



Quality labels and export performance: Evidence from cheese industry

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Abstract

The paper questions the impact of quality labels on firm export competitiveness in the cheese and cream industry. We use firm level data from the French customs and an original dataset of firms and products concerned by protected designations of origin (PDO). Our econometric estimations show that PDO labelling impacts both the extensive margin (the probability to export and the number of destinations) and the intensive margin of trade (the value and quantity of trade). The results concerning the impact of PDO labelling on the export unit value is more puzzling. Moreover, we show that the role of label in export performance varies with the markets of destination and as expected is more important when exporting to EU countries.

Keywords: Quality label, PDO, trade margin, INAO, French customs.

JEL: F10, F14

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Introduction

The European Union has developed an agricultural product quality policy in which several quality schemes are defined. This policy aims at fitting European consumer concerns about the attributes of food products, such as quality and geographical characteristics. It is also expected to sustain competitiveness within the agri-food chains.

In this paper we investigate the role of Protected Designations of Origin (PDO) on French export performance in the cheese industry. Using firm level data and an exhaustive dataset of the firms and products concerned by PDO in the cheese industry, we show through an empirical analysis that labelling in the cheese industry has a positive impact on exporting firms both at the extensive (probability to export and number of export destinations) and at the intensive margin (value and quantity exported).

Our approach is linked to recent developments in firm-based trade theory (Melitz, 2003). The main predictions of this literature have been confirmed for the food industry. For example, it has been shown that the larger the productive food firms, the more likely they are to export more, and serve distant markets (Chevassus-Lozza, Gaigné and LeMener, 2013; Gullstrand, 2011; Latouche and Chevassus-Lozza, 2012; Vancauteran, 2013a), confirming a self-selection mechanism where only the most productive firms can recover the sunk costs for serving foreign markets and become exporters.

There has been much interest recently in the introduction of vertical quality differentiation in firm-based trade theory to explain certain regularities found in international trade data (Hallak and Sivadasan, 2013). For example, Kugler and Verhoogen (2012) allow for vertical differentiation in product quality to explain why larger plants tend to specialise in higher quality products and pay higher input prices. In one variant of their extended Melitz's (2003) model, they consider plant productivity and input quality to be complements in generating output quality, while in a second variant the technology for product quality is given by a Leontief production function, making the level of input quality proportional to a sunk investment in quality. They found evidence that larger, more productive Columbian plants operating in industries in which there is more scope for vertical quality differentiation (proxied by research and development (R&D) and advertising intensity), tend to specialise in higher quality products and pay more for their inputs. Crozet, Head and Mayer (2012) argue that firms that export to a larger number of destinations tend to price their goods more dearly. Their empirical analysis is based on the Champagne industry in which a direct measure of product quality exists. More generally, a small firm can export provided that the level of product quality is high enough. This is the so-called Alchian effect that makes trade costs relatively less important for high-quality (higher priced) products than for lower quality ones. Exporting firms sell higher quality products than non-exporters of the same size, a result reminiscent of Falvey's (1979) policy-induced quality upgrading effects. Curzi and Olper (2012) confirm this finding by using an alternative approach to study the relationship between product quality and food export performance across destinations from a panel of Italian food firms. Product quality is proxied by investment intensity, R&D expenditure, product and process innovations, as well as quality standard certifications (the ISO 9000 certification). They show that more efficient firms sell higher-quality goods at higher prices and serve more

distant markets, confirming the relationship between productivity, product quality, and export performance.

The effect of tariffs and distance on quality has been also the object of several studies recently. Amiti and Khandelwal (2013) argue that tariff reductions induce quality upgrading for firms near the ‘world technology frontier’ because quality upgrading can be seen as a mean to escape more intense competition.¹ Having a public standard defining the vertical level of quality entails that some firms are forced to use a higher level of quality than they would like and that the reverse is true for other more productive firms. Since more productive firms cannot deflect competition by increasing quality beyond the standard, they use their productivity advantage to gain market share. Empirical evidence from Olper, Pacca and Curzi (2014) confirms the strong relationship between market penetration and productivity growth.

However, this literature considers that firms supply a single variety. Yet, world trade is strongly dominated by multi-product firms. Recently, Mayer, Melitz, Ottaviano (2014) have studied the role of market size and distance to trading partners on a firm’s exported product range and its exported product mix across market destinations. The firms’ product mix choice is driven by price competition across markets as the authors only consider horizontal differentiation. Price competition causes a rationalization of production in response to tougher product competition because firms drop their less profitable products and focus on their most successful products. However, large multi-product firms are able to manage price competition by adjusting the quality of their products. Our data reveals that the exporters supply multiple products with different price and quality settings. Indeed, some of multi-product exporters provide both labelled products and non-labelled products. Labelling also enables firms to manage the cannibalization effect and, in turn, reduces intra-firm competition.

In the next section, we describe our dataset. We identify firms exporting products belonging to the cheese and cream industry. Among these firms, we are able to identify firms which are authorized to export PDO products (also called PDO firms). PDO firms can also export non PDO products. The remaining firms are non-authorized and only export non-PDO products. In Section 2, we provide our empirical strategy and analyze the results of our different estimations. The aim is to first compare export performances of PDO authorized firms versus non-PDO firms and second, among authorized firms, to compare the export performances of PDO versus non-PDO products.

