely on the main micro factors distinguished in a set of empirical investigations (Aw & al., 1997; Clerides & Tybout, 1997; Bernard & Jensen, 1999; Hallward-Driemeir & al., 2002; Chin, 2004) to study export activity in the tunisian manufacturing sector. Firm panel data covering the period 1997-2001 over a sample of 674 enterprises are used. The data is provided by the Tunisian National Institute of Statistics (INS) and based on the national inquiry on economic activities. As a preliminary work, we limit our investigations to the micro determinants of exports letting the export premia approach for future investigations.

Considering that export activity is basically linked to micro determinants, we run a generalized probit on the following simple equation:

(1) BINEXP = F (VAPW, AVC, QL, L, KI, AGE, FFDI, DUMS)

where the dependent variable is represented by a binary taking value 1 if the firm export and 0 if it doesn't, VAPW designating value added perworker, AVC the firm's average production cost, QL the quality of labour approximated by the ratio of non producing labor over total labour, L the number of employees that approximates firm size, KI the firm's capital intensity or capital per unit of labor, AGE the age of the firm, FFDI the foreign capital presence at the firm level and DUMS

reflecting industry specificities (dummy variable). Table 1 summurises the results obtained.

Table 1: Micro determinants of exporting in the tunisian manufacturing industries

Bin Exp	Coefficient	z statistic	P>|z|
DUMS	0.406***	6.49	0.000
FFDI	0.029***	12.41	0.000
VAPW	3.4 e-06**	1.93	0.054
AVC	- 0.226	-1.00	0.317
QL	- 0.027***	-3.24	0.001
AGE	- 0.031***	- 4.52	0.000
L	0.001***	4.14	0.000
KI	- 1.7 e-06	-1.6	0.110
Log likelihood	- 823.91607		
Wald chi2 (8)	317.08		
Prob > chi2	0.000		
Nomber of observations	2925		

****** significant at 1%; significant at 5%; significant at 10%***

The results obtained confirm the importance of productivity (VAPW) which significantly increases export probability. The same remark should be made for foreign capital presence at the firm level as well as for firm size approximated by L. However, results such as those associated to the coefficients for labor quality and age should be explained, for the former, by an insufficient quality of data measures of labor and, for the latter, attributed to the fact that firm's experience reflected through its age may not be in its favor if it does not adopt new production techniques and new technologies.

Now, what about the surprisingly insignifant coefficient of average production cost? To answer this question, we need to introduce some theoretical developments for a better comprehension of this result. Since we are working on panel data, we should consider the binary export variable as reflecting a dynamic optimisation problem specific to export decision. Without deeply exploring this problem, we propose a simple theoretical framework based on the following hypothesis.

Let's assume π_j^f the potential profits realised on international sales by a tunisian firm j conditionning to the import demand function described by equation (2):

(2) $$q^f = Z^f .(P_j^f)^{-\sigma f}$$

With Z^f reflecting exogeonous factors explaining demand shift (such as exchange rates, revenues in the foreign market), P^f the unit price of export and σ^f (>1) the price elasticity of import demand on the international market[3]. In a dynamic perspective, the profit function of firm j would take the following form:

(3) $$\pi_{tj}^f = \pi_t(C_{tj}, Z_{tj}) - F$$

with F representing fixed cost related to exports and C_{tj} describing the trajectory of marginal costs incurred by firm j wherever it sales its production[4]. C_{tj} is assumed to take the following form:

(4) $$C_{tj} = C(w_t, C_{t-\tau,j}, Y_{t-\tau,j})$$

with w_t representing an exogenous vector reflecting input prices variations, $C_{t-\tau,j}$ = ($C_{t-1,j}$, $C_{t-2,j}$,..,$C_{t-h,j}$) representing previous cost production realisations. τ reflects period [1,h] over which firm j observes different status (exporter or non exporter) as reflected by the variable BINEXPORT which itself reflects anterior realisations of different status represented here by $Y_{t-\tau,j}$.

