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# Export Activity and Productivity Growth: Evidence from French Manufacturing Firms

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# Export Activity and Productivity Growth: Evidence from French Manufacturing Firms

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**Abstract**

Exports are connected with a better performance of firms. The direction of this correlation has been under investigation for more than fifteen years. Evidence so far is clear. More productive firms will self-select into the export market because they can cover the fixed cost of entry. However, entry does not necessarily imply further productivity growth. It is not sure if firms will learn from exporting activity and it seems to depend on some factors not yet clearly specified. This paper investigates the direction of causality between exporting and productivity for French manufacturing firms. After confirming that French exporters outperform their domestic counterparts further findings indicate that more productive firms will join the export market and this entry will determine further growth in productivity at least for the first years of engagement. Eventually, this higher level of productivity growth will vanish. Thus, learning-by-exporting is evident for France but only for limited time.

*Keywords:* self-selection, learning-by-exporting, total factor productivity (TFP), starters, quitters.

## 1. INTRODUCTION

Globalization has a great impact on the global economy and one of the striking effects is the increased internationalization. Every established firm is facing the challenge of internationalization, which means to choose whether to participate in the international market or not. The common ways of achieving internationalization is either by exporting or by doing foreign direct investment (FDI). Exporting is an activity where firms sell their commodities abroad while FDI can be described as an investment and establishment of a new plant to a foreign country. My focus on this thesis will be on exporting and the impact it has on firm productivity. Due to limited availability of data, FDI is out of the scope of my research.

It is the prevalent belief that international trade and openness play a key role in enhancing growth rates. Many policies focus on promoting international involvement of firms, expecting higher returns and productivity gains. History seems to support this perspective as international trade openness in East Asian countries led to radical growth increase and higher levels of welfare (Wei 1993; World Bank 1993). Additionally, empirical evidence has also proved that exporters perform better than non-exporters. In particular, exporting firms are more productive, larger in size, more capital intensive, more technologically sophisticated and pay higher wages (Aw and Hwang 1995; Bernard and Jensen 1995; Aw, Chung and Roberts 2000; Hahn 2004; Fernandes and Isgut 2005). Consequently, all this evidence made researchers wonder what exactly is the factor which makes exporters perform in a better way than non-exporters.

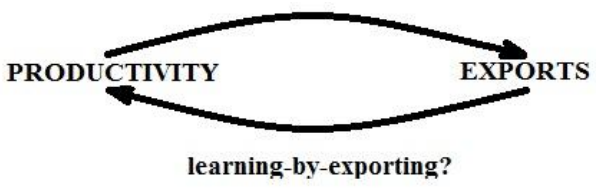
Although all firms face the challenge of exporting there are only some that do export. The explanation behind this is that involvement in exports includes sunk costs (Roberts and Tybout 1997, Clerides, Lach and Tybout 1998; Bernard and Jensen 1999; Girma, Greenway and Kneller 2004; Arnold and Hussinger 2005; Fryges and Wagner 2008). A firm in order to enter the export market needs to cover some extra costs, such as coordination and control costs. If a firm's present value of its profit does not exceed the fixed costs of entry then the firm will have no intention to become an exporter (Girma, Greenaway and Kneller 2004). In terms of academic literature, firms with better performance will *self-select* to export due to their availability to cover the

expenses of entry (Bernard and Jensen, 1999). This self-selection effect could be one explanation of exporter's superior performance relative to non-exporters.

On the other hand, most of the researchers also claim that exporting activity includes some positive externalities towards the exporters, which make them improve their performance (Clerides et al 1998 first and then many others). For example, trade with the international market makes exporters aware of new technology and methods that will eventually enhance their performance. There is a diffusion of knowledge among firms that participate into international trade that makes them more efficient (Hahn 2004). In other words, exporters improve their performance by applying new methods and technology, which they learn by the exporting procedure. This effect is referred to the academic studies as *learning-by-exporting* and based on it, researchers give an additional explanation why evidence shows exporters to perform better than non-exporters.

In theory both self-selection and learning-by-exporting hypothesis seem to be true and consequently the following question generates: Is it the successful performance and the high productivity of firms the factor which leads them to engage in the foreign market or exporting activity enhances firms' performance and leads to success? (self-selection or learning-by-exporting?) Although, there is a probability for both causal effects to hold empirical evidence makes the scenery complex. Researchers tested the direction of causality between exporting activity and performance and the evidence so far gives strong support to the former causal effect while the latter inversed causality remains unclear and vague. Of course there are some studies that support both (Blalock ang Gertler, 2004, Baldwin and Gu, 2003, Girma, Greenaway and Kneller, 2004) or none (Aw, Chung and Roberts, 2000 for Korea) causal effects, but in total self-selection hypothesis is evident in almost all the studies while learning-by-exporting is only supported in a small proportion of them (Wagner, 2007).

**Figure 1: Directions of correlation between productivity and exports.**



Conclusively, in theory both self-selection and learning-by-exporting hypothesis explain the higher performance of exporters compared to non-exporters but in practice the evidence is complex. As Wagner (2007, p. 67) in his study concludes, "after ten years of research in the correlation between exporting activity and productivity the picture that emerges is that exporters are more productive than non-exporters, the more productive firms self-select into export markets, but export orientation does not necessarily leads to higher levels of productivity".

Based on all this research and the fact that there is limited research on this topic for French manufacturing firms, in this study I am testing the direction of causality between exporting and firm productivity for French manufacturing firms. Therefore, I form my research question as follows.

**Research question:** *"Why do exporters in French manufacturing sector outperform non-exporters in terms of productivity? Is it self-selection, learning-by-exporting or both?"*

Namely, I am testing the explanation behind the superior performance of exporters over non-exporters, but first I have to test if there is indeed this kind of evidence for French firms. Similarly to the majority of studies, I find that exporters outperform non-exporters in terms of productivity and I show this evidence in the first place of my results. In the next place, I continue with my research question.

As I afore mentioned, evidence for France is limited and it would be interesting to see the findings for a country with a leading role in exporting activity. France is sixth in the world and second in Europe regarding the export of goods and is a developed country comparable to Germany and USA, therefore I would expect similar results; support of self-selection hypothesis and rejection of learning-by exporting hypothesis.

However, I find evidence for both self-selection and learning-by-exporting for French firms. My results, further indicate that learning effects appear only to the short run after entry for starters while in the long run there is no evidence of learning effects. In my opinion, the main export partners of France that belong to the highly developed group of countries and the fact that the exporting commodities of France are involved

in high R&D which enhances productivity growth can explain the evidence observed for learning-by-exporting effects.

My thesis proceeds as follows. In the next section I am describing the theory behind the correlation of export and firm productivity and I also provide an overview of the existing empirical evidence on other countries. In section 3, I formulate my hypotheses based on my expectations. Section 4 presents some statistics of France that will help me interpret the results. Data and methodology are being analyzed in section 5, while the empirical results of this research are being presented in section 6. Subsequently, I discuss my findings in section 7 and finally, in section 8, I conclude, describing my limitations and giving suggestions for further research and policy implications.

## 2. THEORY

As it is mentioned in the introduction both self-selection and learning-by-exporting in theory explain the observed correlation between exporting and higher firm productivity but in practice evidence is more complex. In this section, theory and empirical results for both those effects will be described in order to give an overview of what are the factors that influence the empirical evidence. Table 1 in the Appendix summarizes the findings of a large proportion of studies till the present. As we can see and as I have already mentioned in the introduction, while self-selection appears to gain strong support, learning-by-exporting seems quite problematic.

