L2C - Learning to Compete : Industrial Development and Policy in Africa

From Productivity to Exporting or vice versa? : Evidence from Tunisian manufacturing firms

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Motivation

1 . Enhancing the competitiveness of a country's industry is a key issue for economic growth.

2. Theoretical models and empirical analyses suggest that competitiveness is closely related to factors as firms productivity and global engagement.

Rationale :

a. More productive firms (large scale of production and sales) are likely to self-select into exporting markets (self-selection effect)

b. Exporting activity is one way to accumulate external knowledge ➔ productivity improvements (learning-by-exporting effect)

3. Large productivity premiums of new exporters compared to non-exporters imply that decision to start exporting is determined by factors affecting firms productivity.

➔ This suggests that there is a channel linking productivity to exporting, namely innovation activity.

Two chains of relationships are identified by the literature:

1. Product innovation ➔ Efficiency gains ➔ Exporting

2. Increase in exporting ➔ Efficiency gains ➔ Process innovation

Paper's outlines

1. Exploring the link between productivity and exporting decision (self-selection versus learning-by-exporting)
2. Exploring the link between exporting and innovation activity (Notice: We do not distinguish between product and process innovation)
3. Extension: Sectoral studies (four sectors: Textile, Electric, Agrofood, remaining sectors pooled together)
4. Policy recommendations
5. Conclusion

Dataset

- Empirical analysis based on firm-level data (*balanced panel dataset*) on 1323 Tunisian manufacturing firms from 2004-06.
- Data are compiled from an accounting, industrial and export flows surveys.
- Surveys are annually conducted by the "Institut National de la Statistique" (INS) of Tunisia.

Empirical methodology

Two clusters of firms are considered:

1. ***Exporters*** (partially and fully exporting firms) versus ***non-exporters***.
2. **Fully exporting firms** versus **others**.

Rationale: Almost 70% of exports come from the offshore sector (most firms are subcontractors benefiting from several advantages)

➔ Pooling partially and fully exporting firms, may well mask more than reveal some features of the real behavior of fully exporting firms.

Modeling self-Selection (Probit Model)

Probability of exporting of firm i in period t regressed on:

- lagged exporting status $EXP_{i,t-1}$ ($PARAEXP_{i,t-1}$ for first cluster and $TOTEXP_{i,t-1}$ for second cluster)
- lagged sales ($OUTPUT_{i,t-1}$)
- other firm characteristics ($Z_{i,t-1}$): *firm's age, firm's size, capital intensity and capital owner status.*

$$Prob(EXP_{i,t}=1)=\Phi(EXP_{i,t-1}, OUTPUT_{i,t-1}, Z_{i,t-1})$$

Key variable: *lagged sales (its coefficient is a sufficient statistic for self-selection whenever it is positive and significant)*

Modeling learning-by-exporting (OLS Model)

Simple linear regression of sales of firm i in period t on:

- lagged exporting status ($EXP_{i,t-1}$)
- lagged sales ($\text{OUTPUT}_{i,t-1}$)
- The same vector of control variables used for modeling self-selection ($Z_{i,t-1}$)

$$OUTPOUT_{i,t} = \alpha_1 EXP_{i,t-1} + \alpha_2 \text{OUTPUT}_{i,t-1} + \alpha_3 Z_{i,t-1} + u_{i,t}$$

Key variable: *lagged exporting*

Notice: One period lag ➔ learning is not instantaneous

Results for self-selection

Results for the first cluster: Exporters versus non-exporters

- *No evidence about self-selection.*
- Previous exporting increases current exporting (coefficient on $PAREXP_{i,t-1}$ is positive and significant) ➔ *Sunk costs of entry into export markets (Roberts and Tybout 1997)* .
- Foreign owned firms have higher ability to export

  Arguments: Better knowledge about foreign markets' characteristics, latest trends in consumer demand, use of better governance strategies……etc.

Results for the second cluster: Fully exporting firms vs others

- There is a strong evidence about self-selection (marginal effect on lagged sales is stronger)

Explanation: Fully exporting firms may exhibit superior productivity (potential import of better governance strategies, best-practice technologies, ..) ➔ self select much more often into exporting markets.

- Lagged exporting increases current exporting (marginal effect decreases slightly).

Interpretations

- Sunk cost of entry into export markets might be lower for these firms (mainly subcontractors)
- Fixed costs of engaging in exporting might be reduced as compared to the previous involvement in exporting.

- Foreign owned firms have higher ability to export (marginal effect is lower)

  Intuition: This may be due to the higher rate at which foreign capital exhibits decreasing returns to scale (stylized fact: these firms are likely to have a higher foreign involvement than others).

- Firm size increases current exporting.

  Explanation: Larger firms may have a large scale of production and sales or may enjoy lower fixed costs associated with exporting compared to smaller ones.

