

## Private Requirements by European Retailers : Impact on French Exporters

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### Abstract

Based on recent development of international economics, this paper aims to evaluate in what extent private standards impact trade, and more precisely trade of French agri-food firms.

Our paper explores an original "handmade" database identifying French agri-food firms which are certified with the International Food Standard – IFS– and/or the British Retail Consortium standard – BRC. From this dataset, one can analyse the characteristics and the export behaviour of certified firms compared to that of the non certified ones. First we look at the productivity of the firms; second, we look at export behaviour of the firms: does a certification such as BRC imply export orientation of the firm? Then we propose the estimation of Chaney's model (2008) to test for the impact of certification on trade costs faced by certified firms to access EU markets.

Our preliminary results show that certification clearly impacts French firms. In the case of BRC certification, we especially show that French certified firms significantly decrease their fixed costs to access EU markets.

**Keywords:** *Private standards, IFS/BRC, trade costs, productivity*

### 1 Introduction

In the European Union (EU), the agri-food sector is one of the safest of the world, subject to both a lot of regulations and an ongoing harmonisation process among EU members. In parallel with the pressures of European and international authorities to harmonise public standards, there is a rise of private food schemes. These schemes can be specific to a firm (internal schemes) or can be imposed by a retailer to its suppliers. This second type of standards is under the scope of this paper. In order to be accepted as a supplier by retailers, firms have to comply with specific requirements. Given the market share of retailers in EU member states, such requirements may impact trade and act as a trade barrier. They are a potential source of market fragmentation even within the Single European Market. Some firms – which are not certified - cannot access to some supply chains, while certified firms may gain market share and even market access in the case of countries in which retailers have a high market share. Based on the analysis of two standards (the International Food Standard – IFS and the British Retail Consortium standard – BRC), this paper aims to evaluate to what extent these requirements impact trade, and more precisely trade of French agri-food firms.

In international economics, private standards<sup>1</sup> receive more and more attention but because of a lack of data, there are still few empirical works. Most of the existing studies are case studies and focus on the way requirements imposed by retailers impact the relations along the supply chain. For instance, Jaffee and Masakure (2005), Henson et al. (2005) or Minten et al. (2006) analyse the way private standards such as Global Gap are implemented by

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1. This term is often used in a broad sense. It includes all private voluntary standards, by opposition to public standards which are mandatory. Nevertheless, this term does not clearly distinguish between private requirements (such as IFS and BRC we are studying in this paper) or international standards defined by normalization institutes for instance (as AFNOR or ISO)

producers in developing countries. These studies analyse the impact of the requirements on the supply chain but not on the characteristics of the firms involved in these certifications and on their trade behaviour.

The new developments in international economics give more room to the firm in the analysis of trade. The models that they develop take the heterogeneity of firms into account and offer a micro-economic analysis of the process of selection at work for firms entering markets. An exporting firm has to bear certain specific costs to break into a market, and only sufficiently productive firms are able to do so. They show that firms self-select into export markets. Firms differ from each other in terms of productivity and, in order to export, each must bear not only a variable cost (transport costs and tariffs), but also a fixed cost (Melitz, 2003; Chaney, 2008). From a review of the literature about the adoption of ISO certification (Zaibet and Bredhal, 1997; Anderson et al., 1999; Verwaal and Donkers, 2001, 2002; Den Butter and al., 2007), it appears that the adoption of a certification by a firm can impact its export behaviour through two channels that we propose to study in this paper: 1) an impact on the productivity of the firm because of adoption of new organisation or production method; 2) a decrease in trade costs (especially transaction costs or costs to search for a network...) leading to advantages for exporting firms.

In this paper we will specifically focus on two certifications mainly imposed by European retailers to their suppliers of processed food products: 1) IFS (International Food Standard) initiated by German retailers, and adopted next by Italian and French retailers; and 2) BRC (British Retail Consortium) initiated by British retailers. These two certifications are more and more required by retailers as a guarantee of the quality of the product they buy. The term quality defines here a set of precised (agreed upon) characteristics of the production process and of the products (traceability, production process, safety..); it does not necessary imply a high quality level, as in a traditional way (as French AOC; IGP..).

This paper studies to what extent compliance with IFS or BRC certification impacts French exporters. We will specifically test two assumptions issued from Melitz (2003) and Chaney (2008): H1) Is there an impact on productivity of certification from French exporter's point of view? Are certified firms more productive than the other? Is there a link between certification and productivity at the firm level? And H2) Do certified firms benefit from a reduction in trade costs (in variable, fixed or transaction costs) to access some European markets? This latest assumption will be tested estimating the theoretical model proposed by Chaney (2008).

Our work proposes an original reading of French individual firm data. Based on a "handmade" dataset identifying firms certified with BRC or IFS, we propose a better understanding of the link between certification and firms' characteristics and export behaviour.

The remainder of the paper is structured as follows. The second section briefly presents IFS and BRC certifications. The third section presents the handmade dataset dealing with firms certified with IFS and/or BRC and the main empirical facts about their characteristics. The fourth part deals with the link between certification, export and a high productivity level, and partially confirms our first assumption. The fifth part, proposes an estimation of the structural frame developed by Chaney (2008) and provides a deeper data understanding. This analysis specifically focuses on the access to different European markets faced by French exporters through the productivity threshold computation. Exporters are distinguished between certified and non certified firms. This analysis validates our second assumption

dealing with the impact of certification on the reduction in costs (transaction costs) to access some markets.

## 2 IFS and BRC certifications

This article will focus on two specific certifications: IFS and BRC which are two certifications imposed by European retailers to their supplying agro-food firms. For these firms, such certifications appear as a necessary condition in Europe to contract with retailers.