### 2.1. Self-selection

In their pioneering work Clerides, Lach and Tybout (1998) and Bernard and Jensen (1999) were the first that investigated the rationale of export and productivity correlation. In their theory this correlation is half explained by the self-selection hypothesis. Efficient firms self-select to export because they can afford the fixed costs that an entry to the export market includes. Roberts and Tybout (1997) proved in their study that the sunk costs of entry are not zero and they further elaborate that these costs depend on the export experience of a firm, as well as the size of a plant, the location and other plant characteristics. For example, a firm in a remote area far away from trade centers will have to cover extra transportation costs compared to an established firm located in a trade center. Additionally, some researchers distinguish which are the main expenses for an entry to the international market. Thus, apart from the transportation costs, the range of entry costs consist of distribution or marketing costs, the cost of training personnel in order to be able to operate in the foreign market or the costs of modifying products in consistence with the foreign consumers' needs (Wagner 2007, Fryges and Wagner 2008). These costs cannot be overcome by less productive firms and therefore they act as an entry barrier.

Based on Bernard and Jensen (1999) a firm exports, $Y_{it}$=1, if current and expected revenues are higher than costs,

$$Y_{it} = \begin{cases} 1 & if\ \hat{R}_{it} > c_{it} + N\ (1 - Y_{it-1}) \\ 0 & otherwise \end{cases}$$

where $\hat{R}_{it}$ are the revenues of firm i today and any discounted increase in the value of the firm in the future from exporting today, $c_{it}$ denotes the cost of production today and N is the sunk cost that the firm must pay if it did not export the previous year, $Y_{it-1}=0$.

Both Clerides et al (1998) and Bernard and Jensen (1999) conclude that it is the "good" firms that choose to export and empirically they find that this is the only explanation of the causal effect between exports and productivity. In other words, they state that more efficient firms self-select to export and it is the only reason why they have a better performance contrary to non-exporters.

In addition to those studies, Melitz (2003) as well as Bernard, Eaton, Jensen and Kortum (2003) and Melitz and Ottaviano (2008) by developing a dynamic industry model with heterogeneous firms showed that only more productive firms will enter the export market while some less productive will serve the domestic market and the least productive firms will be forced to exit the industry. This happens because as the industry exposure to trade increases there is a resource reallocation towards the more productive firms that will force the less productive firms to serve only the domestic market or exit.

Apart from Clerides, Lach and Tybout (1998) and Bernard and Jensen (1999) who first investigated self-selection hypothesis, it has also gained support from the majority of the subsequent literature. Roberts and Tybout (1997) for Colombia, Bernard and Wagner (1997, 2001) for Germany, Aw, Chung and Roberts (2000) for Taiwan, Castellani (2002) for Italy, Delgado, Farinas and Ruano (2002) for Spain, Baldwin and Gu (2003) for Canada, Blalock and Gertler (2004) for Indonesia, Hahn (2004) for Korea, Girma et al (2004) for UK, Van Biesebroeck (2004) for sub-Saharan Africa, Bernard and Jensen (2004a) for USA, Arnold and Hussinger (2005) for Germany and Bigsten and Gebreeyesus (2009) for Ethiopia are many of the studies that found supportive evidence on self-selection hypothesis. In extension to these studies, Kimura and Kiyota (2006) find that the most productive firms in Japan engage in exports and FDI, medium productive firms get involved in either exports or FDI and the least productive firms serve only the domestic market.

Here it is worth mentioning that self-selection to export activity is empirically approved for almost all the countries and it does not depend on any factor, such as the

economic state of the country or the level of exporting activity. In other words, self-selection hypothesis is valid not only for developed but also for developing countries, for countries with a large volume of exports as well as for countries with small exporting power.

Some of the empirical evidence that does not support the self-selection hypothesis are those of Bigsten et al (2004) for African firms and Aw, Chung and Roberts (2000) for Korea. In the first case, the authors find little evidence for self-selection in African countries but as they explain "this may be due to the co-linearity between some of the regressors in the export probit" (Bigsten et al 2004, p.133). In the second case, the explanation that the authors give, for not supporting self-selection hypothesis is that in the middle 80's in Korea the entry costs to the export market decreased significantly while there have been documented governmental investment subsidies towards firms, making entry to the export market a less risky decision. This clearly indicates that Korean producers were less likely to base their decision on productivity when considering to enter the foreign market. They had to be concerned mostly about other factors such as their access to financial resources and how to approach foreign customers instead of improving their productivity. However, those findings are in contrast to Hahn (2004) who finds supportive evidence for self-selection when testing different time period for Korean manufacturing firms. As he states, apart from the different time periods another reason that explains the contradicting results could be the different data set employed. In contrast to Aw, Chung and Roberts (2000) who used data for single years (1983, 1988, 1993), Hahn (2004) used annual panel data that helped him follow more closely the exporting history of plants and to observe important changes that occur during the entry or the exit from the export market.

While self-selection seems to be an explanation of the evidence that exporters are more productive and they present a better performance relative to non-exporters, it does not necessarily explain this effect by itself. Theoretically, a further explanation of this higher performance could be that entrants in the export activity are being benefited by their trade with international markets and consequently they generate higher productivity (Clerides et al 1998). This effect, referred in the literature as learning-by-exporting, is described next.

## 2.2. Learning-by-exporting

Arrow (1962) in his academic work stated that workers are capable to increase their productivity just because they repeat the same action. He refers to that as learning-by-doing and it is quite similar to learning-by-exporting approach that I am testing here. Firms that engage to more demanding foreign markets will eventually improve their performance simply because they have a frequent deal with them. In the academic literature learning-by-exporting is the effect where firms gain knowledge by their engagement into international trade and as a consequence they improve their performance.

In theory, learning-by-exporting was first developed and tested by Clerides et al (1998) who explained that there are external benefits to firms acting in the international trade. As they state there is either a diffusion of knowledge or an improvement in international transport and export support services that makes firms participating in the export market become more productive. They came up with this term just because they wanted to test if there are any productivity benefits for the firms after their entry in the foreign market. Although based on their theory, learning hypothesis looked realistic, their results give no evidence of learning-by-exporting for Colombia, Mexico and Morocco. However, they realize that a firm belonging to an export-intensive industry or region is more likely to become an exporter and that firms in export-oriented regions enjoy lower costs of production regardless the industry orientation.

In extension to Clerides et el (1998), some authors developed additional theories stating that the direction of exporting to higher productivity can be explained by two ways. Firms become more productive as they export either because they have to undertake stringent technical standards to satisfy more sophisticated consumers, they participate in more competitive markets and they are becoming more aware of new technology and methods transforming inputs into outputs or increased openness initiates a process in which resources are reallocated in favor of exporting firms which are more productive than non-exporters (Fernandes and Isgut 2005, Arnold and Hussinger 2005). My focus is on the first channel which explain the learning effect.

Moreover, many authors argue that especially in the developing countries the diffusion of knowledge is even more beneficial as there is more space for information

spillovers and they further suggest that exporting firms in those countries face a more competitive environment which in turn leads in productivity improvements. Although in theory learning-by-exporting seems to be a realistic explanation of why exporting firms are more productive than non-exporters, in practice evidence is rather weak. Only few studies have given support for learning-by-exporting hypothesis, even after controlling for self-selection effects.

Kraay (1999) finds that past exports led to significant improvement in productivity of Chinese enterprises. These learning effects were more pronounced for established firms while for new entrants to the export market the effects were insignificant and occasionally negative. However, they are not sure about the origins of learning effects. Their question is: Do firms improve their production procedure or they simply learn to be better exporters?