Results for learning by exporting

Results for the first cluster:
Exporters versus non-exporters

- *There is an evidence about learning by exporting*
- Lagged sales increase current sales (coefficient on $OUTPUT_{i,t-1}$ positive and significant) ➔ *persistence of the firm's efficiency over time* ➔ *(exporting firms are likely to have higher ability to adjust their technology and productivity over time)*

Results for the second cluster: Fully exporting firms vs others

- No evidence about learning-by-exporting.

Explanation: this is related to the dynamics of learning

- Fully exporting Tunisian firms are mainly subcontractors with relatively longer previous exporting experience.

- Moreover, these firms are already ahead of technological advances ➔ it is as if exporting is made between countries with similar level of technological advancement ➔ limiting the scope for learning.

- Innovation increases current sales

Explanation: Innovation activity (through equipment modernization, investment of resources into R&D activity) feeds back into higher productivity.

III. Link between innovation and exporting

- Endogenous growth theory relates firms' productivity to decisions into R&D and innovation activities.

➔ *Romer(1990):*

- *Technological improvements is driven by investing into R&D activity*
- *Firm's innovative activity is central to its technological progress and productivity growth.*

➔ *Constantini and Melitz (2007): Anticipation of trade liberalization may cause a firm to bring forward the decision to innovate (for future participation in the export market)*

Proxy for innovation activity

Rationale:

1. No availability data about expenditure in R&D + any type of actual innovation is not directly observable.
2. The availability of a team of engineers, scientists and technicians with suitable qualifications and know-how in R&D activities is a quite plausible source for innovation ➔ A measure of human capital is necessary to account for the skills embodied in the firm's employees themselves.

- $INNOV_{i,t}$: The proportion of engineers and technicians with different degrees of qualification in the total labor force of firm i (total number of employees) during period t. This is likely to capture labor displacement.

- Notice: Though INNOV is a proxy, it is usually used in the literature because it may account for actual innovation more than expenditure that may or may not lead to innovation.

Is innovation a prior decision to exporting? (Exporting equation) Probit Model

Probability of exporting of firm i in period t regressed on:

- Lagged innovation $INNOV_{i,t-1}$
- Lagged exporting $EXP_{i,t-1}$
- Same vector of control variables $Z_{i,t-1}$ used in previous relations

$$Prob(EXP_{i,t} = 1) = \Phi(EXP_{i,t-1}, INNOV_{i,t-1}, Z_{i,t-1})$$

Does exporting trigger innovation (Innovation equation) OLS model

Linear regression of innovation of firm i in period t on:

- lagged innovation $INNOV_{i,t-1}$
- Lagged exporting $EXP_{i,t-1}$
- Other firm characteristics $Z_{i,t-1}$

$$INNOV_{i,t} = \gamma_1 PAREXP_{i,t-1} + \gamma_2 INNOV_{i,t-1} + \gamma_3 Z_{i,t-1} + u_{it}$$

Results for the exporting equation

Results for the first cluster:

Exporters vs non-exporters

- Lagged innovations increase the likelihood of current exporting.
- The remaining results are almost similar to those for the estimation of self-selection:

-Lagged exporting increases the likelihood of becoming exporters (sunk cost of engaging in exporting).

- Foreign owned firms have higher abilities to export as expected.

Results for the second cluster: Fully exporting firms vs others

- Lagged innovation increases current exporting (marginal effect is slightly lower)

Explanation: Fully exporting firms are mainly subcontractors for which exporting is guaranteed ➔ This may well mask most the effect of previous innovation on exporting.

- Lagged exporting increases current exporting as expected ➔ sunk cost of previous exporting (marginal effect declines slightly)

Interpretations:

1. Fixed costs associated with exporting may be highly reduced as compared to the previous involvement in exporting.

2. Marginal cost of production is reduced (common knowledge: firm's fixed cost is inversely related to its marginal cost of production (Lewis and Sappington 1989). Larger firms have large fixed costs ➔ lower marginal cost of production ➔ involve in larger scale of production ➔ increases exporting

- Foreign capital increases current exporting
- Firm's age affects negatively current exporting ➔ rigidity of older managing systems (especially when these firms are run by old individuals).

Results for the innovation equation

Results for the first cluster:
Exporters vs non-exporters

- Lagged exporting increases current innovation.

  Interpretation: Exporting leads to "new knowledge" and not just investment in new knowledge.

- Lagged innovation increases current innovation as expected (sunk cost of innovation).
- The firm size is a good determinant of innovation as expected.

  Intuition:

- Importance of scale in research activity (Damijan and Kostevc 2006).
- Likely higher ability to diversify risks and access to a larger pool of financial means ➔ more advantages over smaller firms in investing in innovation.
- Likely higher absorptive capacity? ➔ even when these firms do not innovate, they nevertheless invest in innovation activity to enhance their absorptive capacity.