1. Data and empirical facts

1.1. Data

We aim at evaluating the effect of PDO labelling on export performance. To do so, we use French firm-level data from the French customs. This database provides for each firm its exports in value and quantity by product (defined at the NC8 level) and destination. We restrict the sample to the firms exporting cheese or cream (products that belong to the HS4 categories 0405 or 0406) in order to have a homogenous sample of firms in terms of products. We end up with a dataset of 638 exporting firms within the cheese and cream industry.

¹ From the importing firms’ perspective, a higher specific tariff tends to reduce the relative price of high quality products vis-à-vis lower quality products subject to the same unit tax. Distance has similar effects in inducing reductions in the volume of trade and in skewing the composition of trade toward higher quality products. Curzi and Olper (2012) report supportive evidence from Italian firms.

Among these exporting firms, we identify the firms which are authorized to handle PDO labelled products by using the exhaustive list of firms of the French national institute responsible for these official designations (INAO- Institut National de l'Origine et de la Qualité) for 2012. This year, 34 firms among the 638 exporting firms have PDO labelling products. The list of products covered by PDO labelling is also given by the INAO. In the cheese and cream industry, 21 products benefit from a PDO label. These products are defined at the NC8 level of the classification of goods of the EU statistics.

As PDO labelling concerns specific products, we associate the two INAO databases and the firm-product pairs that are identified in the customs dataset. Two points should be highlighted here. First, PDO authorized firms are multi-products firms: they do not only export labelled products and they may also export non-labelled products. Second, each PDO labelled product does not have an exclusive NC8 code. In the empirical analysis, we assume that the PDO label applies to all the products belonging to a NC8 category of good concerned by a PDO and exported by an authorized firm. Because of this approximation, the effects of labels may be under-estimated in our analysis.

The dataset was also completed using the data provided by INSEE at the firm level for 2012. This information is useful to control for the main characteristics of the firms, as its main activity, its total sales or added value per worker.

1.2. Descriptive statistics

The combination of French Customs and INAO datasets allows us to distinguish PDO authorized firms from non-authorized firms. Furthermore, within authorized firms, we can identify which NC8 category of product is labelled. Thus, each firm-product pair may be classified into three types: non-authorized firms, authorized (or PDO) firms with non-labelled products and authorized firms with labelled products. PDO firms represent 5% of firms exporting products from the cream and cheese industry and more than 22% of export value in this industry. Among these exports, 23.5% concern labelled products. In other words, as shown in Figure 1, non-authorized firms concern 78% of French exports of cream and cheese, non-labelled products of PDO authorized firms 17% and PDO firms and products 5%.

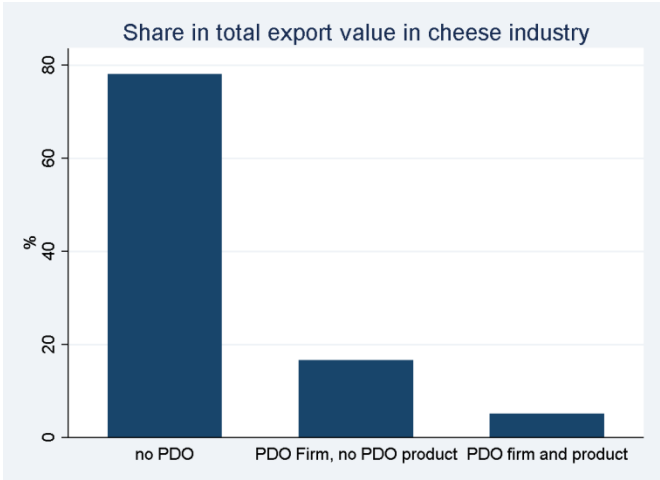


Figure 1: Share in export value in cheese and cream industry

Table 1 gives the number of firms using this classification and according to the number of products exported in our dataset. Among the 638 firms of our sample, as said above, 34 are authorized and 604 are not authorized to handle PDO products. Among the 34 authorized firms, 33 also export products without label. The distribution of firms according to the number of products shows that most of the firms are multi-products. Half of non-authorized firms and the third of authorized firms even export more than 9 products within the cheese industry.

Table 1: Number of firms according to the number of products exported

	1	2 to 5	6 to 9	>9	Total
Non-Auth firms	80	123	76	325	604
Auth firms, non-PDO product	0	13	9	11	33
Auth firms, PDO product	1	13	9	11	34