Castellani (2002) comes to an interesting result regarding the Italian manufacturing firms, where the productivity growth depends on firms' export intensity and not simply on their presence in export market. In other words, the more export oriented is a firm the higher the productivity growth. Firms with a marginal involvement in the international trade do not get productivity benefits. Moreover, Castellani (2002) concludes that productivity growth is influenced not only by the export activity of firms but also by the infrastructure of them. Smaller firms and firms in less advanced areas might be less capable to receive the knowledge that comes from foreign markets and consequently they have less productivity gains compared to more privileged firms established in big trade centers. Interestingly here, a developed country reveals learning-by-exporting evidence.

Furthermore, Bigsten et al (2004) by applying a flexible approach that models unobserved heterogeneity, found supporting evidence on learning-by-exporting hypothesis for African firms. As they mention, exporting impacts positively on productivity and in their study they also suggest that following a bivariate normal distribution similarly to previous studies is an incorrect assumption that leads to insignificant results. As they suggest this is why in these studies the causality of exporting to efficiency is only explained by the fact that it is the low-cost producers that choose to engage in export activity.

Van Biesebroeck (2005), in line with Bigsten et al (2004), found similar results for sub-Saharan African firms. Exporters increase their productivity advantage after they start exporting. Notably, both studies refer to a competitiveness gap and productivity gap that does not allow the domestic market to grow in those African countries. Domestic expand is limited and only exporting can solve the lack of demand that many firms face in the domestic market. Exporting firms not only present a higher productivity advantage but also show a higher rate of productivity growth.

Additionally, Bigsten and Gebreeyesus (2009) found supportive evidence for learning-by-exporting investigating a ten year period dataset of Ethiopia. As they claim, previous research for African countries (referring to Bigsten et al (2004) and Van Biesebroeck (2005)) was based on an only three year period dataset limiting the validity of identified learning effects, and therefore their study makes evidence stronger. They find evidence of productivity gains both for the years before and after entry with a remarkable jump in the year of entry. However, only 5% percent of the manufacturing firms participate in the export market indicating that there are high entry barriers to be faced in the decision to export.

Baldwin and Gu (2003) findings shed more light to the learning hypothesis. Their results indicate that apart from the self-selection there is also evidence for learning-by-exporting for Canadian manufacturing firms. Entrants have presented faster labor productivity growth prior to entry compared to their domestic counterparts and beyond export activity further increased their productivity growth. However, this learning effect differs across firms. They further found that domestic-controlled and younger firms appear greater productivity gains when entering the export market relative to foreign-owned and large firms. Similarly to Castellani, they also result that export intensity affects the productivity gains for exporters. Here, due to the specification of my research on French firms, it is important to mention again the appearance of learning effects for a developed country.

In contrast to Aw, Chung and Roberts (2000) that found no evidence of self-selection and learning-by-exporting on Korean manufacturing plants, Hahn (2004) gives support to both those hypothesis. According to Aw, Chung and Roberts the explanation lies on the fact that during the period they are testing (late 1980's) the manufacturing expansion had already taken place and knowledge has already been

acquired and disseminated. Additionally, they argue that knowledge gained from exporting experience is not only diffused to exporting firms but also to non-exporters through labor mobility. As a result, productivity gains are not visible when comparing those groups. Nevertheless, Hahn (2004) findings show that more productive firms self-select to export and once they enter the export market they have further productivity gains. The explanation he gives for the contradicting results with Aw, Chung and Roberts (2000) is the different dataset employed. As I have already mentioned in the previous chapter Hahn (2004) uses annual panel data that give him room to make better comparisons and observe changes occurring during entry or exit of a firm from the export market. He also goes one step further and finds that there are also increasing levels of shipments and employment for exporting firms. Policies in Korea that enhance international openness should be combined with resource reallocation policies in order to exploit the productivity gains by international trade. Overall, as he states "the benefits from exporting have been realized not only through resource reallocation channel but also total factor productivity (TFP) channel in Korea" (Hahn 2004 p. 25).

Girma, Greenaway and Kneller (2004) evidence of learning-by-exporting for UK firms is an additional evidence for learning effects on developed countries. Based on their predictions they did not expect to find such evidence for UK firms. However, Girma et al (2004) came across an interesting result, supporting learning-by-exporting hypothesis. As they state, their findings are opposed to the prevalent outcomes for developed countries but they blame both their novel matching analysis as well as the underlying structural differences of UK relative to other developed countries for that findings.

Similar results supporting learning-by-exporting are found by Blalock and Gertler (2004) regarding Indonesian manufacturing plants. They explain that firms in less developed countries have much more to gain from their exposure to international export markets stating that learning effects are more evident for this category of countries.

In addition, Fernandes and Isgut (2005) found robust evidence on learning-by-exporting for young Colombian manufacturing plants and they also suggest that there are differences between industries depending on the destination country and the

export intensity. In particular, exports to high income countries and industries with a larger volume of exports are the key factors for learning effects and they further suggest that young plants are more likely to have productivity gains from exporting relative to old plants. Notably, this result comes in contrast to Clerides et al (1998) who found only evidence for self-selection for Colombian firms using the same time period of data. They do not refer to this different outcome, but I suppose that the use of different methodology led to this unexpected result.

De Loecker (2005) using matched sampling techniques and controlling for the self-selection into export market of Slovenian manufacturing firms, finds that export entrants become significantly more productive once they start exporting than non-exporters. Taking under consideration that the period he is testing (1994-2000) coincide with the liberalization of the Slovenian market after the communistic regime the results are not surprising. As he suggests, there was a remarkable increase of exporting activity due to the lack of demand in the domestic market, that led to a good economic performance of Slovenian economy during the period tested. In line with some other researchers he also realizes that productivity benefits are more pronounced for firms exporting towards high income regions.

When investigating for German manufacturing firms, Fryges and Wagner (2008) found that exporting improves labor productivity growth but only within a sub-interval of the range of firms' export-sales ratio. Their findings indicate that the latest years labor productivity is falling below the expected growth rate of non-exporting firms. They explain that, perhaps the increased recent transaction of firms with more distant and less developed countries like India or China is the reason of this fall. Those markets incur increased costs without necessarily providing learning effects and for that reason, the authors suggest that there is an optimal level of export-sales ratio leading to an inverted U-shaped relationship between export intensity and labor productivity growth. Sullivan (1994b) first named it as "threshold of internationalization".

In contrast to those studies there are many others that reject the learning-by-exporting hypothesis. Clerides et al (1998) for Colombia, Mexico and Morocco, Bernard and Jensen (1999) for US, Aw, Chung and Roberts (2000) for Korea and Taiwan, Delgado, Farinas and Ruano (2002) for Spain, Bernard and Wagner (1997) and Arnold and

Hussinger (2005) for Germany are just some of them. In addition to these studies, Dogan, Wong and Yap (2011) are coming across some quite interesting results. While the previous empirical evidence just rejects the learning-by-exporting hypothesis they realize that entrants to export market and established exporters have a negative effect on sector productivity of Malaysia. Surprisingly, continuous non-exporters revealed a positive effect on productivity growth explained by within-firm productivity growth and the reallocation of resources in favor of them. However, their result indicate that entrants were overall more productive than both domestic oriented firms and established exporters although non-exporters made the most significant contribution to productivity growth. Conclusively, the main conclusion is that the direction of exporting to productivity is not clear yet and it needs further investigation.