### *2.1 Definition and typology of standards*

The definition of a 'standardisation system' proposed by E. Valceschini and L. Saulais (2005) distinguishes between public regulations, collective standards (ISO, Agri-confiance, etc.) and private standards introduced by the operators themselves (NQS at Nestlé for example) or by clients on their suppliers (BRC, IFS, Global-GAP, etc.).

Public regulation is developed by governments, and the knowledge on which they are based on is public in nature. Regulation is also affected by changes in European legislation and the international rules (Codex Alimentarius). Collective norms on the other hand are developed by standardisation organisations (AFNOR - the French national organisation for standardisation, ISO, etc). Public and private actors are involved in the building of the standards.

In this paper we focus on private standards introduced by clients on their suppliers. They can be defined as a common frame of reference on which several partners do agree. In BRC or IFS context, these frame of reference are based on retailers' point of view: only those who take the initiative are involved in their elaboration and they aim at defining a commercial relationship between retailers and their suppliers. More precisely, they serve to build confidence in respect of the final product, within a contractual relationship. The certification appears as a key point both from suppliers' and retailers' points of view, preliminary to contract signature. A validated certification is a proof for retailers of the suppliers' competence and they are thus shown to be in a position to produce the specified product.

Finally, these frames of reference are characterised by the sanctions implied. The loss of certification is determined by private auditors. Once the certification is lost, the sanction may be the breaking off of commercial relations and the exclusion of the supplier from the retailer network.

### *2.2 Requirements included in IFS or BRC*

BRC gathers the most important retailers in Great Britain. Since 1998, a food referential "BRC food" has been implemented. It aims at guaranteeing that firms supplying products sold under retailer private brand comply with the private requirements. It is noteworthy that most of the British retailers now consider BRC as a necessary condition to contract with a supplier. It gives guarantees to the retailers on the quality of the product they buy. In this context quality means a precise (agreed upon) list of characteristics, and not a high or low quality label as in a more classical sense.

Version 4 of the BRC food standard includes the implementation of 226 requirements points belonging to 6 parts: i) the HACCP (Hazard Analysis Critical Control Point) system; ii) a quality management system; iii) environmental consideration about the production site; iv) control of the product; v) control of production process; vi) requirements about human resources. Audits are lead every six or twelve months depending on the results of the previous audit:

when previous audit highlighted serious non-compliance points, the audit frequency is higher.

Among these requirements, ten are seen as fundamental points. A non compliance with these points cancel the certification. A non compliance with other requirements is only highlighted and checked again during the following audit.

The International Food Standard (IFS) has been created in 2002 by the "Hauptverband des Deutschen Einzelhandels" which gathers the main German retailers. As for BRC, this standard is used by German retailers as a basic requirement for their suppliers of "own label" food products. .

In France, in 2003, the FCD (Federation for business and retail) decided to join this initiative and contributed to IFS evolutions.

In its 4<sup>th</sup> version (July 2004), the IFS food certification concerns processed agrifood product. It implies: i) the HACCP (Hazard Analysis Critical Control Point) system ii) a quality management system; iii) direction liability; iv) resource management; v) production process; vi) measures, analyses, and improvement. The new version (5<sup>th</sup>) is available since 2007. Among all the imposed requirements, ten are key points: non compliance with one of these 10 points cancel certification.

Hence, all products intended to be sold under a retailer private label are potentially concerned by these two standards. BRC is mostly imposed by British retailers; IFS concerns German or French retailers.

Regarding certification costs, audits and official requirements have a fixed costs for firms.

BRC is said to cost 1800 euros to firms. But the global cost of the certification is of course narrowly linked to the state of the firm before the certification process. According to this initial state of the firm, the compliance process will be more or less easy to implement, then more or less costly.

### **3 The identification of certified firms in the French agro-food sector**

Contrary to public standards which are adopted at the national level and applied by all trading partners in the country, private requirements are part of a commercial agreement between two parties and only interested firms get certified for these requirements. Thus, in order to measure their impact on trade, it is necessary to work at the plant level and not at a sectoral or a product level.

Our paper explores an original "handmade" database of French agri-food firms which combines different types of data. First, we gathered the list of French plants which were IFS (or/and) BRC certified in 2007. The list is available on the official website of the two standards. The information we have is the name of the plant, its location and the certification it complies with. 1041 plants have been certified in 2007: 256 comply with the two certifications IFS and BRC; 206 comply with BRC only and 579 with IFS only. The identification number of the firm the plants belong to, has been obtained from an online Siren database. This identification number is necessary in order to match this list of certified firms to the two other databases we use in this work.

To have information on the firm, we use the data provided by the French National Institute of Statistics (INSEE). These data are collected in a survey which is compulsory for all firms located in France with more than 20 employees or with total sales of over five million Euros. This survey (Enquête annuelle d'entreprises-EAE) collects a wide range of variables including

the main activity of the firm (NACE code), total sales, the number of employees, value added, stock of capital, investment, location and accounting data.

To know the export behaviour of these firms, we also use the register of French Customs which identifies all French exporters whatever their size and the destination (origin) of their exports (imports) per product (at the 8-digit level of the combined nomenclature) by value and quantity.

The 1041 plants matched with 574 certified firms in the agri-food annual survey of enterprises. Among these 573 firms, 172 have both IFS and BRC certifications, 76 have only BRC and 326 have IFS. Regarding the main activity of the firm, table 1 shows the breakdown of firms by distinguishing between certified (whatever the certification) and non certified firms.