Sources: Author's calculation using French Custom and INAO datasets

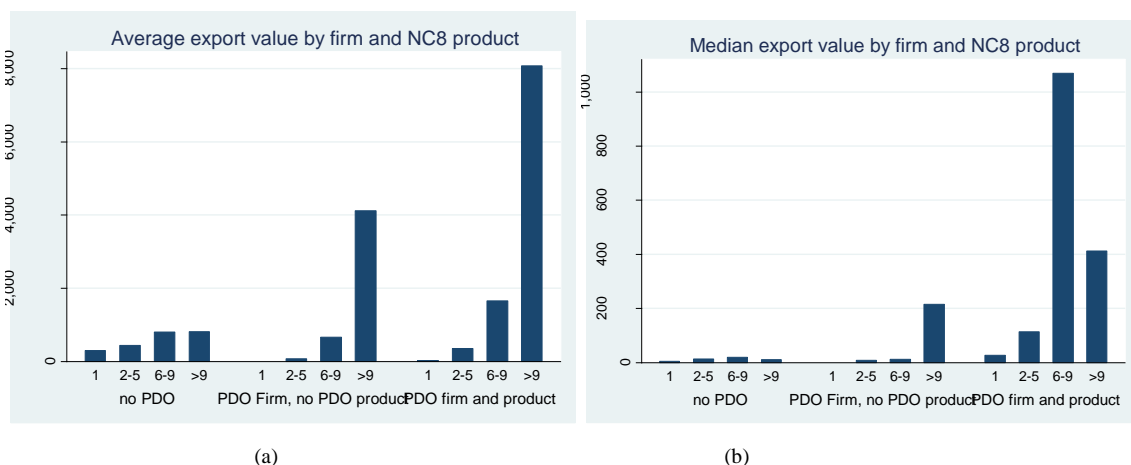
Table 2 illustrates the share of labelled products in authorized firms' exports. PDO products represent 29% of the products exported, and 21% of the export in value. However, these shares vary according to the total number of products exported by the firm. The larger the firm, the lower the share of labelled products in export (both in terms of number and export value). The last column of table 2 presents the average share of destination countries where firms export both labelled and non-labelled products. It shows that the export destinations for a given firm do not exactly coincide for labelled and non-labelled products. Only 31.1% of the destinations are the same for labelled and non-labelled products sold by the firms that export few products (between 2 and 5 products).

Table 2: Share of labelled products in authorized firms products and trade

# HS8 per firm	% HS8 with label	% labelled exports	% common destinations
[2-5]	43%	64%	31.1%
[6-9]	19%	66%	56.8%
≥10	13%	18%	49.8%
total	29%	21%	48%

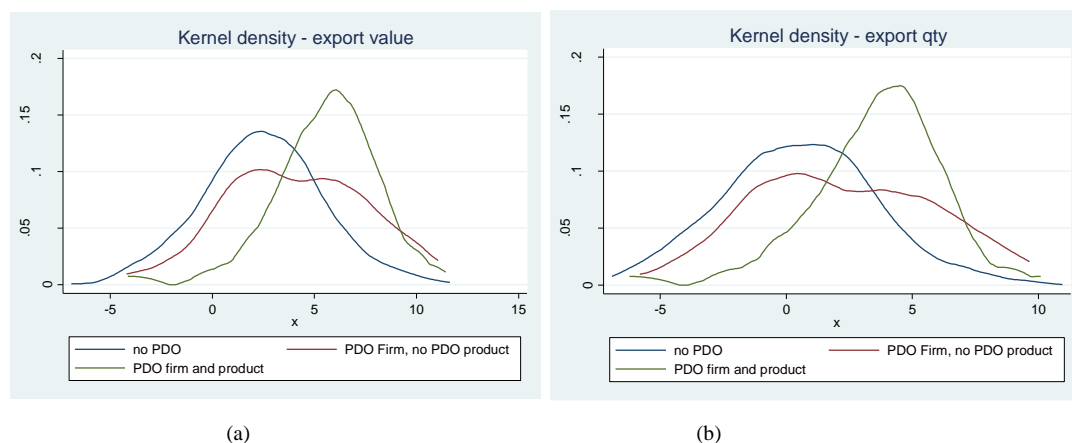
Sources: Author's calculation using French Custom and INAO datasets

We compare the mean export value by firm and product, depending on whether the firm is authorized or not and whether the product is labelled or not. Figure 2 shows that values and quantities exported are higher for PDO authorized firms than for non-authorized firms. The result holds both for labelled and no labelled products of authorized firms except for firms exporting a small number of products. This observation is confirmed by the Figure 3, which displays the kernel density of the export value and quantity by firm-product pair. More authorized firms with labelled products export higher values than non-authorized firms for a given NC8.



Sources: Author's calculation using French Custom and INAO datasets

Figure 2: Export value and quantity (mean and median) by firm and NC8 category of good

