Does Input Trade Liberalization Boost Downstream Firms Exports? Evidence from the French Agrofood Sector

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Introduction

Tariff cuts on intermediate inputs while final products remain protected is largely debated among public makers. Much attention has been given to the impact of input trade liberalization on the domestic upstream industries, but relatively little to the impact on the downstream sector.

Indeed, whether standard and new trade theories do not reach a consensus on the impact on the domestic upstream sector, those theories predict that downstream industries would expand with falling tariffs in the intermediate inputs market. It may seem to be reasonable to expect that falling prices of intermediate inputs reduce production costs of downstream firms allowing them to become a new exporter or to increase their exports. This mechanism is captured in all models of trade with perfect or imperfect competition with an intermediate sector. Indeed, this literature considers that downstream firms use the same technology and are identical in productivity. However, in a world where downstream firms differ greatly in productivity, each downstream firm adjusts differently its output price to a change in input prices, inducing a reallocation of the final demand among downstream firms.

Then, the purpose of this paper is to develop a theoretical model which argue that tariffs cuts on intermediate products may be detrimental to some of upstream firms, and to test its predictions with firm level data.

Data

Data concerning individual French agri-food firms for the years 2001 to 2004 come from two main sources:

-The French National Institute of Statistics (INSEE): annual data collected in a survey which is compulsory for all firms located in France with more than 20 employees or with total sales of over 5 million €; a wide range of variables including the main activity of the firm (NACE code), total sales, total export sales, the number of employees, investment, and some accounting data.

-The register of French Customs, which identifies the destination of exports per product (at the 8-digit level of the combined nomenclature) by value and quantity for each exporting firm. Each firm is identified by its identification number (SIREN code).

Data concerning aggregated trade between countries from the BACI database (Comtrade homogeneized database, CEPII)

Data concerning tariffs at European borders from TARIC database (European Commission)

Theoretical model

Based on Melitz 2003, we introduce an intermediate good in a model with heterogeneous firms.

Main hypotheses:

We consider an economy with n + 1 countries hosting M downstream firms producing a differentiated product under monopolistic competition. The mass of firms is exogenously determined.

Technology

The production of a variety requires two inputs, labor l and intermediate goods m. As the focus of this model is on agribusiness, it is consistent to take these two inputs as complementary. So there exists a technological constraint in the production of the final good. The price of labor is set to one, and z is the price of the intermediate good. Each firm uses α units of the intermediate good available in the world market and $1/\varphi$ units of labor to produce one unit of final good. Nevertheless, we consider that a firm can be more efficient, and use a less labor-intensive technology to produce its variety. So, as in Melitz (2003), the marginal productivity of labor φ differs across firms.

Access to markets

Firms pay a fixed cost f_d to serve the domestic country ; and in order to sell a part of their production in a foreign market a fixed cost f_x for each foreign country, which represents the adaptation costs to international markets and an iceberg transport cost $\tau > 1$.

Under monopolistic competition, each firm faces a residual demand curve with constant elasticity and leads to the pricing rule:

$$p(\varphi) = (z\alpha + 1/\varphi)/\rho$$

Main features

• Final good price elasticity to intermediate good price is increasing with firm productivity:

$$\epsilon_{p(\varphi),z} = \frac{\partial p(\varphi)}{\partial z}\frac{z}{p(\varphi)} = z\alpha\left(1/\varphi + z\alpha\right)^{-1} \Rightarrow \frac{\partial \epsilon_{p(\varphi),z}}{\partial \varphi} > 0$$

• The sign of the intermediate price effect on exports depends on the wedge between the price index elasticity and the variety price elasticity:

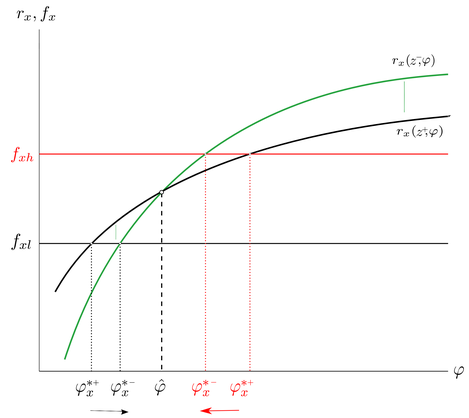
$$\epsilon_{r_x(\varphi),z} = (\sigma-1)\left(\frac{\partial P}{\partial z}\frac{z}{P} - \frac{\partial p(\varphi)}{\partial z}\frac{z}{p(\varphi)}\right) = (\sigma-1)\left(\epsilon_{P,z} - \epsilon_{p(\varphi),z}\right)$$

• There exists an unique value of labor productivity $\hat{\varphi}$ such as $\partial r_x(\hat{\varphi})/\partial z = 0$
Stated differently, $\partial r_x(\hat{\varphi})/\partial z < 0$ (resp., > 0) when $\varphi > \hat{\varphi}$ (resp., $\varphi < \hat{\varphi}$)

• Thus: the productivity threshold φ_x^* above which a firm can export decreases (and the probability to export increases) when the intermediate good price increases if $\varphi_x^* > \hat{\varphi}$.
The productivity threshold φ_x^* above which a firm can export increases (and the probability to export decreases) when the intermediate good price increases if $\varphi_x^* < \hat{\varphi}$.