**Table 1.** Repartition of agro-food firms according to their main activity in NACE nomenclature

Number of firms in 2007	Non certified firms [1]		Certified firms [2]		% of cert. firms [2]/([1]+[2])
Processing of meat products	803	34%	109	19%	12%
Processing and preserving of fish	112	5%	28	5%	20%
Proc. and preserving of F&V	108	5%	58	10%	35%
Manufacture of oils and fats	25	1%	2	0%	7%
Manufacture of dairy products	179	8%	115	20%	39%
Manuf. of grain mill products	86	4%	19	3%	18%
Manuf. of prepared animal feed.	193	8%	4	1%	2%
Manufacture of other food prod.	556	23%	166	29%	23%
Manufacture of beverages	307	13%	72	13%	19%
<b>Total Agri-food Sector</b>	<b>2369</b>	<b>100%</b>	<b>573</b>	<b>100%</b>	<b>19%</b>

Source: EAE 2007 database

Based on Table 1, we choose to focus on the main categories of activities found in the sample of certified firms. The five most important activities in our sample of certified firms are: processing and preserving of meat and meat products (151); processing and preserving of fruit and vegetable (153); manufacture of dairy products (155); manufacture of other food products (bread, cacao, tea, coffee..) (158); manufacture of beverage (159). It is important to note that the share of certified firms in dairy industry (155), processing fruit and vegetable (153) and other food product (158) are more important than the share in the same industry in the full sample. In these activities, IFS and BRC certifications (and especially BRC certification) seem to have a great importance, as shown in the following sections.

In order to identify impact of these two standards on exporting behaviour of firms, we match our sample of certified firms with the French custom database for the year 2007. 446 certified firms are identified as exporters: 257 were certified IFS; 118 were certified IFS and BRC; only 71 were only certified BRC.

128 firms were not exporting in 2007 (54 with both certifications, 69 with IFS, 5 with BRC). Regarding IFS certification, it is required by some French retailers; hence certified firms can be non exporters. But BRC certification is specific of British retailers. Why are some BRC firms non-exporters? They should be supplier of an exporter to British retailer. In fact, this is a limit of our dataset. We have no way to find information on the commercial links between firms.

Certified firms (whatever the certification) export in value 15% of the total value exported by French firms in these cpf3 products all around the world. At the EU 15 market scale, certified firms export 42% of the total value exported by French firms (IFS firms export 34% and BRC firms exports 29% of the total value-remind that some firms have the double certification).

#### 4 The link between certification, productivity and export status

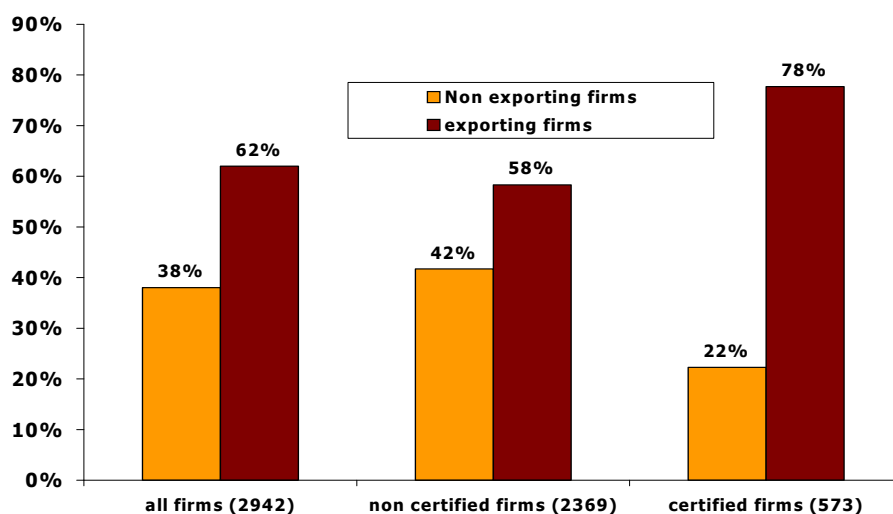
The new developments in international economics give more room to the firm in the analysis of trade. Melitz (2003) takes the heterogeneity of firms into account and offers a micro-economic analysis of the process of selection at work for firms entering markets. An exporting firm has to bear certain specific costs to break into a market, and only sufficiently productive firms are able to do so. He shows that firms self-select into export markets.

Hence looking at the export status of French certified firms and their productivity will give empirical understanding of the impact of certification.

##### 4.1 Empirical strategy: matching firms on their productivity level

In this section, our empirical strategy is to establish a link between productivity, export rate and certification. If certification increase productivity, then we should find evidence that certified firms are more productive than non certified firms and that they are more export oriented. To go further, if compared with firms with the same productivity level they are more export oriented, one could assume that other characteristics than productivity is impacted by certification.

Regarding the export status of the firms, we see on Figure 1 that certified firms are proportionally more exporters than the other. Potentially, and according to new development of international economics this would suggest that firms are much more productive than the other.



**Figure 1.** Export status of French agri-food firms – 2007

From this point, we want to deepen our understanding of the link between export status of certified firms and productivity level. To lead this analysis, we identify three types of firm: certified firms, non certified firms with the same characteristics as certified firms and the other firms. To identify firms with same productivity we use the propensity Score Matching method using Mahalanobis metric matching. The propensity score was introduced by Rosenbaum and Rubin (1983 cited in d'Agostino, 1998). This score is the conditional probability to be certified given the characteristics of the firm. Once we find two firms one certified and one non certified, with the same propensity score, then we can look at the

export behaviour and test is with similar characteristics certified firms are more export oriented than the other.