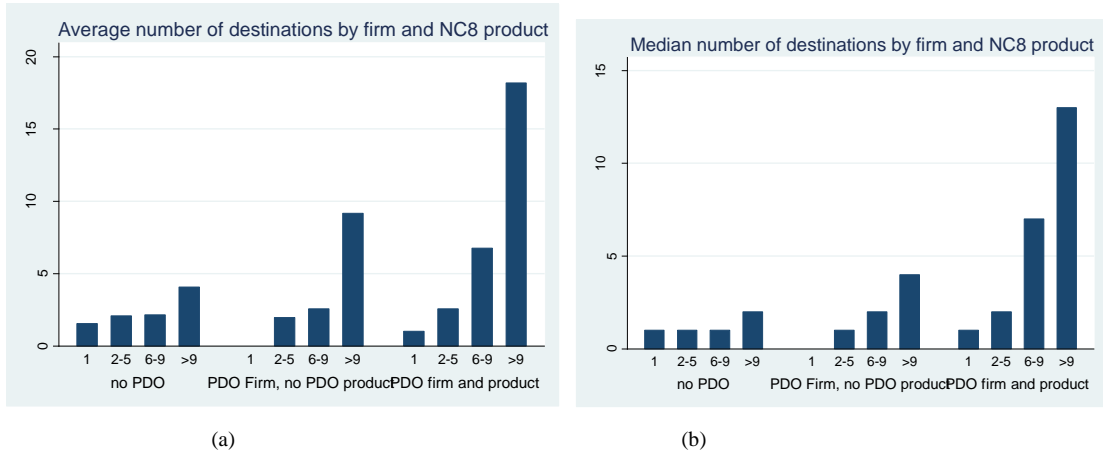


Sources: Author's calculation using French Custom and INAO datasets

Figure 3: Export value and quantity by firm and NC8 products kernel density

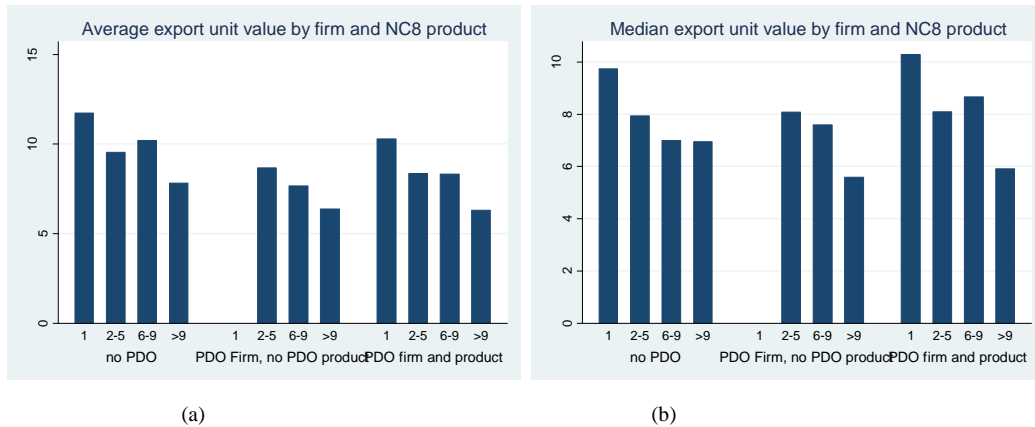
In figure 4, we assess the extensive margin of trade by computing the average and median number of destination countries by firm and NC8 category of product. The number of destinations is always higher for PDO authorized firms. This result is more salient for firms that export more than 9 products. Furthermore, authorized firms export labelled products to a higher number of destinations as compared to their other products.

Contrary to export values or number of destinations, the unit value (in average and median) does not differ a lot according to the type of firms and product (Figure 5). Trade unit values of non-authorized firms are higher in average than and not different in median from those of authorized firms. Within PDO authorized firms, PDO products are exported at a higher price than non-labelled products, both in average and median, except in firms with a large number of products.



Sources: Author's calculation using French Custom and INAO datasets

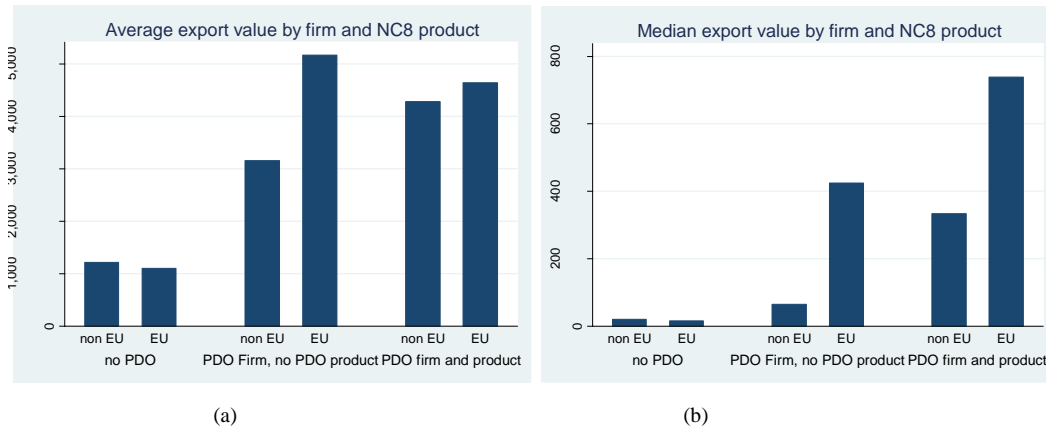
Figure 4: Number of destination (mean and median) by firm and NC8 category of good