Several explanations can be given in order to explain why there is no conclusive result about learning-by-exporting evidence so far. As Fernandes and Isgut (2005) suggest, in order to capture learning-by-exporting effects one has to compare the performance of mutually exclusive groups, such as exporters and non-exporters. However, firms that are exporting are not necessarily excluded by the domestic market. In particular, there are many firms that give priority to the domestic markets while they engage to the foreign markets only marginally, therefore an inclusion of those firms in the sample does not give reliable results (Fernandes and Isgut, 2005,). Furthermore, as they state, measurements of export participation do not capture the level of engagement of firms nor how long firms have been into the export markets. While entrants may appear to have learning effects, successfully established firms are less likely to learn from exporting, as they are already aware of new technology. These suggestions clearly indicate that there are many firms whose presence in the group of exporters is likely to generate a downward bias in the learning-by-exporting effect and this could be a reason of the non-strong supporting evidence.

Similarly to the above mentioned suggestions, many authors state that more developed countries will not have the same performance benefits from export activity compared to less developed countries. The majority of the academic literature that gives support to the learning-by-exporting hypothesis concern developing or under-developed countries. The explanation behind this is that exporters in less developed countries benefit from trading with developed countries because there is more space of knowledge diffusion towards the less advanced countries. For example, firms in

sub-Saharan countries trading with developed countries, are expected to have more productivity gains compared to US firms, as they have limited knowledge before they enter the international market. However, there are studies testing high developed countries that have given support to learning-by-exporting hypothesis, as for example Girma et al (2004) for UK. Perhaps, there are some additional factors that may affect the export premium of firms in terms of productivity for some countries or different methodology may also lies behind those differences. This makes the scene even more vague and make me wonder if there are indeed cross-country differences or it is the different methodology that excuses the different empirical results.

Another interesting point that may explain the weak support of learning-by-exporting hypothesis is that non-exporting firms may be benefited by the regional spillovers that occur by exporters (Fryges and Wagner, 2008). In this case, non-exporters appear to have productivity gains caused by positive externalities or backward linkages in the intra-country market. Thus, comparing those firms with exporters in order to obtain productivity gains that explain the learning effect it is likely to result in no remarkable differences. However, this approach shows that the gains from international trade are beneficial in a multiple way for countries, therefore policies would promote a more intense exporting activity.

Apparently, learning-by-exporting seems to be unclear whether it explains the correlation between exports and productivity. While in some studies it is rejected in some others evidence is supportive. In the next section, my hypotheses are being formulated based on my predictions.

## 3. HYPOTHESES

After all this theoretical analysis and the empirical evidence I described in the previous section and provided that I am investigating the direction of causality between exporting activity and firm productivity for French manufacturing firms, in this section I am formulating my hypotheses based on my expectations.

In order to test the direction of causality between exports and productivity I first need to find if there is a correlation between those two factors, for French manufacturing firms. In other words, for the test of self-selection and learning-by-exporting effects, I first have to prove that there is evidence of superior performance for exporters relative to non-exporters in terms of productivity. As it has already been mentioned, previous evidence shows that exporters appear to have better performance compared to their domestic counterparts. In particular, they are more productive, larger in size, more capital intensive, more technologically sophisticated and pay higher wages than non-exporters. Evidence is clear for the majority of the countries and it does not depend on any specific factor. Thus, I would expect to observe that French manufacturing exporters are more productive than the domestic oriented firms and this brings me across my first hypothesis.

***Hypothesis N$^{o}$ 1****: Exporting manufacturing firms are more productive than non-exporting firms.*

In extension of my first hypothesis I will further test for productivity differences among different groups of exporters. More specifically, I want to detect differences between established exporters, starters in the export market, and non-exporters.

In the next place of my research, I am testing the direction from productivity to exporting. Based on the academic literature, self-selection hypothesis has gained big support from most of the existing studies as an explanation of exports and productivity correlation. More specifically, evidence shows that firms with higher productivity will self-select to the export markets because they are capable of covering the sunk costs of entry. Previous literature is limited for France, but since

these findings hold for most of the countries investigated and provided that there is no discrimination among countries for the self-selection effect, I would expect to obtain resembling evidence. In particular, I will try to find the ex-ante productivity advantage for future exporters before entry and subsequently how a change in non-exporters productivity would affect their decision to export. All being equal, I would expect that French firms in the manufacturing sector appear to be more productive the years before entry relative to the control group (non-exporters) and that a positive change in productivity of non-exporters would increase the chances of their decision to export. Taking into account all the factors and my expectations, I formulate my second hypothesis as follows.

***Hypothesis N$^o$ 2****: More productive manufacturing firms will self-select into the export market.*

In the last place of my study, I will investigate the inversed direction of causality from exporting activity to productivity. Learning-by-exporting in theory seems realistic but empirical evidence has came across ambiguous results. The prevalent belief is that firms in less developed countries have more chances to be benefited by externalities in the international trade as there is more space for knowledge diffusion. Even if this is true it does not necessarily mean that developed countries have nothing to win. Evidence has shown that there are examples of learning effects for developed countries like Italy, Canada, UK, and Germany [1]. However, there is also evidence for rejecting this hypothesis for USA, Germany and Spain [2] and thus the overview is becoming unclear and my predictions harder.

In order to get my results I will test the productivity growth after the entry for new entrants relative to the control group (non-exporters) for different time-spans. In my study, I am basically following the methodology of Bernard and Jensen (1999) who found no evidence on learning-by-exporting hypothesis when investigating USA and

[1] Castellani (2002), Baldwin and Gu (2003), Girma et al (2004) and Fryges and Wagner (2008) respectively.

[2] Bernard and Jensen (1999, 2004a) for USA, Bernard and Wagner (1997, 2001) and Arnold and Hussinger (2005) for Germany and Delgado, Farinas and Ruano (2002 for Spain).

due to the prevalent belief that developed countries do not learn by foreign activity, I would expect to find no supportive evidence for learning effects. Therefore, I come across my last hypothesis which is formed below.

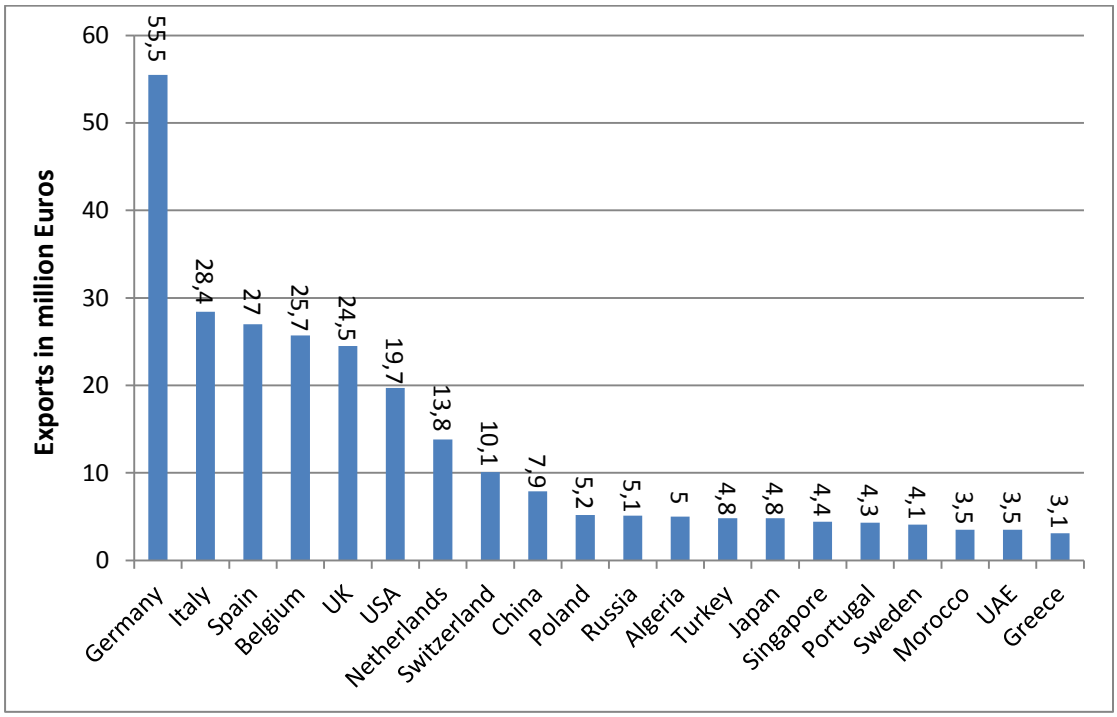
***Hypothesis N$^o$ 3**: Presence in the foreign market does not make manufacturing firms more productive relative to non-exporters, i.e. French manufacturing firms do not learn by exporting.*

Before moving to my methodology and the results, I first give an overview of the French economy and the exporting history of the country. There are some interesting factors that have to be considered when interpreting the results as they may have an impact on the export decision.