The choice of the firm characteristics to be accounted for to match firms is of huge importance. After several tests, we finally chose to match firms according to their total Factor Productivity (TFP) computed following the now well-known methodology proposed by Olley and Pakes (1996). Usually, the TFP is estimated as the residual of the Cobb-Douglas production function. Nevertheless, this residual may be correlated with the two variables of the Cobb Douglas function : the labour and the capital. This residual may be decomposed into two components: the first one is a productivity shock that is observed by the decision-maker in the firm but not by the econometrician. It affects the firm's decision-making process: productivity is known to the firms (but not to the econometrician) when they choose their input levels. The second component of the residual is an unexpected productivity shock that is unobserved by both the firm and the econometrician. It has no effect on the firm's decision-making process. Thus, a standard estimation of the TFP would provide biased and inconsistent estimates. Moreover, beside this bias of simultaneity, Olley and Pakes (1996) show that it may appear a selection bias due to the exit of the less productive firms from the domestic market. Thus, without taking this selection bias into account, one may overestimate the productivity level. The Olley and Pakes methodology we have followed is presented in appendix A.

As this TFP is a global image of the firm we did not use other covariates in the matching. From this matching, we identify in 2007, among non certified firms, firms which have the same characteristics as certified firms. By definition, there are as many certified firms as firms with matched status.

Tables 2a and 2b present our results. Table 2a deals with BRC certification. Comparing TFP between unmatched firms and certified or matched firms, we see that the former are much less productive than the other group. This confirms the link between certification and high level of productivity<sup>1</sup>. Now, looking at the export rate, we clearly see that compared with other firms (matched or unmatched firms) certified firms are much more export oriented.

**Table 2a.** Productivity and export rates of agro-food firms certified with BRC according to their main activity in NACE nomenclature and their category after Propensity Score Matching

Sector		Matched Non BRC	BRC	Unmatched
Processing and preserving of meat products	Productivity	114.5	114.6	72.5
	Export rate %	5.6	14.6	5.1
Processing and preserving of fruit and vegetables	Productivity	128.0	131.6	83.3
	Export rate %	16.2	18.6	16.1
Manufacture of dairy products	Productivity	142.4	144.7	86.5
	Export rate %	8.9	16.9	8.4
Manufacture of other food prod.	Productivity	112.7	114.80	81.7
	Export rate %	15.8	19.5	10.3
Manufacture of beverages	Productivity	134.4	135.4	131.9
	Export rate %	19.3	29.2	21.5

Source: EAE 2007, customs 2007, and handmade database

1. At this step one should note that the causality between certification and high productivity has not been established. Do certification increases productivity? or Do only highly productive firms choose certification? Dynamic analysis from the initial certification year would be necessary to deepen this point.

As for table 2b, the same conclusions do not hold. IFS firms are much more productive than unmatched firms, whatever the subsector. Regarding export rate, they are still more export oriented than the unmatched firms but they do not differ from matched firms other; in most of subsectors they are even less export oriented than the other.

**Table 2b.** Productivity and export rates of agro-food firms certified with IFS according to their main activity in NACE nomenclature and their category after Propensity Score Matching

Sector		Matched Non IFS	IFS	Unmatched
Processing and preserving of meat products	Productivity	106.2	106.7	67.5
	Export rate %	8.4	7.3	4.8
Processing and preserving of fruit and vegetables	Productivity	119.8	122.3	80.3
	Export rate %	19.1	13.5	16.5
Manufacture of dairy products	Productivity	134.4	136.9	78.4
	Export rate %	15.7	11.2	10.2
Manufacture of other food prod.	Productivity	109.6	112.9	76.1
	Export rate %	18.1	11.6	10.3
Manufacture of beverages	Productivity	140.1	137.9	128.9
	Export rate %	24.2	22.0	22.8

Source: EAE 2007, customs 2007, and handmade database

From this first empirical analysis, it seems that the link between certification and high productivity is established. It is important to note that at this step the causality included in this link has not been established yet. We do not know whether only highly productive firms adopt certification or certification increase highly productivity. Only dynamic aspects could validate a causality.

Compared with firms with the same value of TFP, the export orientation is not the same. Regarding BRC, the export rate is much higher than the export rate of matched firms, showing that other elements that productivity are at in play to be more export oriented. This orientation does not hold for IFS certification. This result was expected as IFS is now also requested by French retailers.

## 5 Certification and market access: a decrease in entry costs for certified firms

In order to export, firms able to export have to bear export costs (both fixed and variable) specific to the market they want to export to. Our second assumption concerns the link between the certification chosen by the firms and the costs they face to access markets.

The nature of the costs impacted is assumed to be transaction costs or network access costs. The link between international standards (and not private standards) and transaction costs can be found in the literature. In their paper, Den Butter et al. (2007) propose the example of the adoption of a standard size for containers. Because of this standardization, containers do fit on all appropriate ships and vessels, trains and trucks at any location in the world. This adoption has led to a substantial reduction of transaction costs. The common acceptance of the standard and its surrounding infrastructure was essential for the productivity gains of such standards.

Several other papers deal with certification strategy of firm through surveys. For instance Anderson et al. (1999) consider the ISO9000 certification in the USA and study the reason why firms choose to comply with such a certification. One of the relevant motivation for manager to obtain this certification, is to reduce costs and improve product quality by



adopting standard product designs appropriate for a variety of customers. Particularly this standardisation leads to a reduction in costs of transaction to contract with various partners. In transaction costs economics, based on Williamson (1985) work, the unitary element of the analysis is the transaction. In this literature, the asset specificities, the uncertainty, and the frequency of transactions have to be taken into account. The certification as imposed by retailers imply specific requirements that are necessary to contract with specific partners. The certification aims at guaranteeing the quality (agreed upon) of the product traded, reducing uncertainty. The frequency of transaction is not observed per se in international trade database, but the total amount of product traded, the geographical orientation of exports are known. *Hence, To study certification as imposed by retailers through transaction cost economics perspective sound as a relevant issue.* As the two certifications we are studying are geographically defined (BRC in Great Britain; IFS in Germany first and then Italia and France), we can assume that analysing the trade costs that French certified firms are facing to enter these markets will reveal the impact of certification on these costs. We will use Chaney model to lead this analysis and test this assumption.