Sources: Author's calculation using French Custom and INAO datasets

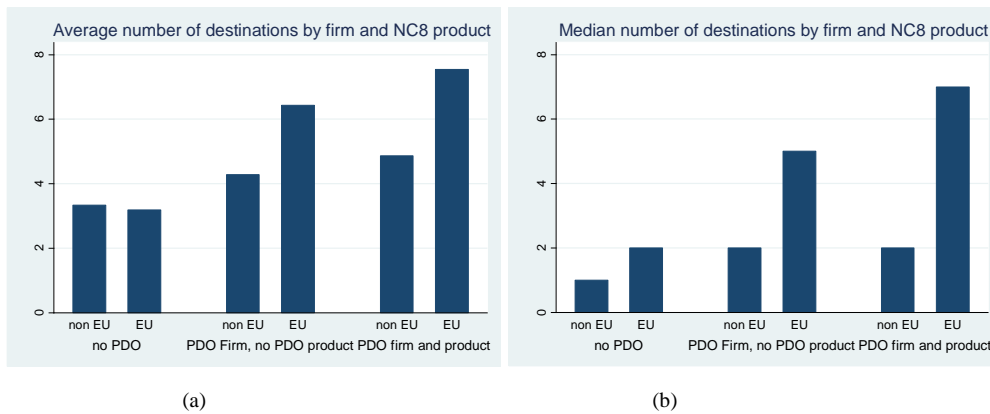
Figure 5: Average unit value by firm and NC8 category of good

Finally, as PDO are developed and recognized at the European level, we investigate the trade performance of labelled firms and products according to the markets of destination. Figure 6 and 7 display the export values and numbers of destination for European and non-European countries in average and median. The previous result holds when distinguishing EU and non-EU destinations: PDO authorized firms export more in value than non-authorized firms. Within authorized firms, labelled products exhibit higher export values, however, the difference between European and non-European destination is low (Figure 6). In terms of number of destinations, we observe similar results. It is worth noting that PDO authorized firms export to a larger number of European countries than non-European countries (Figure 7). This result also holds in median for non-authorized firms.



Sources: Author's calculation using French Custom and INAO datasets

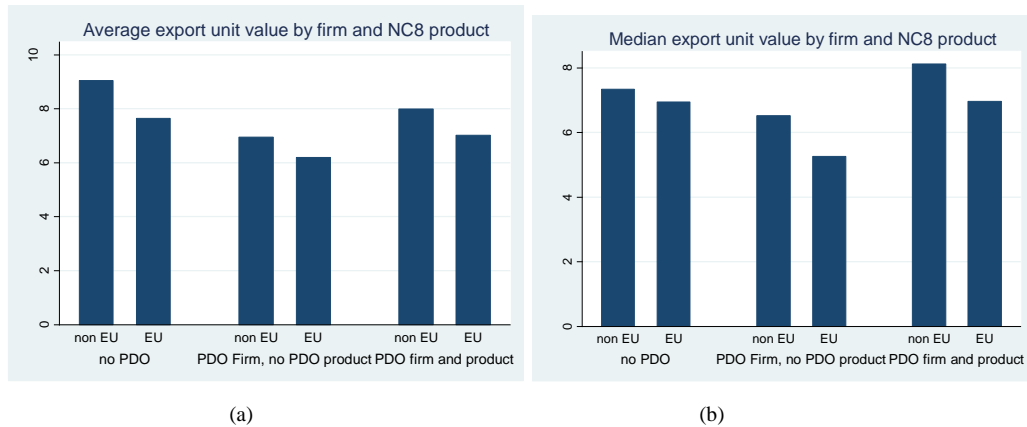
Figure 6: Export value by firm and NC8 category of good, according to the destination market



Sources: Author's calculation using French Custom and INAO datasets

Figure 7: Number of destination by firm and NC8 category of good, according to the destination market

Figure 8 displays the export unit value (in average and median) by firm-product pair according to their type and destination market. PDO firms have higher unit values for PDO products than for non-PDO products with lower unit values on EU markets than non-EU markets. Unit values for products exported by non PDO firms appear higher in average and equivalent in median than unit values for products of PDO firms whatever the market. This result is quite puzzling and was not expected.



Sources: Author's calculation using French Custom and INAO datasets

Figure 8: Export Unit values (mean and median) by firm and NC8 category of good, according to the destination market

To sum up, descriptive statistics suggest a positive role of PDO labelling in firms export performance in the cheese and cream industry. This impact appears both at the extensive margin and at the intensive margin. Moreover, we observe these differences in trade margin both within and between firms. An authorized firm export more and to more destinations than non-authorized firms especially to EU markets and the value exported by an authorized firm is higher for its labelled products than for its non-labelled products.

2. Empirics

2.1 Empirical strategy

Our objective is to examine whether PDO labelling entails better performance for French exporters in the cheese industry. To do so, we estimate the impact of benefiting from a label on the value and quantity of export (the intensive margins of trade), on the export unit value, on the probability of export to a given destination (the extensive margin of trade).

The direct effect of PDO on trade is estimated using a dummy PDO_{fk} equal to 1 if the firm f benefits from PDO labelling for the category of good k (defined at the NC8 level) and zero otherwise. To catch for the spill-over effect of PDOs for authorized firms, we also introduce as explanatory variable in some specifications a dummy indicating whether the non-label product is exported by an authorized firm (i.e., a firm that also export label products).

The three models have the same explanatory variables. In the first model (extensive margin), the dependent variable I is binary, equals to 1 for observations with positive export flows for the firm f , the good k and the country of destination j , and to zero otherwise. A probit model is estimated. In the second and third models, the dependent variables are respectively the value of trade X_{fjk} of firm f to destination j for product k and the trade unit value uv_{fjk} :

$$\begin{cases} I(X_{fjk} > 0) \\ X_{fjk} \\ uv_{fjk} \end{cases} = \beta_0 + \beta_1 PDO_{fkt} + \Gamma Y_{fkj} + \varepsilon_{fjk} \quad (1)$$

Y_{fkj} are different sets of variables and fixed effects (firms, destinations and/or products) and Γ the associated vectors of parameters.