## 4. FRANCE AND EXPORTS

France has long been one of the leading economies in the world. As of 2010, it is the World's fifth and Europe's second largest economy based on nominal GDP[3]. Regarding exporting, France appears high in the rankings; sixth in World's export of goods (second in Europe after Germany) and fourth in global services exports. In addition, it holds the second place for foreign direct investment (FDI), both inward and outward. The main export commodities of France are machinery and transportation equipment, aircraft, plastics, chemicals, pharmaceutical products, iron and steel, beverages and wines. Moreover, France's main international partners are Germany 15.9%, Italy 8.2%, Spain 7.8%, Belgium 7.4%, UK 7%, US 5.7% (2009)[4]. Figure 2 shows the export partners of France and exports in million Euros.

**Figure 2. France's partners and exports in million Euros (2009)**




*Source: www.insee.fr* [5]

[3] World Development Indicators database, World Bank, 1 July 2011
[4] The World Factbook, CIA, 2010
[5] http://www.insee.fr/fr/themes/tableau.asp?reg_id=0&ref_id=NATTEF08457ï¿½&page=graph

Two things emerge, France's export partners are mainly highly developed countries and the main export commodities are involved in high R&D levels. Perhaps these factors give France a competitive advantage for future engagement in the international trade and they may also explain the oncoming results.

## 5. DATA AND METHODOLOGY

In this chapter I will present the data I use and the methodology I follow in order to reach my results. In particular, I will describe the data and the way I use them, the reasons I followed this particular methodology, the variables I used and the model sampling. By this, I will give you an overview of my research and a deeper insight of my thoughts. In the first place, in my thesis I use both OLS and Levinsohn-Petrin (2003) algorithm in order to estimate total factor productivity (TFP) which is the way I measure firm productivity. In the second place, I follow Bernard and Jensen (1999) methodology and I also add some extensions in order to test my hypotheses.

### 5.1 Data

Unconsolidated data from Amadeus are being employed. They include information of 84.946 French manufacturing firms for a 9 years period (1999-2007). The Amadeus database was generated by Bureau van Dijk and includes data for 14 million listed and non-listed firms across Europe. This information concerns financial variables such as turnover, export turnover, material cost, number of employees, cost of employment and tangible fixed assets as well as information about the region, the company name and the industry (measured by the 2 digit NACE classification[6]).

Moreover, EUKLEMS database[7] is used for the deflation of some variables that I use to estimate total factor productivity (TFP) in my model as well as deflating data from IMF[8].

### 5.2 Total Factor Productivity estimation

In order to measure the productivity of firms and to make any comparison I estimate total factor productivity (TFP). Also known as Solow residual, as he was the one that employed this term (Solow, 1957), TFP is a variable which accounts for effects in

[6] NACE is an EU classification framework of economic activities. The NACE 2 classification is used for the industry classification in this study, which in 2008 was first introduced by the European Commission.

[7] The EUKLEMS database includes data on several economic measures at the industry-level for EU countries.

[8] The International Monetary Fund (IMF) is an organization of 187 countries. IMF publishes a range of time series data on IMF lending, exchange rates and other economic and financial indicators.

production not caused by inputs. In particular, taking into account all the inputs in the production function TFP measures the productivity occurred by exogenous factors. For example the technological change, the weather conditions or even the expertise of the employees/workers. By the econometric point of view, TFP is obtained as the residual in the functional relationship and it is the most appropriate way to measure productivity, especially in my case. Mainly because I look for differences in productivity occurred by the export activity, taken inputs as granted.

Before I start with the estimation of total factor productivity I had to deflate my variables. Since my data consist of values measured in Euros and due to the fact that I have time series panel data, changes in price levels will distort my results while making comparisons across time periods. Therefore, values have to be adjusted to a reference year using the price of an appropriate deflator. In my case, I set as reference year the year 1995. Turnover is being deflated by the gross output price indices, material cost is deflated by the intermediate output price indices and tangible fixed assets are being deflated by the GDP deflator[9].

In line with Van Beveren (2010) I start by assuming the Cobb-Douglas production function:

$$Y_{it} = A_{it} K_{it}^{\beta k} L_{it}^{\beta l} \quad (1)$$

where $Y_{it}$ denotes the value added of firm i in period t, $K_{it}$ and $L_{it}$ are inputs of capital, and labour, respectively, while $A_{it}$ represents the Hicksian neutral efficiency level of firm i in period t. In contrast to $Y_{it}$, $K_{it}$ and $L_{it}$ that are observable inputs, $A_{it}$ variable is unobservable to the researchers. Taking the natural logs of equation (1) I form a linear production function

$$y_{it} = \beta_0 + \beta_k k_{it} + \beta_l l_{it} + \varepsilon_{it}$$

where the y, k and l represent the natural logarithms and

$$ln\,(A_{it}) = \beta_0 + \varepsilon_{it}$$

[9] Gross output and intermediate inputs prices indices are taken from EUKLEMS database. GDP deflator is taken from IMF file.

$\beta_0$ is the mean efficiency level across firms and over time and $\varepsilon_{it}$ is the time- and producer-specific deviation from that mean.

Further decompose of the error term into observable and unobservable component gives

$$y_{it} = \beta_0 + \beta_k k_{it} + \beta_l l_{it} + \upsilon_{it} + u_{it}^q \quad (2)$$

where,

$$\omega_{i\,t} = \beta_0 + \upsilon_{it} \quad (3)$$

denotes the firm-level productivity and $u_{it}^q$ is an i.i.d. component, that represents the unexpected deviations occurred by external factors.

In this thesis I calculate total factor productivity using the variables number of employees and the deflated values of turnover, material cost and tangible fixed assets. First, value added is calculated as the difference of deflated turnover and deflated material cost and then using the OLS regression I estimate equation (2) using the log of value added ( $y$ ), log of employees ( $l$ ) and the log of deflated tangible fixed assets ( $k$ ). TFP are the residuals values of this regression. Here, it is important to say that each estimation was made separately for each of the 21 industries included in my dataset.

Estimating equation (2) under OLS several issues may occur. This method requires that the inputs in the production function are exogenous or, in other words, determined independently from the firm's efficiency level (Van Beveren, 2010). However, productivity and input choices are likely to be correlated and this may lead to a simultaneity or an endogeneity problem (Marschak and Andrews, 1944). If at the time of input decisions the firm has already prior knowledge of $\omega_{it}$, endogeneity arises because the prior knowledge about productivity will (partly) determine the input quantities (Olley and Pakes, 1996). For example, in case of a positive shock, increased use of labor will result in an upward bias in the labor coefficient (De Loecker, 2007). Consequently, measurements of total factor productivity under OLS will be downward biased in labor intense seasons. In addition, in the presence of

simultaneity issues, it is generally hard to predict the direction of bias in the capital coefficient.