Assuming that exports depend on the sign of π_{tj}^f [5] and P^f equals marginal cost equals AVC under perfect competition, a graphical analysis of the relationship between AVC and BINEXPORT will be proposed for tunisian firms included in our sample. But, before doing this, some definitions must be presented for a better comprehension of the graphical analysis presented below. These definitions are given in table 2 which describes tunisian firm's profile classification relying on BINEXPOT observations over the period 1997-2005

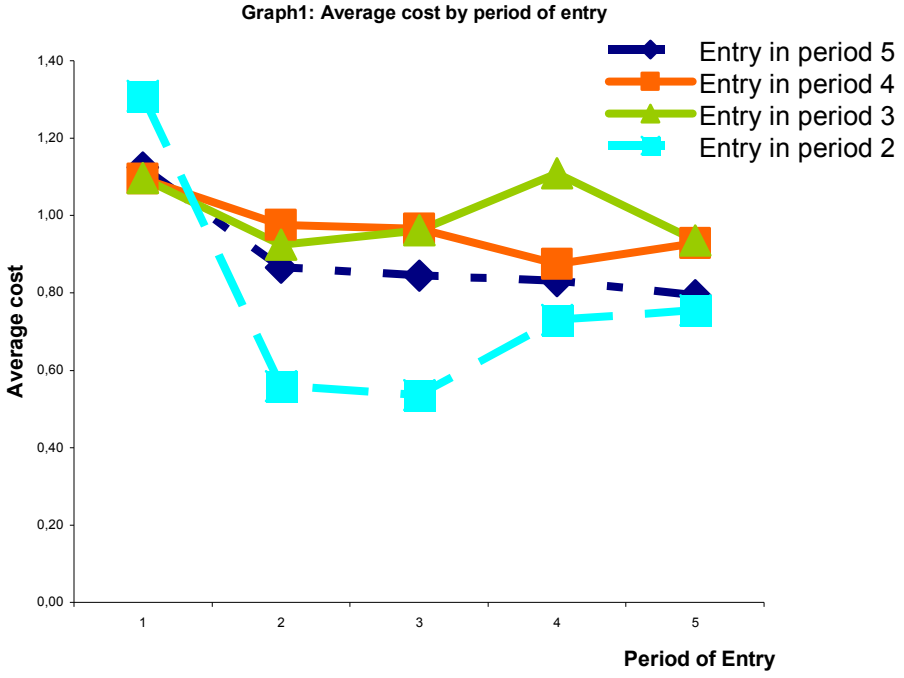
[3] . The import demand function is derived under the condition of a representative consumer preferences represented by a Dixit-Spence utility function.

[4] . Hypothesis assumed in this paper because the data a our disposal does not allow any distinction of production costs between local sales and foreign sales.

[5] . The sign of π_{tj}^f depends not on ly on costs but also on the value of F

Table 2: Profile classification of the tunisian firms included in the sample according to their export status[6]

Profiles description
Exporter : an exporting firm with BINEXP =1 all over the period considered *Non exporter* : a non exporting firm with BINEXP =0 all over the period considered *Entrant* : a new exporting firm with BINEXP = {0,1,1,1,1} if its internationl market access happens in period 2 (for example) Quitter : an exporting firm leaving the internation market with BINEXP = {1,1,1,0,0} if it leaves at period 4 (for example) Switcher : an exporting firm accessing then leaving and/or reaccessing the internation market with BINEXP = {1,0,1,0,1} (for example).