The direct impact of PDO can be seen by comparing label products to non-labelled products (direct effect of PDO). In this case the benchmark will be non-label products. The spill-over effect of PDO can also be measured. In this case, it is interesting to compare the exports of non-label products by authorized firms to those on non-label products by non-authorized firms. Thus the benchmark will be the export on non-authorized firms.

Two different samples will be considered in the analysis. In a first step, the whole sample will be accounted for. In a second step, only firms in the cream and cheese industry will be included.

Moreover, the effects of PDO (direct and spill-over) are first measured regardless of the destination country. We also propose to distinguish the impacts of labelling according to the importer, assuming that the impact of PDO may be different within the European Union, as the label is officially defined at the community level.

2.2 Direct effect of PDO labelling on firm performance

Table 3 shows the results obtained at the extensive and intensive margins on the whole sample. The benchmark is composed with products without labels.

Equation (1) was estimated using product – country fixed effects. The dependent variable is the decision to export (i.e., a dummy is used indicating whether the firm exports a given product to a given destination- columns (1) and (2)), the logarithm of the value exported in columns (3) and (4) and the logarithm of unit values in the last two columns (columns (5) and (6)). Columns (1), (3) and (5) present the global impact of PDO firms and products on export performances. Columns (2), (4) and (6) present the impact of PDO distinguishing the destination of export between UE and non-EU markets.

Results show that for a given product and destination, authorized firms have a higher probability to export and export higher values. The estimated coefficients are positive for PDO products. Regarding the unit value (column (5)), the coefficients is negative and significant for PDO dummy. This result was not expected and has to be further investigated.

Distinguishing between EU and non-EU markets, columns (2), (4) and (6) confirm the previous results on EU markets. Dummy indicating PDO products exported to EU markets has a positive and significant impact on the probability to export and on the value exported. The same holds for dummy indicating export of PDO products to non-EU markets. The surprising results of negative and significant impact of PDO products on the unit value holds for both EU and non-EU markets.

To control for firm characteristics, we add variables *Added value per worker* and *Total sales*. These variables catch for the productivity and the size on the firm respectively. As expected both variables have positive and significant impacts of the probability to export and on the value exported. It is interesting to note that for the unit value, *Added value per worker* has a positive and significant impact on unit value whereas *Total sales* has a negative and significant impact.

Table 3: Effect of PDO on exported value, exported quantity and unit value on all firms

	<i>Extensive margin</i>		<i>Intensive margin (value)</i>		<i>Unit value</i>	
	(1)	(2)	(3)	(4)	(5)	(6)
PDO product	0.72*** (0.03)		1.53*** (0.17)		-0.12*** (0.03)	
PDO product x EU		0.90*** (0.05)		1.85*** (0.2)		-0.13*** (0.03)
PDO product x non EU		0.59*** (0.05)		0.79*** (0.3)		-0.11** (0.05)
Added value per worker	0.32*** (0.01)	0.32*** (0.01)	0.46*** (0.05)	0.45*** (0.05)	0.05*** (0.01)	0.05*** (0.01)
Total sales	0.16*** (0.01)	0.16*** (0.01)	0.05*** (0.01)	0.05*** (0.01)	-0.02*** (0.00)	-0.02*** (0.00)
FE product NC8-country	yes	yes	yes	yes	yes	yes
Nber Obs.	220892	220892	10441	10441	10441	10441
R ²	-	-	0.34	0.34	0.52	0.52
Log like.	-24503	-24503	-	-	-	-

Standard errors in parentheses, * p<0.10, ** p<0.05, *** p<0.01

Table 4 presents the same specification as in Table 3 but on the sample of firms in the milk and cheese industry (APE code 10.51). This restriction reduces the sample to 162 firms (31 authorized firms and 131 non authorized firms exporting cheese and cream products)². The results obtained are globally the same as in Table 3. PDO products benefit from a higher probability to be exported (column (1)) and higher values of exports (column (3)). Restricting the sample to firms in the milk and cheese industry, we obtain the expected positive and significant effect of PDO on unit values.

Distinguishing between EU and non-EU countries (columns (2), (4) and (6)) shows different results compared to those in table 3. The probability of export is higher for PDO products on both EU and non-EU markets. On the value of export, the role of PDO is only significant for non-EU markets. On the unit value, the role of PDO is positive and significant only on EU markets.