Some studies introduce fixed effects and instrumental variables to overcome the simultaneity problem (Griliches and Mairesse 1995, Olley and Pakes 1996 and Levinsohn and Petrin 2003). Olley and Pakes (1996) have developed a consistent semi-parametric method solving the simultaneity problem by using the firm's investment decision to proxy for unobserved productivity shocks. Alternatively to Olley and Pakes (1996), Levinsohn and Petrin (2003) rely on intermediate inputs. The condition of OP requires that investment increases in productivity, but due to the fact that investment does not happen in every year this may lead in loss in efficiency. For that reason LP use as proxy the intermediate inputs that can better reflect the productivity socks. In my case, I follow LP algorithm and I use the material input as a proxy to control for unobserved productivity socks when estimating total factor productivity.

Intermediate inputs (materials in my case) can be presented as a function of productivity and capital: $m_{it} = m_t (k_{it}, \omega_{it})$. This function can be inverted in order to express the unobserved productivity, taking into account that intermediate inputs (capital) are monotonically increasing in $\omega_{it}$: $\omega_{it} = s_t (k_{it}, m_{it})$, Under these assumptions the following equation is obtained:

$$y_{it} = \beta_0 + \beta_k k_{it} + \beta_l l_{it} + s_t (k_{it}, m_{it}) + u_{it}^{q} \qquad (4)$$

where $m_{it}$ denotes the value of deflated material cost of firm i in year t. Similarly with OLS case, here, I use the log value added as dependent variable and the logged values of employees, deflated material cost and deflated tangible fixed assets as free, proxy and capital components when running the LP regression. Next, I estimate the total factor productivity separately for each 2-digit nace industry which are the residual values of this regression.

As I expected, estimations of the above functions using OLS and Levinsohn and Petrin methods resulted in different coefficients for capital and labor and consequently differences in TFP. The table below shows the differences and as it is observed in case of OLS there is a downward bias in the TFP values.

**Table 2: TFP differences between OLS and LEVPET**

| Variable | Obs | Mean | Std. Dev. | Min | Max |
|---|---|---|---|---|---|
| **TFP_OLS** | 329074 | 3.880296 | 0.6410288 | -6.007263 | 10.86457 |
| **TFP_LevPet** | 329074 | 4.817438 | 0.8312227 | -4.04275 | 12.76292 |

Furthermore, the correlation between those two variables appears to be quite high, in line with what I expected to find.

**Table 3: TFP correlation**

| Correlation | TFP_OLS | TFP_LevPet |
|---|---|---|
| **TFP_OLS** | 1 | 0.6840 |
| **TFP_LevPet** | 0.6840 | 1 |

### 5.3. Methods and Modeling

In this paragraph I will present the models and the methodology behind them. I categorize this paragraph in three sub-paragraphs for my three hypothesis.

#### 5.3.1. Exporters vs. Non-exporters

In order to test my 1st hypothesis I follow Bernard and Jensen (1999) methodology and I adjust the models based on my dataset and conditions. Initially, I will test my hypothesis regarding productivity premium of exporters over non-exporters by comparing the total factor productivity of those two groups. Bernard and Jensen (1999), due to some peculiarities with their data, made comparisons for 3 different years (1984, 1987, 1992), but in my case I will apply my test for the whole nine year period controlling for industry, years and employment. The model I use in order to test my hypothesis is:

$$ln\ Y_{it} = a + \beta\ Export_{it} + \gamma\ Industry_i + \delta\ year_t$$

$$+ \theta\ log\ (employment_{it}) + \varepsilon_{it} \qquad (5)$$

where $Y_{it}$ is the TFP of a firm i in year t, $export_{it}$ denotes the export status of the firm i in year t and is equal to 1 if export turnover is higher than zero, $industry_i$ and $year_t$ are dummy variables controlling for industry and year and $employment_{it}$ is a control variable measuring the number of employees. Here, I am interested in the coefficient β of the *Export* variable, which denotes the average percentage difference of productivity between exporters and non-exporters in the same industry.

Moreover, I want to investigate the differences in productivity between different groups of exporters. Therefore, I categorized exporters in three groups based on their export status; continuous exporters who have been exporting for all nine years of observations, never exporters who have no export participation in the tested years, and starters who started exporting and they continue export for the following years. In this case the control group is never exporters and my model is:

$$ln\ Y_{it} = a + \beta_1\ Starters_{it} + \beta_2\ Continuous_{it} + \gamma\ year_t$$

$$+ \delta\ Industry_i + \theta\ log\ (employment_{it}) + \varepsilon_{it} \qquad (6)$$

where $Y_{it}$ is the TFP of a firm i in year t, $Starters_{it}$, $Continuous_{it}$ and $Quitters_{it}$ indicate the different groups of exporters, $industry_i$ and $year_t$ are industry and year dummies and $employment_{it}$ is measured by the number of employees. The coefficients $\beta_1$ and $\beta_2$ will indicate the productivity advantage or disadvantage for each group relative to non-exporters and the productivity differences among those groups. TFP is represented either by OLS estimation or by LevPet and regressions are made with and without the *employment* variable.

### 5.3.2. Self-selection

In order to test my 2nd hypothesis for the self-selection I follow again the Bernard and Jensen (1999) methodology. In theory good firms self-select to export because they can afford the extra costs included when engaging to the export market. Therefore, I

will test how an increase in productivity would affect the decision of a non-exporter to get involved in the export market.

According to Bernard and Jensen (1999), in order to test this and to avoid problems with unobserved plant heterogeneity I employ a linear probability specification with fixed effects for the following model.

$$Y_{it} = \alpha + \beta\, TFP_{it-1} + \gamma\, Y_{it-1} + \delta\ \ ln\ employment_{it} + \kappa_i + \varepsilon_{it} \qquad (7)$$

where $Y_{it}$ is the export dummy equal to 1 if the export turnover is higher than 0, $TFP_{it-1}$ is the lagged firm productivity of firm i in year t, $Y_{it-1}$ is the lagged export status indicating if a firm was exporting in the previous year and $employment_{it}$ is a control variable measuring the number of employees. Independent variables are lagged one year to avoid simultaneity problems.

However, due to the fact that lagged regressors and specification with fixed effects may be biased and inconsistent, I estimate the linear probability models in first differences indicated below

$$\Delta Y_{it} = \alpha + \beta\, \Delta TFP_{it-1} + \gamma\, \Delta Y_{it-1} + \delta\ \ \Delta\ ln\ employment_{i\tau} + \varepsilon_{i\tau} \qquad (8)$$

where all indicators denote first differences of the variables indicated in the previous model.

To further investigate the self-selection hypothesis, I will make a comparison in productivity between firms that start export and firms that never exported. This comparison will be made for the initial years before the entrance in the export market. Bernard and Jensen (1999) split up their time series dataset in two periods explaining that in the last years of their observations there was a boom towards exporting activity that may lead to biased results. In my case, I will treat my data as a whole nine years period and I will mark year T=2004 as the year of start exporting and then keep on going in the export market. In particular, I mark as starters the firms that start exporting in 2004 and they keep on exporting till 2007 which is my last year of observations. Comparisons are made for the initial years before exporting and only

between starters and never-exporters. I start by considering systematic differences in the pre-export levels of plant characteristics by running

$$ln\ Y_{i0} = a + \beta\ Export_{iT} + \gamma\ Industry_i + \delta\ ln\ employment_{i0} + \varepsilon_i \qquad (9)$$

where $Y_{i0}$ is the total factor productivity of firm i in initial year, $Export_{iT}$ is an export dummy indicating the status of the firm the year T (2004), $Industry_i$ is a vector of the 2 digit industry dummies and $employment_{i0}$ is a control variable of the number of employees in the initial year. Tests will be made for three years separately (1999,2000,2001). The coefficient β on the export dummy measures the export premium for future exporters the initial years before beginning to export.