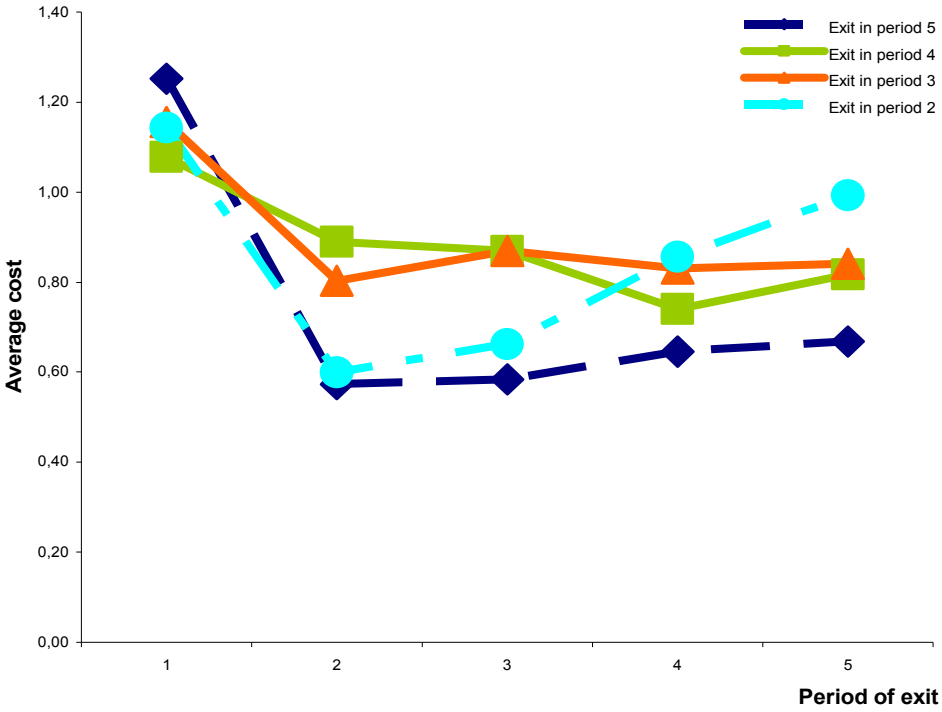


Starting with entrants and quitters profiles (graph 1 and 2), we observe that entry could occur at different periods of time. Most importantly,

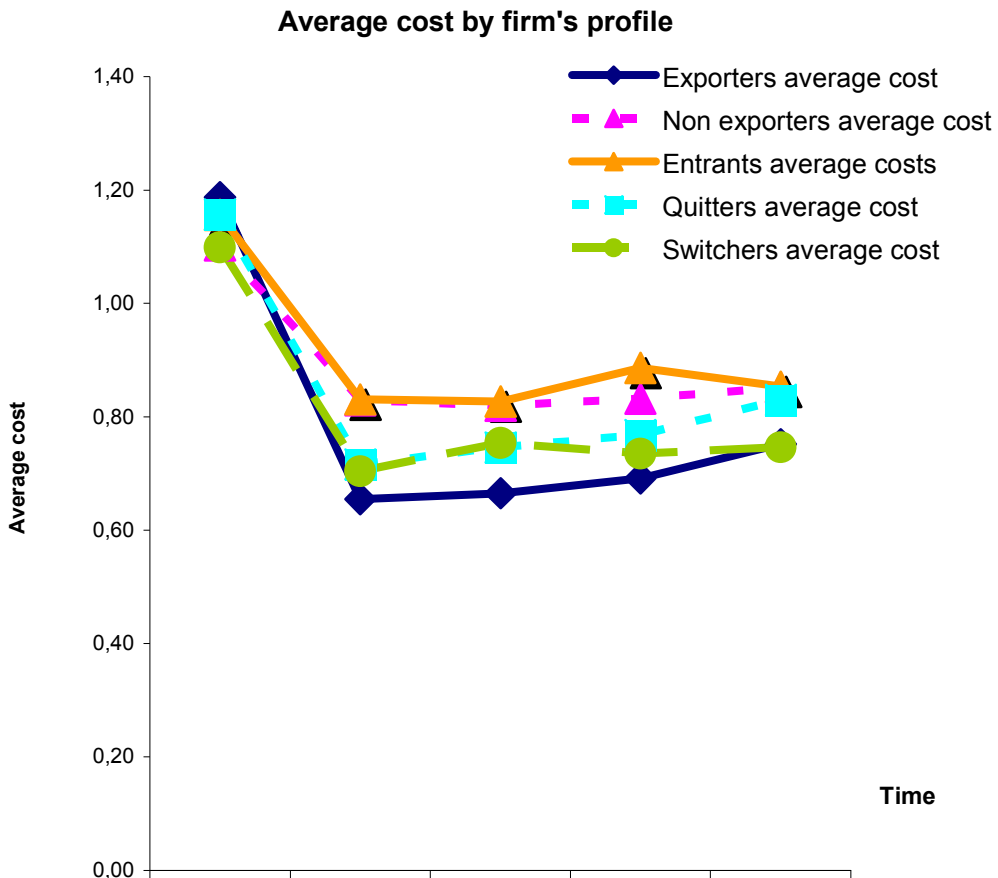
[6] . A firm is considered as an exporter if it realises more than 25% of its revenue on the international market.

period 2 entrance happens with an important average cost decrease allowing period 2 entrants to stay a maximum time (relative to the period of observation corresponding to five years). However, this does not mean that period 2 entrants could stay indefinitely in this market since we observe an increasing level of their AVC just after entry. This lead us to take in account the conditions for entry in and exit from the international market. In fact, whatever the periods of international market access, AVC threshold would explain both entry and exit. Entry is provocated when entrant firms AVC reaches a level which is less than the AVC threshold for entry on the international market (AVC_{ent}) as reflected in period 5 entrants curve.