### 5.1 The productivity threshold specific to each market from the Chaney's model

In Chaney's model, firms differ in their level of labour productivity  $\phi$ .  $\phi$  is Pareto distributed on  $[1, +\infty[$  with shape parameter  $\gamma$  (with  $\gamma > \sigma + 1$ ).  $\gamma$  is an inverse measure of sector heterogeneity. A sector with a high value of  $\gamma$  will be homogeneous in the sense that the output is homogeneously distributed among all the firms. Conversely, a sector with a small value of  $\gamma$  will be heterogeneous in the sense that the output is concentrated among the biggest and most productive firms.

The probability that the productivity of a firm is above a value  $x$  can be written as:

$$(1) \quad P(\phi > x) = (x)^{-\gamma} \quad \text{with } x \geq 1.$$

To deliver products to country  $j$ , French firms face various trade barriers that generate fixed or variable costs. Fixed costs ( $f_j$ ) comprise all costs due to product compliance (label, packaging, etc) but also all costs induced by the local distribution networks to enter, the marketing/advertising strategy, etc... Variable costs ( $\tau_j$ ) depend on the exchanged quantity of the product and are included in the model as iceberg-type costs.

The total cost of producing and selling  $q_j$  units of good to market  $j$  for a firm with labour productivity  $\phi$  is:

$$(2) \quad c_j(\phi) = \frac{w \tau_j}{\phi} q_j(\phi) + f_j$$

where  $w$  is the average French productivity.

Each firm faces a residual demand curve with constant elasticity  $\sigma$ . Thus, the optimal price fixed by a firm with productivity  $\phi$  in country  $j$  is a constant mark-up (equal to  $\frac{\sigma}{\sigma-1}$ ) over the marginal cost:

$$(3) \quad p_j(\phi) = \frac{\sigma}{\sigma-1} \times \frac{w\tau_j}{\phi}$$

With firms choosing optimal prices, and the consumer demand derived from the utility function, exports by a firm of productivity  $\phi$  to country  $j$  are:

$$(4) \quad x_j(\phi) = p_j(\phi)q_j(\phi) = E_j \left( \frac{p_j(\phi)}{P_j} \right)^{1-\sigma}$$

where  $E_j$  is the total expenditure in country  $j$  in the agri-food sector and  $P_j$  is the CES price index.

The firms that are able to export to country  $j$  are those that are able to bear market entry costs. A firm will export only if it makes positive profits ( $\pi_j > 0$ ).

$$(5) \quad \pi_j = (p_j(\phi)q_j(\phi) - c_j(\phi))$$

Using equation (2) and (3), the profit expression becomes:

$$(6) \quad \pi_j(\phi) = \frac{E_j}{\sigma} \left( \frac{\sigma}{\sigma-1} \frac{w\tau_j}{\phi} / P_j \right)^{1-\sigma} - f_j$$

The zero profit condition defines the productivity threshold ( $\bar{\phi}_j$ ) above which firms are able to export to  $j$  :

$$(7) \quad \bar{\phi}_j = \lambda_1 \left( \frac{f_j}{E_j} \right)^{\frac{1}{\sigma-1}} \frac{w\tau_j}{P_j}$$

with  $\lambda_1$  being constant.

Chaney (2008) develops this expression by calculating the price index  $P_j$ . He shows that this index depends on the characteristics of the importing country and is a function of the distribution law for firms entering this market. He thus finds that:

$$(8) \quad P_j = \lambda_2 E_j^{\frac{1}{\sigma} - \frac{1}{\sigma-1}}$$

$\theta_j$  with

$$(9) \quad (\theta_j)^{-\gamma} \equiv \sum_{n=1}^N (Y_n / Y) \times (w_n \tau_{nj})^{-\gamma} \times (f_{nj})^{-(\frac{\gamma}{\sigma-1})}$$

and  $\lambda_2$  being constant, and  $(Y_n / Y)$  is the share of country  $n$  in total world output.  $(\theta_j)^{-\gamma}$  is a variant of the remoteness index of Anderson and van Wincoop (2004).

In this way, the productivity threshold to enter market  $j$  for potential exporters is:

$$(10) \quad \bar{\phi}_j = \lambda_4 \left( \frac{Y}{E_j} \right)^{\frac{1}{\sigma}} \left( \frac{w\tau_j}{\theta_j} \right) (f_j)^{1/(\sigma-1)} \quad \text{with } \lambda_4 \text{ being constant.}$$

## 5.2 Estimation of the model

The first expression deals with the probability for a French firm to export to market  $J$ . Let's define  $Y_{ij}$  as a dummy variable which is 1 if the firm  $i$  exports to country  $J$ , and 0 otherwise:

$$(11) \quad \begin{cases} Y_{ij} = 1 & \text{if } \phi > \bar{\phi}_j \\ Y_{ij} = 0 & \text{if } \phi \leq \bar{\phi}_j \end{cases}$$

As we assume that firm productivities follow a pareto distribution, we can express the probability that the productivity of a given firm is above the threshold to enter market  $j$ :

$$(12) \quad P(\phi > \bar{\phi}_j) = (\bar{\phi}_j)^{-\gamma}$$

$$\text{and (13)} \quad P(\phi \leq \bar{\phi}_j) = 1 - (\bar{\phi}_j)^{-\gamma}$$