In the second place, I want to see how future exporters perform in the run up to enter the foreign market and I will test this by comparing the estimated average productivity growth of starters and never exporters for the years 1999-2003. Model 10 shows the form of my regression.

$$\Delta lnY_{iT-1} = \alpha + \beta\ Export_{iT} + \gamma\ Industry_i + \delta\ \ ln\ employment_{i0} + \varepsilon_i \quad (10)$$

where $\Delta lnY_{iT-1}$ denotes the annual average growth rate of productivity between the first year and year T-1, $Export_{iT}$ is an export dummy denoting starters ($Export_{iT}$=1) if they start export in 2004 or non-exporters ($Export_{iT}$=0), $Industry_i$ is a variable controlling for industry and $employment_{i0}$ denotes the number of employees. In this case, coefficient β of export dummy will give me an overview of how faster exporters grow compared to their domestic counterparts for the years before the entry to the international market. I execute this test for the period 1999-2003 and I alternate $employment_{i0}$ in my model. TFP is represented either by OLS estimation or by LevPet similarly to previous cases.

### 5.3.3. Learning-by-exporting

Based on theory, firms tend to perform better after they enter the international market because they participate in a market that either forces them to become more competitive or provides them some external benefits. However, the scene is not clear regarding the empirical evidence. In this sub-paragraph I will explain how am I going

to test this hypothesis for France, basing my methodology again on Bernard and Jensen (1999). According to them the cleanest test of the effects of exporting on plant outcomes can be found by regressing the change in a performance measure on the export status.

$$\Delta lnY_{iT} = \alpha + \beta\, Export_{i0} + \gamma\, Industry_i + \delta\, employment_{i0} + \varepsilon_{iT} \quad (11)$$

where $\Delta lnY_{iT} = (\ln Y_{iT} - \ln Y_{i0})/T$ denotes the average annual productivity growth, $Export_{i0}$ is the export dummy indicating starters in 2000, $Industry_i$ are industry dummies and $employment_{i0}$ is measured by the number of employees. Differently with the previous tests and in extension to Bernard and Jensen method, I mark as starters the firms that entered the export market in 2000 which is the first year that I can obtain an entry. I do this in order to see not only if there is any learning effect, but also how starters are growing in terms of productivity in the long run after export engagement. Therefore, my tests start from the first year of entry and they gradually extend till the inclusion of all eight years after entry (2000-2007). The coefficient β will show the increase in the average annual growth rate of the productivity measure of starters over non-exporters in the same industry. Log of employment is alternated and OLS and LevPet measurements of TFP are being done sequentially.

## 6. RESULTS

In this chapter, reports of my results are being presented in tables together with short descriptions of them. I am presenting my findings for each of my hypothesis sequentially.

### 6.1. Hypothesis 1

For my first hypothesis, I first estimated equation (5) where I control for industry, years and I alternatively control for employment. In accordance with Bernard and Jensen, I am interested in the coefficient β of the export variable, which denotes the productivity advantage of exporters over non-exporters in the same industry. Table 4 reports my results.

**Table 4: Export premium for exporters**

| | **(a) OLS** | **(b) LevPet** | **(c) OLS** | **(d) LevPet** |
|---|---|---|---|---|
| **TFP** | 0 .172***<br>(88.04) | 0.582***<br>(219.69) | 0.199***<br>(89.58) | 0.225***<br>(94.43) |
| **Log of employment** | No | No | -0.022*** | 0.292*** |
| **$R^2$** | 0.3406 | 0.3404 | 0.3428 | 0.5514 |
| **Observations** | 328.217 | 328.217 | 328.217 | 328.217 |

***Denotes level of significance 1%. Numbers in parenthesis are t-statistics.

Numbers in columns (a)–(b) are coefficients on the export dummy in a regression of the form:

$ln\ Y_{it} = a + \beta\ Export_{it} + \gamma\ Industry_{it} + \delta\ Year_{it} + \varepsilon_{it}$

and the values in columns (c)-(d) are coefficients on the export dummy in a regression of the form:

$ln\ Y_{it} = a + \beta\ Export_{it} + \gamma\ Industry_{it} + \delta\ Year_{it} + \theta\ log(employment) + \varepsilon_{it}$

where employment is the number of employees in a firm.

Based on the table, exporters seem to have higher productivity than non-exporters for the nine years period and all the coefficients are significant at 1% level. In particular, exporters are more productive in a range of 17% to 58% and this finding reveals the export premium of exporters over non-exporters, with respect to the productivity of

firms, giving evidence to my first hypothesis. Interestingly, I obtain that when controlling for employment, the coefficient of export status for the LevPet function is significantly decreasing.

Moreover, I want to test the differences in productivity between different groups of exporters. For that reason I am running a regression of equation (6) where I test the productivity of starters and continuous exporters relative to never exporters, controlling again for industry, year and employment. The results are being presented in the following table where the control group is non-exporters.

**Table 5: Export premium for different groups**

| | (a) OLS | (b) LevPet | (c) OLS | (d) LevPet |
|---|---|---|---|---|
| **Starters** | 0.189*** (69.07) | 0.596*** (166.47) | 0.227*** (75.58) | 0.255*** (79.99) |
| **Continuous exporters** | 0.221*** (78.78) | 0.793*** (206.59) | 0.275*** (83.24) | 0.304*** (84.69) |
| **Log of employment** | No | No | -0.031*** (-32.45) | 0.283*** (259.11) |
| **$R^2$** | 0.3626 | 0.3883 | 0.3663 | 0.5677 |
| **Observations** | 258.870 | 258.870 | 258.870 | 258.870 |

***Denotes level of significance 1%. Numbers in parenthesis are t-statistics.

Numbers in columns (a)–(b) are coefficients on the export dummy in a regression of the form:

$ln\ Y_{it} = a + \beta_1\ Starters_{it} + \beta_2\ Continuous_{it} + \gamma\ Industry_{it} + \delta\ year_{it} + \varepsilon_{it}$

and the values in columns (c)-(d) are coefficients on the export dummy in a regression of the form:

$ln\ Y_{it} = a + \beta_1\ Starters_{it} + \beta_2\ Continuous_{it} + \gamma\ Industry_{it} + \delta\ year_{it} + \theta\ log(employment_{it}) + \varepsilon_{it}$

where employment is the number of employees in a firm.

Apparently, the productivity level of starters and continuous exporters seems to exceed that of non-exporters. In addition, I observe that starters have lower productivity than continuous exporters denoted by the lower magnitude of the coefficient. In particular, based on column (d) continuous exporters have 30% higher productivity than never exporters while starters appear a productivity premium of 25%. Similarly to the previous table coefficient β of export status when regressing with LevPet and controlling for employment decreases significantly. Conclusively, continuous exporters have the highest productivity, starters follow next indicating a

productivity a bit lower than continuous exporters and never exporters present the lowest productivity level. Again here, my findings give further evidence to my tested hypothesis.

To sum up, I give support to my 1st hypothesis that exporters have higher productivity than non-exporters and I go one step further testing the levels of productivity for different groups of exporters. In terms of productivity for French manufacturing firms I can conclude that:

**Continuous exporters > Starters > Never exporters**

### 6.2. Hypothesis 2

Regarding my second hypothesis where I test the self-selection decision for French manufacturing firms, I start by testing the export decision of firms that do not export. According to Bernard and Jensen, I will investigate the possibility of a non-exporter to become an exporter if productivity (TFP) increase. Running a regression of model (8) I get the results documented in table 6.