Graph 2: Average cost by period of exit



Exit could be provocated when quitters AVC takes a value that goes far from the AVC threshold for exit from the international market (AVC_{exit}). This illustration is in accordance with the theoretical analysis of dynamic competitive advantages (or disadavantages). Following the necessary inequality $AVC_{ent} < AVC_{exit}$ it becomes possible to explain why period 2 entrants, for example continue to export over periods 4 and 5 despite their increasing costs (graph 1). The same interpretation is valid for period five quitters (graph 2).



	1	2	3	4	5
Exporters average cost	1,19	0,66	0,66	0,69	0,75
Non exporters average cost	1,10	0,83	0,82	0,83	0,85
Entrants average costs	1,16	0,83	0,83	0,89	0,85
Quitters average cost	1,16	0,72	0,75	0,77	0,83
Switchers average cost	1,10	0,70	0,75	0,73	0,75

Finally, taking in account all profiles, it appears that, on a competitiveness basis, exporting firms do better than non exporting. Hence, as shown in graph 3, non exporting firms despite efforts they made to decrease their AVC still observe large differences in yearly observed AVC level compared to exporters (graph 3).

Now, it's seems important to study the way firms' cost trajectories could be modified. In the absence of any information on firms' own efforts to enhance their competitiveness, we try in the next section to check for potential sources of positive externalities that could modify tunisian firms production costs trajectories.

III- A check for potential sources of externalities increasing export probability.

In this section, we present a model in which the decision to sell on the local market, international market or both depends on additional costs firms incur when choosing to export or not. Let's assume that these additional costs are essentially transportation costs that we are not able here to measure them.

Suppose a firm j that decides between producing only for the local market or producing both for the local (L) and the international market (F). The total cost function of firm j is defined as follows:

(5) $$C_j(Y_j) = h_j(Y_L, Y_F) + g.Y_{jF}$$

(6) $$Y_j = Y_{jL} + Y_{jF}$$

where $h(Y_{jL},Y_{jF})$ denotes costs incurred on production. According to the Samuelson's iceberg method for transportation cost evaluation, we assume that if quantity Y is destinated to a foreign market, only the quantity g .Y, will arrive to this market, with
$0<g<1$.

As in Aitken & al. (1997), externalities (spillovers) are introduced and assumed to reduce production costs. Two potential sources of externalities are distinguished: export activity (θ_{exp}) and FDI presence (θ_{FDI}) :

(7) $$\frac{\partial h(Y_L, Y_F)}{\partial \theta_{\exp}} \leq 0$$ and (8) $$\frac{\partial h(Y_L, Y_F)}{\partial \theta_{FDI}} \leq 0$$

Firm j equilibria is derived from standard profit maximization conditions with Y_L and Y_F as arguments:

$$(9)\quad \text{Max}_{Y_{jL},\,Y_{jF}}\ \pi = P_L \,.\, Y_{jL} + P_F\, Y^*_{jF} - h(Y_{jL},Y_{jF}) - \left(\frac{Y_j^F}{g}\right)^7$$

with P_L and P_F designating respectively local and international prices.

Since firm j is initially assumed to be a non exporter, its decisions about how much to produce (and sell) for the local and foreign markets will be reflected through the first order conditions of (9). But, Y_{jF} is a priori unknown. That's why Y_{jF} is considered as a latent variable denoted Y^*_{jF}.

The last assumptions of the model are designated to prepare for empirical investigations. The various cost functions (production cost, transport costs) are expressed as follows:

$$(10)\quad h(Y_{jL},Y^*_{jF}) = \frac{a}{2}\,(Y_{jL}+ Y^*_{jF})^2 + s\,(Y_{jL} + Y^*_{jF}) + \gamma\,.Y^*_{jF}$$

with $s = s(X_j, \theta_{exp}, \theta_{FDI})$ a vector reflecting per unit production costs represented by X (labor, capital, intermediate inputs) and externalities contribution to per unit production cost decrease. Transportation costs incured on foreign market sales are represented by

$$\gamma\,.Y^*_{jF} = \left(\frac{Y^*_{jF}}{g}\right)$$

Starting from equation (9) and (10) and deriving profit maximization first order conditions, we obtain the simultaneous equation system:

$$(11)\qquad Y_{jL} = \beta_1 P_L + \beta_2 Y^*_{jF} + \beta_3 X_j + \beta_4 \theta_{exp} + \beta_5 \theta_{FDI} + \varepsilon_{jL}$$

$$(12)\qquad Y^*_{jF} = \psi_1 P_F + \psi_2 Y_{jL} + \psi_3 X_j + \psi_4 \theta_{exp} + \psi_5 \theta_{FDI} + \varepsilon_{jF}$$

with normally distribution assumed for ε_{iL} and ε_{iF} .