From equation (10), we obtain an expression of these probabilities:

$$(14) \quad P(\phi > \bar{\phi}_j) = \left( \lambda_4 \left( \frac{y^s}{E_j^s} \right)^{\frac{1}{\gamma}} \left( \frac{w\tau_j^s}{\theta_j^s} \right) (f_j^s)^{1/(\sigma-1)} \right)^{-\gamma}$$

$$(15) \quad P(\phi \leq \bar{\phi}_j) = 1 - \left( \lambda_4 \left( \frac{y^s}{E_j^s} \right)^{\frac{1}{\gamma}} \left( \frac{w\tau_j^s}{\theta_j^s} \right) (f_j^s)^{1/(\sigma-1)} \right)^{-\gamma}$$

The estimation of equations 14 and 15 on available information from our data will quantify the impact of the variables identified in the theoretical model. We especially aim at giving a global image of the heterogeneity of market access based on this estimation.

To estimate these equations we need to compute the parameter  $\gamma$  from our data. To estimate it, we follow the methodology of Helpman et al. (2004). For each agri-food subsector, we sort the firms according to their level of productivity and then regress the logarithm of the rank of the firm on the logarithm of the productivity. Data for the years 1996 to 2004 are included in the regressions and time fixed effects are thus introduced. Results of the estimations of  $\gamma$  are available upon request. The higher the parameter, the lower the heterogeneity of the sector. The processed cereals sector and the dairy sector appear as the most heterogeneous and the meat sector is the most homogeneous.

Now, we are able to compute  $\log \left[ P(\phi > \bar{\phi}_j) \right]$  which will be a linear combination of available variables. The variables introduced in the estimation are:  $\frac{E_j^s}{y^s}$  is the share of  $J$  in total EU25 imports of product  $s$ ,  $d_{ij}^1$  is the distance from the firm's head office to the capital of country  $j$ <sup>1</sup> and is a proxy for variable costs  $\tau_j$  (we assume that  $\tau_j = \xi d_j^\delta$ ), the variant of the remoteness index of Anderson and van Wincoop (2004) is decomposed in two components:  $\Theta_j^s$  is in fact

1. The location of the firm was found in the annual survey of firms (INSEE) and distances were downloaded from the Michelin database.

the inverse of the supply of the potential partner countries of the importing market and country fixed effects (the details of this decomposition are in annex A).

Concerning variables which remain unknown (as variable or fixed costs specific to each destination markets), we introduce country fixed effects. These country fixed effects give us a global image of remaining trade resistance on EU markets. Sub-sector fixed effects are also introduced to account for sub-sector specificities and especially price differences.

### 5.3 Results

Table 3 presents our results. From the data, we observe the export or not of a firm to a market. Knowing the distribution of the firms, we can deduce the productivity threshold and the impact of the variables of interest on this threshold.

Classical variables as distance and size of the importing country have the expected impact. A greater distance increases the costs to access to a market. According to the new international economics, this increases the firm productivity level needed to bear such costs. On the contrary, the size of the importing country increases opportunities for French exporters and hence gives the opportunity for less productive firms to access the market. It decreases the productivity level needed to access this market. Our Potential supply index has also the expected sign, but is not significant. An importing country benefiting from a high potential supply from its partners except France, will offer less opportunity for French exporters.

The country fixed effects are of special interest in our work. As presented before, these fixed effects show the global image of remaining trade costs at entry to markets (here: Great Britain, Germany, New member states and other EU countries, Belgium being the reference).

**Table 3.** Estimation of the productivity threshold based on the observed export behaviour of the firms

	Impact of BRC			Impact of IFS		
<b>Importing country size</b>	-0.138 (0.006)			-0.142 (0.006)		
<b>Distance</b>	0.078 (0.007)			0.081 (0.006)		
<b>Potential supply of the compet. Countries</b>	-0.031(0.010)			-0.037 (0.010)		
	Country fixed effects : Belgium as reference					
<b>Country fixed effects</b>	BRC	matched	Non BRC	IFS	matched	Non IFS
<b>Great-Britain</b>	0.09 (0.016)	0.25 (0.032)	0.28 (0.014)	0.176 (0.018)	0.212 (0.024)	0.286 (0.015)
<b>Germany</b>	0.08 (0.018)	0.15 (0.027)	0.20 (0.013)	0.118 (0.017)	0.130 (0.021)	0.217 (0.014)
<b>Other EU15</b>	0.07 (0.011)	0.19 (0.016)	0.26 (0.010)	0.142 (0.012)	0.145 (0.013)	0.271 (0.011)
<b>New Member States</b>	0.32 (0.020)	0.49 (0.029)	0.60 (0.015)	0.535 (0.021)	0.399 (0.022)	0.563 (0.015)
<b>Constant</b>	3.328 (0.04)			3.317 (0.04)		
<b>Observations</b>	75164			75164		

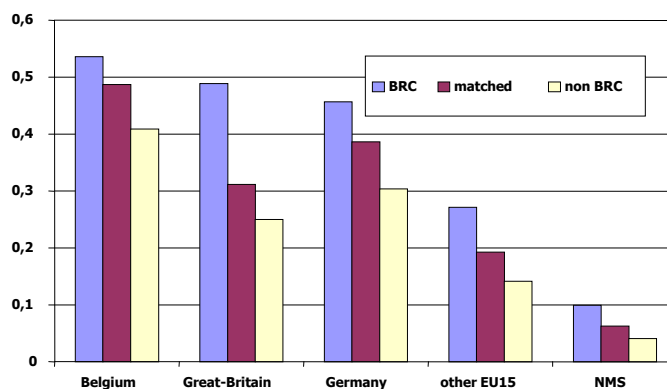
Comparing Certified firms to non certified firms with the same productivity level or other non certified firms, it appears that certifications have different impact.