Table 4: Effect of PDO on exported value, exported quantity and unit value for firms in the milk and cheese industry

	<i>Extensive margin</i>		<i>Intensive margin (value)</i>		<i>Unit value</i>	
	(1)	(2)	(3)	(4)	(5)	(6)
PDO product	0.61*** (0.04)		0.47** (0.21)		0.11*** (0.04)	
PDO product x EU		0.97*** (0.06)		0.33 (0.25)		0.16*** (0.04)
PDO product x non EU		0.37*** -0,05		0.75** (0.35)		0.01 (0.06)
Added value per worker	0.02 (0.02)	0.01 (0.02)	0.62*** (0.12)	0.62*** (0.12)	-0.03 (0.02)	-0.03 (0.02)
Total sales	0.21*** (0.01)	0.21*** (0.01)	0.18*** (0.03)	0.18*** (0.03)	-0.01 (0.01)	-0.01 (0.01)
FE product NC8-country	yes	yes	yes	yes	yes	yes
Nber Obs.	67760	67760	3200	3200	3200	3200
R ²	-	-	0.6	0.6	0.63	0.64
Log like.	-9346	-9312	-	-	-	-

Standard errors in parentheses, * p<0.10, ** p<0.05, *** p<0.01

2.3 Impact of PDO products on authorized firms: spill-over effects

Tables 5 and 6 deal with the estimations of direct and spill-over effects of PDO. The specifications are the same as in Tables 3 and 4 but with a different benchmark. In Tables 3 and 4 the benchmark was the exports of products without labels. In tables 5 and 6, the benchmark is composed with the products without label exported by non-authorized firms.

Table 5 present the results obtained on the whole sample. The dummy PDO has the same impacts on the probability to export, the value exported and the unit value than in table 3.

² The excluded firms are either agri-food firms in other sectors or wholesalers.

Hence PDO products have a positive and significant impact on the extensive and intensive margins of exports compared to products from non-authorized firms.

Looking at the spill-over effect of PDO (i.e. the coefficient of the dummy indicating non-label products of authorized firms), it is also positive and significant both at the extensive and intensive margins. Distinguishing between the EU and non-EU markets, the role of PDO (direct and spill-over effects) for authorized firms is confirmed on EU markets. On non-EU markets, the same results are confirmed at the extensive margin; at the intensive margin, only PDO products benefit from a positive effect on the value exported. The spill-over effect does not hold.

The unexpected results concerning the unit value are confirmed in columns (5) and (6). PDO products have a lower unit value than products sold by non-authorized firms. And this result holds on EU and non-EU markets. Other products from authorized firms have also a lower unit value than products from non-authorized firms.

The role of firm variables (*added value per worker* and *total sales*) is the same as in table 3. Their role is always positive and significant on extensive and intensive margins. *Total sales* has, as in table 3, a negative impact on unit value.

Table 5: spill-over effects of PDO on exported value, exported quantity and unit value for all firms

	<i>Extensive margin</i>		<i>Intensive margin (value)</i>		<i>Unit value</i>	
	(1)	(2)	(3)	(4)	(5)	(6)
PDO products	0.77*** (0.04)		1.70*** (0.17)		-0.16*** (0.03)	
Oth product, authorized firms	0.32*** (0.02)		1.12*** (0.12)		-0.23*** (0.02)	
PDO product x EU		0.96*** (0.05)		2.06*** (0.20)		-0.16*** (0.03)
PDO product x non EU		0.64*** (0.05)		0.87*** (0.3)		-0.14*** (0.05)
Oth product, authorized firms x EU		0.33*** (0.03)		1.87*** (0.14)		-0.26*** (0.03)
Oth product, authorized firms x non EU		0.31*** -0.03		-0.13 (0.18)		-0.18*** (0.03)
Added value per worker	0.33*** (0.01)	0.33*** (0.01)	0.51*** (0.05)	0.49*** (0.05)	0.04*** (0.01)	0.04*** (0.01)
Total sales	0.17*** (0.01)	0.17*** (0.01)	0.09*** (0.02)	0.09*** (0.02)	-0.03*** (0.01)	-0.03*** (0.01)
FE product NC8-country	yes	yes	yes	yes	yes	yes
Nber Obs.	220892	220892	10441	10441	10440	10440
R ²			0.35	0.35	0.52	0.52
Log like.	-24401	-24389	-	-	-	-

Standard errors in parentheses, * p<0.10, ** p<0.05, *** p<0.01

In Table 6, the sample is limited to firms from the cream and cheese industry. Most of the results obtained in table 5 are confirmed. Some differences appear. Results show that authorized firms benefit from a higher probability to export for PDO and other products. For the intensive margin, only PDO products have higher exported values. Authorized firms do not benefit of spill-over for their other products.

Distinguishing the destination markets, we see that PDO products have higher performances both at the extensive and intensive margins. More interestingly, we see that other products from authorized firms have good performance on EU markets. Conversely, on non-EU markets, other products from authorized firms have a lower probability to be exported and the same export values as non-authorized firms. Hence on non-EU markets there is no spill-over effect from PDO for authorized firms.

Restricting the sample to firms in the cream and cheese industry solve the puzzling results on the unit value, as in table 4. Columns (5) and (6) show that PDO products positively impact the unit value, and this is especially the case on the EU markets (the dummy PDO has no impact on non-EU markets). Conversely, the dummy *Other products from authorized firms* has a negative impact on the unit value, and especially on non-EU markets.