Substituting (11) in (12), allows to determine an expression with only Y^*_{jF} in the left side as a latent variable reflecting firm j decisions to export (or not). Then, we have to define a dummy variable Z reflecting this decision process:

[7] . If Y_{jF} is the quantity that firm j wants to sell on the foreign market with transportation costs included.

$$\begin{cases} Z_j = 1 \text{ if } Y^*_{jF} > 0 \\ Z_j = 0 \ \textit{otherwise} \end{cases}$$

The probability that firm j exports with spillovers help is given by equation (13) :

(13) Prob $(Z_j=1) =$ Prob $[\mu_1 P_F + \mu_2 P_L + \mu_3 X_j + \mu_4 \theta_{exp} + \mu_5 \theta_{FDI} + v_j]$ with $v_j = v(\varepsilon_{jL}, \varepsilon_{jF})$ normally distributed.

IV- Econometric analysis of potential spillovers: sources and learning effects

The first econometric procedure used to estimate (13) is the generalized probit random effects since our data is of a panel type. But a second econometric procedure (2SCML) will be requested to deal with the non exogeneity of θ_{exp} and θ_{FDI} due to possible correlation between θ_{exp} and X_j and θ_{FDI} and X_j[8].

Some of the variables included as regressors in equation (13) will be constructed using other statistical sources: the importance of FDI relative to National gross fixed capital formation for each subsector (using the tunisian classification) as a measure of sectoral θ_{FDI} (SFDI). FDI data is provided by Foreign Investment Agency Promotion (FIPA). The importance of exports relative to domestic production (SEXP) as a measure of θ_{exp} is evaluated using the National Accounts source. Local prices are approximated by the sales industrial price index (IPVI) while foreign prices are approximated by the unit value of exports index (PuEXP) using the international trade data provided by INS. Total costs (TOTCOST) are computed as the sum of real input cost plus other charges plus real wages and financial charges.

[8] . Following Aitken & ali (1997), sectoral FDI and sectoral exports activities would develop for production costs considerations.

Table 3: Probit estimates of export decision

Bin Exp	Coefficient	z statistic	P>|z|
IPVI	0.024***	6.25	0.000
PuEXP	0.025***	5.51	0.000
TOTCOST	6.47 e-06	1.56	0.118
SEXP	0.043***	10.94	0.000
SFDI	- 7.305***	-11.84	0.000
Log likelihood	- 841.025		
Wald chi2 (8)	307.51		
Nomber of observations	3171		

****** significant at 1%; significant at 5%; significant at 10%***

Results in table 3 show that sectoral exports significantly increase the probability of exports while sectoral FDI significantly lowers the probability of export. This latter result not only eliminates FDI as a spillover source but also appears quite strange. However, considering tunisian textile industry, largely dominated by foreign firms, one could firstly expect such a result because export activity in this industry is strongly monopolised by foreign firms living in separation from local firms for whom little incentives are given to look after international sales. Secondly local firms may have decided to not export if local prices are sufficiently high which had been the case before the end of MFA (*Multifiber agreements*) in 2005. The results obtained in table 3 also confirm an earlier result obtained for the coefficient associated to costs which still continue to be insignificant and takes here a wrong sign. The possibility that SFDI and SEXP are not strictly exogeneous would have contributed to these results.