Regarding BRC firms, results show that certification significantly reduce the remaining trade costs that firms face at entry to the markets. To be certified divides per 3 the fixed effect associated with access to Great Britain, even compared to firms with the same productivity level. It is also important to note that firms with high productivity (matched firms) and other

firms face nearly the same remaining trade costs. And this is also true for export to other destinations. This confirms the role of this certification as a performing tool to decrease some specific costs that we assume to be linked to the network access (especially retailer network) or to transactions.

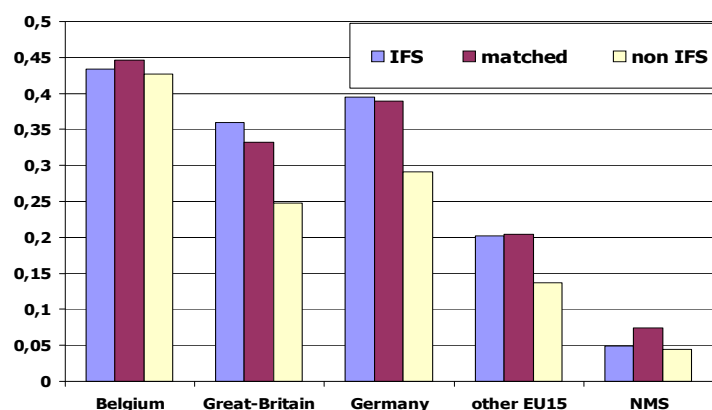
Regarding IFS, it seems that this certification does not significantly impact the remaining trade costs to access markets. This is specially true comparing certified and non-certified firms with the same productivity level. Those two types of firms seem to have a greater access to markets than firms with lower productivity. From this one should conclude that IFS certification do not impact market access in the same way as BRC. Once again this can be explained by the fact that IFS certification is also asked by French retailers. Hence IFS certification may be used as a strategic tool for domestic sales instead of international sales.

From the estimation of the impact of our variables on the productivity threshold, we can compute the probability to export to each market. Figures 2.a and 2.b synthesise the average probability by destination country and type of firm. Figure 2a clearly shows that BRC certification globally increase the probability to export for certified firms. The advantage of BRC certification is significant, even compared to firms with the same high productivity (matched firms), whatever the market. Of course the impact is much higher on the probability to export to Great-Britain.



**Figure 2a.** Impact of BRC certification on the probability to export to each market computed from our estimations

Figure 2b shows the same results for IF certification. As shown in the estimation, it appears that IFS is not as export oriented as BRC. The gain in probability to export from this certification is still significant compared to non certified firms. Nevertheless, compared to firms with the same productivity level, IFS firms have no significant advantage.



**Figure 2b.** Impact of IFS certification on the probability to export to each market computed from our estimations

## 6 Discussion

Private standards imposed by retailers are of increasing interest in economics. The increasing market share of retailers in several countries (mainly EU countries) leads to an increasing volume of trade concerned by private standards. Concerning market access to such countries the question is: to what extent do these standards act as barriers to trade? The compliance with these standards becomes an access condition.

Regarding international economics literature, few studies (if none) do exist at our knowledge presenting an empirical analysis of the impact of private standards. Our paper is an original work leading to a first understanding of the way private standards impact trade.

Our study is based on the theoretical framework from the new international economics. Because certification is adopted at the firm level and depends on the international strategy of the firm, we need to work at the firm level. In this respect the new international economics is a consistent tool.

Our analysis established a link between certification (IFS or BRC) and high productivity of the firm. For BRC certification, this link can be extended to a higher export orientation. BRC firms are highly productive and compared to non certified firms with the same productivity level, are much more export oriented. Regarding IFS, the export orientation of certified firms is not established. It is important to note that French retailers are requiring IFS certification. Hence IFS appears as a strategic tool on the domestic market and not only to export. It could be interesting to work on data from other EU countries, as countries from Central and eastern Europe (CEECs) in order to test the export orientation of firms certified with IFS. Some other authors already present IFS as a strategic tools for CEECs to export to EU markets (Gawron and Theuvsen, 2008).

Nevertheless, this work has several limits that will have to be treated in further steps.

The first limit of this work, because of data constraints, is that we are not able to establish the causality between certification and productivity. Do certification increase productivity? Or, conversely, do only highly productive firm adopt certification? To answer these issues, we need to know the initial year of certification. This information is not available yet.

Another limit concern the answer to the trade barrier argument about private standards. At this step we did not highlight the fact that non BRC or non IFS firms could not access British or German market. To answer this issue, we would need to know which firms are trading with retailers, which is impossible with the data we have.

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**ANNEX A**

The decomposition of the variant of remoteness index used in our estimation:

Usually in the empirical literature,  $(\theta_j^s)^{-\gamma}$  - the variant of the remoteness index of Anderson and van Wincoop (2004)- is proxied by country fixed effects only. Here our strategy is to split this index into two parts: the first corresponds to the supply of potential partners of country  $j$  and the second to the fixed costs at entry to market  $j$  faced by the trade partners of  $j$ . From equation (9),

$$(20) \quad (\theta_j^s)^{-\gamma} \equiv \underbrace{\sum_{n=1}^N (Y_n^s / Y^s)}_{[1]} \times \underbrace{(w_n \tau_{nj}^s)^{-\gamma}}_{[2]} \times \underbrace{(f_{nj}^s)^{-(\frac{\gamma}{\sigma-1})}}_{[2]}$$

where  $n$  is the exporting country (except France) and  $N$  the set of world countries.