- The firm's age reduces current innovation ➔ older firms may be less innovative (except those which have already invested in innovation activities).
- Foreign capital increases current innovation ➔ these firms have better access to new technologies and might be endowed with more financial resources to invest in innovation activities.

Results for the second cluster: Fully exporting firms vs others

- Results do not give new insights as compared to the previous cluster except that the coefficient on lagged exporting increases

  ➔ Fully exporting firms have higher abilities to acquire new knowledge and more incentives to innovate

Extension: Sectoral studies

Main results for the Textile sector

- **Sample size:** 327 textile firms (Notice: the percentage of fully exporting firms exceeds 84% for the three waves data)
- **The main result is about learning by exporting:** No evidence about learning-by-exporting for both clusters of firms (especially fully exporting firms given that the percentage of fully exporting firms exceeds 84% for the three waves data)

Explanation: Dynamic effect explanation - Textile sector has adopted an export-oriented strategy since beginning of the seventies ➔ its firms have long previous exporting experience.

Main results for the Electric sector

- **Sample size:** 48 firms (Small sample ➔ Possibe source of biaises in our results)
- **First main result (about self-selection):** No evidence about self-selection for partially exporting firms and a strong evidence for fully exporting ones ➔ Likely superior productivity of fully exporting firms.
- **Second main result (about learning by exporting):**

1. No evidence about learning by exporting for partially exporting firms.

   Explanation: This sector is known to be capital intensive ➔ it is possible that an increase in efficiency is associated with more intensive utilization of capital in such a way as to mask the direct effect of exporting.

➔ Possibility of biases

2. There is an evidence about learning by exporting for fully exporting firms .

Explanation: Dynamic aspect of learning - Electric sector has emerged in the country non long ago ➔ no long experience in exporting ➔ larger gains from exposure to international export markets than the textile sector.

- Third main result (about innovation): Exporting increases the incentives to innovate for both clusters of firms.

Explanation: Firms are heavily dependent on foreign technologies ➔ increases their incentives to innovate.

Main results for the Agrofood sector

- **Sample size:** 87 firms
- **First main result (about self-selection):** There is no evidence about self-selection for partially exporting firms.

Explanation: Export decision is not driven by efficiency, but rather by other factors including the availability of first quality agricultural products and industrial policies encouraging exporting.

Remark: Results for fully exporting firms were meaningless.

- **Second main result (about learning by exporting)**: There is no evidence about learning by exporting for partially exporting firms; In turn the evidence is quite strong for fully exporting ones.

Explanation: This is likely to be related to the destination of exporting - Exporting to high income countries (EU) offers a higher scope for learning than exporting to medium and/or low income countries (De Loecker 2007).

a. Partially exporting firms export mainly to medium and/or low income countries (such as Libya, Algeria and Morocco)

b. Fully exporting firms export mainly to high income countries (European Union: Italy, Spain, France), USA, and Switzerland.

Policy recommendations (based on sectoral studies)

1. The lower scope for learning for the textile sector as compared to the electric sector (for fully exporting firms characterized by subcontracting regime) ➔ subcontracting is likely to benefit more to the emerging economies in the short term, but in the long-term when reaching saturation, the benefits from exporting gradually decline.

Possible recommendation: Industrial policies of emerging economies should consider subcontracting as an intermediary stage for the economic development (to increase its competitiveness and reduce its technological dependency) and move to co-contracting and then entirely finished product with higher added-value.

2. In agrofood sector exporting is not driven by efficiency ➔ the sector might gain much more if export promotion could be increased endogenously through efficiency improvements. **How?**

Possible recommendation: Changing the structure of agrofood products - The sector should move from general quick, easy and secure profits products towards more sophisticated and industrialized products with higher added value (e.g., food processing).

3. The likely higher productivity gains for firms exporting towards high income regions than to medium and/or low income countries (agrofood sector).

Possible recommendation: if agrofood firms aim to acquire the maximum gain from exporting, it could be through extending exports to high income countries.

4. The strong statistical support for the positive impact of FDI on increasing firms' efficiency, its export incentives and innovation activities in almost all sectors and for the whole industry.

Possible recommendation: Extending incentives given to firms with high foreign involvement than to local firms.

Conclusion

- Stronger evidence about self-selection for fully exporting firms in almost all sectors ➔ Potential superior productivity of fully exporting firms.
- The importance of productivity gains from exporting has two driving forces:

1. Dynamics of learning: the scope for learning decreases with the length of exporting experience (case of textile and electric sectors)
2. Export destination: exporting to high income countries brings about larger productivity gains as compared to exporting to medium or/and to low income regions (case of agrofood sector)

- Fully exporting firms have higher abilities and more incentives to innovate.
- FDI generally increases firms' efficiency, its export incentives and innovation activities in almost all sectors.

Thank you for your attention!