Table 6: spill-over effects of PDO on exported value, exported quantity and unit value for firms in the milk and cheese industry

	<i>Extensive margin</i>		<i>Intensive margin (value)</i>		<i>Unit value</i>	
	(1)	(2)	(3)	(4)	(5)	(6)
PDO products	0.65*** (0.04)		0.53** (0.21)		0.09** (0.04)	
Oth product, authorized firms	0.13*** (0.02)		0.19 (0.15)		-0.08*** (0.03)	
PDO product x EU		1.11*** (0.06)		0.47* (0.26)		0.14*** (0.05)
PDO product x non EU		0.36*** (0.05)		0.72** (0.36)		-0.01 (0.06)
Oth product, authorized firms x EU		0.43*** (0.04)		0.44** (0.19)		-0.06 (0.03)
Oth product, authorized firms x non EU		-0.07*** (0.03)		-0.16 (0.22)		-0.10** (0.04)
Added value per worker	0.03 (0.02)	0.02 (0.02)	0.64*** (0.12)	0.64*** (0.12)	-0.04* (0.02)	-0.04** (0.02)
Total sales	0.21*** (0.01)	0.21*** (0.01)	0.18*** (0.03)	0.18*** (0.03)	-0.01* (0.01)	-0.01* (0.01)
FE product NC8-country	yes	yes	yes	yes	yes	yes
Nber Obs.	67760	67760	3200	3200	3200	3200
R ²			0.6	0.6	0.64	0.64
Log like.	-9333	-9248	-	-	-	-

Standard errors in parentheses, * p<0.10, ** p<0.05, *** p<0.01

4 Discussion

Our different estimations show that PDO products benefit from better export performance especially compared to non-PDO products of authorized firms. Comparing authorized firms to non-authorized ones, we also show that authorized firms have better performance than non-authorized ones for all their products (PDO and non-PDO ones). Deepening our analysis we show that this result mainly holds on EU markets. On non-EU markets, non-PDO products of authorized firms do not benefit from any spill-over effect compared to non-PDO products of non-authorized firms.

The results confirm the export competitiveness role of PDO labelling in the French cheese industry. Benefiting from labels allows firms to reach new markets (in particular outside of the EU), to export more in value and quantity. Further investigations are needed, especially regarding the unit value analysis.

Several improvements have to be done. First, the evaluation at the extensive margin has to be extended to non-exporting firms (our current estimation is restricted to firms who export at least once). Second, the comparison of PDO authorized firms with similar non-authorized firms (in the same industry) using data on firms' characteristics has enriched our analysis by understanding the determinants and the impact of PDO labelling at the firm level. The role of PDO labelling appears as different in the whole sample with all firms compared to the reduced sample with firms belonging to the cream and cheese industry. This fact has to be accounted for in the theoretical model. The strategy adopted by firms in the cream and cheese industry appears as specific concerning PDO products. Third, the differences of impact we observed in European and non-European countries have to be developed. And even among European countries, some differences could exist. Some European countries have numerous PDO labels (as Italy) and consumers may be more aware of labels than in some other countries inside Europe. In the same idea, some countries outside the EU also develop their own PDO-type approaches, as Japan for instance. Such countries should also be distinguished from the other.

References

- Chevassus-Lozza E., C. Gaigné and L. Le Mener (2013) Does input trade liberalization boost downstream firms exports? Theory and firm level evidence, *Journal of International Economics* 90(2), 391-402.
- Chevassus-Lozza, E., Latouche, K. (2012). Heterogeneity of firms, heterogeneity of markets and trade costs: access of French exporters to European agri-food markets. *European Review of Agricultural Economics* 39, 257-288.
- Curzi, D., Olper, A., 2012. Export behavior of Italian food firms: Does product quality matter? *Food Policy*. 37(5), 493-503.
- Falvey, R.E. (1979), "The Composition of Trade within Import Restricted Product Categories", *Journal of Political Economy*, 87,1105-1114.

- Hallak, J.C. and Sivadasan, J. (2013), “Product and Process Productivity: Implications for Quality Choice and Conditional Exporter Premia”, *Journal of International Economics* 91, 53-67.
- Kugler, M. and Verhoogen, E. (2012), “Plant, Plant Size and Product Quality”, *Review of Economic Studies* 79, 307-339.
- Lutz, S., Lyon, T.P. and Maxwell, J.W.(2000), “Quality Leadership when Regulatory Standards are Forthcoming”, *Journal of Industrial Economics* 48, 331-348.
- Mayer, T., Melitz M.J., and Ottaviano G. (2014). Market Size, Competition, and the Product Mix of Exporters. *American Economic Review* 104 (2): 495–536.
- Melitz, M. J. (2003), “The Impact of Trade on Intra-Industry Reallocations and Aggregate Industry Productivity”, *Econometrica* 71, 1695–1725.
- Olper, A., Curzi, D. and Pacca, L. (2014), Do Food Standards Affect the Quality of EU Imports? *Economics Letters*, 122, 233-237.
- Olper, A., Pacca, L. and Curzi, D. (2014), Trade, Import Competition and Productivity Growth in the Food Industry, *Food Policy*, 49,71-83.
- Vancauteren, M. (2013a) The Role of EU Harmonization in Explaining the Export-Productivity Premium of Food Processing Firms. In *Frontiers of Economics and Globalization*, vol 12 : Nontariff Measures with Market Imperfections: Trade and Welfare Implication (H. Beladi and K. Choi, eds).
- Vancauteren, M. (2013b). The effect of EU harmonization of regulations on markups: Evidence from the Dutch food processing industry. *European Review of Agricultural Economics* 40(1), 163-189.