To eliminate this simultaneity problem, we use the 2SCML technique as described in Rivers and Vuong (1988). This technique combines OLS estimates and probit estimates including residuals obtained from OLS regression of SFDI on X and SEXP on X. 2SCML results are reported in table 4:

Table 4: Two Stage Conditional Maximum Likelihood estimates of export decision

Bin Exp	Coefficient	z statistic	P>|z|
IPVI	0.022***	5.16	0.000
PuEXP	0.034***	7.44	0.000
TOTCOST	7.9 e-09*	1.92	0.055
SEXP	0.046***	7.63	0.000
SFDI	- 0.009***	- 2.49	0.013
ue	0.032***	2.94	0.003
ve	0.593***	9.59	0.000
Log likelihood	- 796.77		
Wald chi2 (8)	419.05		
Nomber of observations	3160		

****** significant at 1%; significant at 5%; significant at 10%***
ue and ve are respectively residuals of the OLS regression of SFDI and SEXP on X

As a matter of comparison, table 4 shows that total cost variable turns to have a significant but negligeable effect on the probability of export. The positive sign of the coefficient associated to TOTCOST variable seems to confirm our graphical analysis made earlier and the following interpretation based on threshold values of international production costs of entry and exist. spillovers generated by sectoral exporting activity are again confirmed, the coefficient associated to SEXP conserves its value while spillovers generated by FDI turns to be negligeable.

The empirical evidence on spillover source generated by sectoral exporting activities should now be tested within a simple learning process representation in ordre to insure that export spillovers increases the probability of exporting through a significant decrease of average production cost. Inspired by the learning curve and its representation in a similar context by Clerides and Tybout (1998), we propose to estimate a dynamic equation of learning taking the following form:

$$(14)\quad AVC_{jt} = \lambda_j + \lambda_A\, AVC_{j,t-1} + \lambda_Y\, (Y^f_{jt} + Y^f_{jt-1}) + \lambda_B\, BINEXP_{j,t} + \eta_{jt}$$

with $(Y^f_{jt} + Y^f_{jt-1})$ representing the cumulative export volumes (CUMVOLEXP) over the period of estimation. GMM2 method of estimation is used to estimate equation (14). Results are reported in table 5a and 5b.

Table 5.a : GMM2 estimates of the learning process through cumulative exports volume

AVC	Coefficient	z statistic	P>|z|
AVC(-1)	0.055**	2.09	0.037
CUMVOLEXP	7.23 e-11	1.22	0.224
Number of obs	*2013*		
Wald chi2 (2)	*4.37*		
Sargan test chi2 (3) = 10.38			
Prob > chi2	*0.065*		
A-B test of res.ser.corr. of order 2: z = -1.46			*Pr>z = 0.143*

****** significant at 1%; significant at 5%; significant at 10%***

Table 5.b : **GMM2 estimates of the learning process basef on earlier export decisions**

AVC	Coefficient	z statistic	P>|z|
AVC(-1)	0.056**	2.13	0.033
BINEXP	- 0.007	- 0.30	0.767
Number of obs.	2013		
Wald chi2 (2)	4.64		
Sargan test chi2 (3)	10.18		
Prob > chi2	0.07		
A-B test of res.ser.corr. of order 2: z= -1.36			Pr>z = 0.17

****** significant at 1%; significant at 5%; significant at 10%***

Results reported in table 5a and 5b does not confirm the existence of any learning process sustaining the absorption of export spillovers in the tunisian manufacturing industries. In other words and according to the wrong sign of CUMVOLEXP coefficient (table 5.a), this variable does not predict correctly AVC trajectory which means that we can not validate any learning effects based on export spillovers with respect to the traditional representation of the learning curve. The same result is obtained for variable BINEXP (table 5.b).

V- Concluding remarks

Our investigations on export performances and export learning allowed us to obtain a set of interesting results with regard to basic micro factors favouring exports, with regard to the cost trajectory of different export profiles and finally with regard to a learning process assumed to affect cost trajectories in a way that it could sustain and stimulate export activity in the tunisian manufacturing.

While productivity is confirmed as a main micro criterion for access to international market, we consider that production cost play a central role in reflecting tunisian firms behaviour with respect to international market access. Since entry in foreign markets does not insure a long stay in these markets, we conclude that tunisan firms, could they be new entrants or "confirmed" exporters, should be aware that international markets will punish them any time "they snoose" and let their cost trajectory shift in the wrong direction. On the other hand, tunisian firms have to rely on themselves in the absence of any evidence on export spillovers learning process helping them to put their cost production trajectories in the right direction.

Finally, we consider that the credibiliy and the efficiency of the export promotion strategy adopted in Tunisia could be reinforced if long period empirical evidence on exporting firms behaviour, prior and after accessing international market, motivates the choice of those who really deserves financial support for export market access. I mean that regardlesss to input prices affecting production costs in an exogenous manner, firms own efforts to be competitive must be taken as a main criterion for export promotion support. Otherwise, incentives offred through this export promotion strategy would face anti-selection and moral hazard problems.

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