-part [2]: We propose to replace  $(f_{nj}^s)$  by the average of the fixed costs at entry to market  $j$ , i.e.  $(\bar{f}_j)$ . These average fixed costs, which remain unknown, will be taken into account in the importing country fixed effects  $T_j$ , as noted in (12) and (13) and defined below.

-part [1]: this part ( hereafter called  $\Theta_j^s$  ) will be computed and included in the estimations. Thus (20) can be written as:

$$(21) \quad \theta_j^s \equiv (\bar{f}_j)^{-\frac{1}{\gamma}} \times \Theta_j^s \quad \text{with} \quad \Theta_j^s = \left( \sum_{n=1}^N (Y_n^s / Y^s) \times \left( \frac{1}{w_n \tau_{nj}^s} \right)^\gamma \right)^{-\frac{1}{\gamma}}$$

*Calculation of  $\Theta_j^s$*

Note that because of the lack of data on the productivity of the other exporting countries  $n$ , we did not include the productivity of labour  $w_n$  in the index. Nevertheless, since we calculate  $Y_n^s$  as the total exports of country  $n$  for the subsector  $s$ , and  $Y^s$  as the world exports of subsector  $s$ , to a certain extent, the average productivity of country  $n$  is taken into account in the ratio  $Y_n^s / Y^s$ .

$\tau_{nj}^s$  are the variable trade costs faced by exporter  $n$  at the entry to market  $j$  which are classically proxied by  $d_{nj}$  the distance between the capitals of the two countries  $n$  and  $j$ . In this step, we include the information on the proximity between country  $j$  and some of its partners by computing  $d_{nj}^{(1 - \frac{B_{nj} + L_{nj} + Col_{nj}}{3})}$  where  $B_{nj} = 1$  if the two countries share a common border (otherwise 0),  $L_{nj} = 1$  if they share a common language (otherwise 0), and  $Col_{nj} = 1$  if they share a common history (otherwise 0)<sup>1</sup>. Such a structure for the exponent implies that the impact of the distance between country  $j$  and its partner  $n$  is reduced when one of these three dummies is equal to 1.

1. All these variables are given in the CEPII database.



Moreover, following Balgati et al. (2008) in order to scale all  $\tau_{nj}^s$  from 0 to 1, we propose the following computation for  $\tau_{nj}^s$  :

$$1/\tau_{nj}^s = \left( 1 / (d_{nj}^{(1 - (\frac{B_{nj} + L_{nj} + Col_{nj}}{3}))}) \right) / \sum_n \left( 1 / (d_{nj}^{(1 - (\frac{B_{nj} + L_{nj} + Col_{nj}}{3}))}) \right)$$

In fact  $1/\tau_{nj}^s$  does not vary with  $s$ . Thus, hereafter we replace  $1/\tau_{nj}^s$  by  $1/\tau_{nj}$

$$\Theta_j^s = \left( \sum_{n=1}^N (Y_n^s / Y^s) \times (1/\tau_{nj})^\gamma \right)^{-\frac{1}{\gamma}}$$

Thus, we compute

The variable  $\Theta_j^s$  is in fact the inverse of the supply of the potential partner countries of the importing market, but takes into account the proximity of these partners. The higher this index, the lower the potential supply and the higher the potential opportunities for French exporters. In the productivity threshold equation and the value of exports equation, the variable  $\Theta_j^s$  is expected to have a positive impact<sup>1</sup>.

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1. Following Aiken and West (1996), the variable  $\Theta_j^h$  was mean-centred to eliminate the colinearity with the distance variable.

**ANNEX B**

## Olley-Pakes methodology

In order to estimate the Total Factor Productivity (TFPP) at the firm level, we use the now well-known Olley and Pakes (1996) method. Based on the estimation of a Cobb-Douglas production function, the procedure accounts for two biases : simultaneity and selection bias. The simultaneity bias arises because productivity is known to the firms (but not to the econometrician) when they choose their input levels. The selection bias results from the relationship between productivity shocks and the probability of exit from the domestic market.

Thus the production function to be estimated is

$$Y_{it} = A_{it} L_{it}^{\alpha} K_{it}^{\beta} M_{it}^{\gamma}$$

where  $Y_{it}$  is the output of the firm  $i$  at year  $t$ ,  $A_{it}$  is the TFP,  $L_{it}$  is the number of employees of the firm,  $K_{it}$  is the capital stock of the firm.

Taking the log of the variables, we obtain

$$y_{it} = \beta_o + \beta_l L_{it} + \beta_k K_{it} + \beta_m M_{it} + e_{it} \quad \text{where} \quad e_{it} = \Omega_{it} + u_{it}$$

Usually, the TFP is estimated as the residual of the production function. Nevertheless,  $e_{it}$  may be correlated with the other variables. Indeed, Olley and Pakes show that  $e_{it}$  may be broken down into two components : the productivity shock that is observed by the decision-maker in the firm but not by the econometrician.

$$\Omega_{it}$$

is a state variable that affects the firm's decision-making process; while  $u_{it}$  is an unexpected productivity shock that is not observed by either the firm or the econometrician. It has no effect on the firm's decision-making process. Thus, a standard estimation of the productivity would provide biased and inconsistent estimates for two reasons : simultaneity between output and variable inputs and selection bias resulting from the exit of inefficient firms (Yassar et al., 2008).

We follow the methodology of Olley and Pakes to solve these two biases. For more details see Yassar et al (2008). After this seminal paper, different developments have been proposed in the literature, many based on the implication of the lack of data (and notably of investment) on the results of the estimations. In our dataset, missing values are very scarce, thus we follow Olley and Pakes.