Theoretical model

The effect on reallocation and export probability of a fall of intermediate good price depends on export fixed cost levels in the final good sector:



Proposition 1: *A fall in prices* ($\mathbf{z^+ \rightarrow z^-}$) *of the intermediate good decreases the probability of entering the foreign market when export fixed costs are low enough* ($\mathbf{f_{xl}}$) *and increases when export fixed costs are high enough* ($\mathbf{f_{xh}}$).

Proposition 2: *A fall in prices of the intermediate good* ($\mathbf{z^+ \rightarrow z^-}$) *induces a reallocation of exports from low productivity firms to high productivity firms when export fixed costs are low enough* ($\mathbf{f_{xl}}$) *and a higher increase of exports for high productivity firms than for low productivity firms when export fixed costs are high enough* ($\mathbf{f_{xh}}$).

Empirical part:

Testing the impact of agricultural (input) tariffs on export level and probability to export of French agrifood (output) firms.

1. Export level $Export_{ist} = \beta_0 + \beta_1 z_{st} + \beta_2 z_{st}/\varphi_{it} + \beta_3 \varphi_{it} + \beta_4 C + \nu_{it}$

2. Probability to export $P(Export_{ist} > 0) = \alpha_0 + \alpha_1 z_{st} + \alpha_2 \varphi_{it} + \alpha_3 C + \epsilon_{it}$

3. Total effect of input tariffs on export level

$$\Gamma(\varphi_{it}) = \frac{\partial Export_{ist}}{\partial z_{st}} = \beta_1 + \beta_2/\varphi_{it} \qquad \Gamma(\hat{\varphi}) = 0 \Leftrightarrow \hat{\varphi} = -\beta_2/\beta_1$$

Expectations to validate the model:

• **First stage**

- direct effect of input tariffs on export level should be negative $\beta_1 < 0$
- More productive firms should loose more from rising tariffs $\beta_2 > 0$

Second stage: consistency between equation **1.** and **2.**

- if $\alpha_1 < 0$ then we expect high export fixed cost, and $\beta_1 + \beta_2/\varphi_{it} < 0 \,\forall\, \varphi_{it}$
- if $\alpha_1 > 0$ then we expect low export fixed cost, and $\beta_1 + \beta_2/\varphi_{it} > 0 \,\forall\, \varphi_{it} < \hat{\varphi}$ and $\beta_1 + \beta_2/\varphi_{it} < 0 \,\forall\, \varphi_{it} > \hat{\varphi}$

	$\alpha_1 < 0$	$\alpha_1 > 0$
$\Gamma < 0 \quad \forall\varphi$	H0 and high f_x	H1
$\Gamma<0 \;\; \forall\, \varphi>\hat{\varphi}$ $\Gamma>0 \;\; \forall\, \varphi<\hat{\varphi}$	H1	H0 and low f_x

First regressions:

Number of obs = 11239
LR chi2(13) = 1030.80
Prob > chi2 = 0.0000
Log likelihood = -6702.2119
Pseudo R2 = 0.0714

TAB. 1 – Estimation results : OLS

Variable	Coefficient	(Std. Err.)
Itariff_input	-0.117	(0.029)
Iprod_tinput	0.002	(0.001)
Iproductivity	0.961	(0.032)
Year_dummy		
Sector_dummy		
Constant	3.229	(0.201)

Number of obs = 3841
F(14, 3826) = 88.09
Prob > F = 0.0000
R-squared = 0.2438
Adj R-squared = 0.2410
Root MSE = 1.4353

TAB. 2 – Estimation results : probit

Variable	Coefficient	(Std. Err.)
Itariff_input	-0.093	(0.017)
Iproductivity	0.263	(0.016)
Year_dummy		
Sector_dummy		
Constant	-1.838	(0.103)

• **Classical results** :
- More productive firms are more inclined to export $\beta_3 > 0$
- More productive firms export more $\alpha_2 > 0$

• **Validation of the model :**
- Direct impact of input tariff is negative $\beta_1 < 0$
- More productive firms are more affected $\beta_2 > 0$
- Input tariff decreases the probability to export and export level for all firms $\alpha_1 < 0$; $\beta_1 + \beta_2/\varphi_{it} < 0 \,\forall\, \varphi_{it}$

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