**Table 6: The decision to export**

| | First differences | |
|---|---|---|
| | **(a) OLS** | **(b) LevPet** |
| **Productivity$_{t-1}$** | 0.004<br>(1.53) | 0.010***<br>(3.56) |
| **Log of employment** | 0.025***<br>(7.17) | 0.023***<br>(6.82) |
| **$R^2$** | 0.1319 | 0.1319 |
| **Observations** | 160.844 | 160.844 |

*** indicate level of significance 1%. The numbers indicate the β coefficient of Total Factor Productivity variable in model 8.

Based on these findings, I can state that more successful non-exporters are more likely to get involved in the export market. Particularly, the coefficient β of TFP variable

indicated in column (b) shows that 1% increase in productivity increases the probability of a firm to export by 1%. This result gives evidence to the fact that firms with a better performance will more probably become exporters and it sheds light to the self-selection hypothesis.

In order to make my evidence stronger, I further compare ex-ante plant characteristics and growth rates for exporters and non-exporters. I selected future exporters that did not export in any of the first years (1999-2003) and compare initial levels of productivity relative to non-exporters. My results are being reported in the following table (table 7). The coefficient β of the export variable denotes the premium of future exporters in the years before entry.

**Table 7: Ex-ante advantage in TFP for starters**

| | **1999 premium** | | **2000 premium** | | **2001 premium** | |
|---|---|---|---|---|---|---|
| | **(a) OLS** | **(b) LevPet** | **(c) OLS** | **(d) LevPet** | **(e) OLS** | **(f) LevPet** |
| **Starters** | 0.163** (4.03) | 0.174*** (4.03) | 0.184*** (5.73) | 0.196*** (5.41) | 0.117** (3.48) | 0.118*** (3.22) |
| **Industry dummies** | Yes | Yes | Yes | Yes | Yes | Yes |
| **Log of employment** | Yes | Yes | Yes | Yes | Yes | Yes |
| **$R^2$** | 0.3686 | 0.4780 | 0.3805 | 0.4249 | 0.4063 | 0.4430 |
| **Observations** | 6.705 | 6.705 | 8.444 | 8.444 | 9.346 | 9.346 |

** and *** denotes level of significance 1% and 5% respectively. The numbers show the coefficient β of export variable for the initial years (1999, 2000, 2001) and they represent the productivity premium of future exporters over non-exporters, controlled for 2 digit industry and employment. Numbers in parenthesis are t-statistics.

Based on my results, future exporters have a higher performance in terms of productivity in the initial years before their entry in the foreign market. The coefficients in my table are positive and significant which suggests export premium regarding productivity for future exporters relative to non-exporters. Those values indicate that starters outperform non-exporters for the initial years before entry, giving additional evidence to the self-selection hypothesis.

Keeping investigating the ex-ante characteristics of future exporters compared to non-exporters, I further want to test how entrants perform on average for the whole period before entering the export market (1999-2003). Thus, I compare the average TFP growth rate of both groups to see the effects. My results after regressing model (10) are presented in the table below.

**Table 8: Ex-ante advantage in average growth rates for starters**

| | **(a) OLS** | **(b) LevPet** | **(c) OLS** | **(d) LevPet** |
|---|---|---|---|---|
| **Starters 1999-2003** | 0.007<br>(0.97) | 0.014**<br>(2.21) | 0.015**<br>(2.16) | 0.018***<br>(2.74) |
| **Industry dummies** | Yes | Yes | Yes | Yes |
| **Log of employment** | No | No | Yes | Yes |
| **$R^2$** | 0.0337 | 0.0647 | 0.0541 | 0.0695 |
| **Observations** | 5.060 | 5.060 | 5.060 | 5.060 |

*and ** denotes level of significance 1% and 5%, respectively. The numbers show the coefficient β of export variable and they represent the extra annual growth rates in productivity for future exporters over non-exporters for the years 1999-2004. Numbers in parenthesis are t-statistics.

In this case, the significant values indicate that future exporters have a marginally higher average growth rate from non-exporters ranging from 1.4% to 1.8% in the years before the entry. Those results add more evidence to the self-selection hypothesis and combined with the previous results make the scenery even more clear.

Overall, my results incline to the direction of giving evidence for self-selection in French manufacturing firms. In line with the majority of the researchers, I would state that more productive French manufacturing firms tend to engage in the foreign market and consequently I give support to my 2nd hypothesis.

### 6.3. Hypothesis 3

In order to test my 3rd hypothesis I estimate equation (11) where average annual growth of productivity of never exporters and starters in 2000 are compared. I chose this year because it is the first year I can obtain an entry. With this way, I will obtain how starters productivity growth changes after they get involved in the export market relative to non-exporters. Estimations are made sequentially for longer time-spans after entry controlling for industry and employment. The results are being reported in table 9.

Based on this table I can obtain that starters present a better performance relative to never exporters at least for the years after entry. In particular, results under OLS estimation give strong evidence for learning-by-exporting effect for all the observed years after entry. Starters have on average 1% higher growth in productivity after their engagement relative to non-exporters. However, in the case of LevPet estimation, the results are a bit different. The advantage in productivity growth for starters seems to be higher than that of non-exporters for the first three years, after which it vanish. The coefficients indicate, that starters are in a range of 0.5% to 1% more productive than the control group for the years from 2000 to 2003 and then there is no evidence for productivity growth advantage implied by the insignificant values in the last columns of table 9.

Apparently, my findings by following OLS and LevPet algorithm present some important differences, but as I have explained in the previous section, the case of LevPet gives more reliable results because it overcomes simultaneity issues. Therefore, the evidence of my findings is that new entrants experience learning-by-exporting effects for the short run after their engagement in the export market while in the long run those effects disappear as there is no further advantage in productivity growth compared to firms that never exported. Remember that in this case starters enter the export market on 2000 and they continue export till 2007. Overall this finding suggests that the choice of the time horizon matters.

Ultimately my results do not give support to my 3rd hypothesis, namely that French manufacturing firms will not learn by exporting. Unexpectedly, I found evidence of

learning-by-exporting effects for the new entrants in the foreign market for French manufacturing firms, but this effect seems to vanish in the long run.

## Table 9: Average annual productivity growth rate of starters over non-exporters

| | OLS | | | | | | | LevPet | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **2000-2001** | **2000-2002** | **2000-2003** | **2000-2004** | **2000-2005** | **2000-2006** | **2000-2007** | **2000-2001** | **2000-2002** | **2000-2003** | **2000-2004** | **2000-2005** | **2000-2006** | **2000-2007** |
| **Starters in 2000** | 0.011** (2.08) | 0.009** (2.16) | 0.008** (2.48) | 0.005* (1.79) | 0.004* (1.63) | 0.006** (2.39) | 0.007*** (3.09) | 0.010** (1.98) | 0.006 (1.48) | 0.005* (1.55) | 0.0003 (0.13) | -0.001 (-0.64) | -0.0002 (-0.09) | 0.0009 (0.43) |
| **Industry dummies** | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| **Log of employment** | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| **$R^2$** | 0.0195 | 0.0367 | 0.0372 | 0.0432 | 0.0401 | 0.0451 | 0.0494 | 0.0241 | 0.0453 | 0.0475 | 0.0580 | 0.0480 | 0.0585 | 0.0580 |
| **Observ.** | 8.008 | 7.753 | 7.537 | 7.677 | 7.228 | 5.782 | 6.226 | 8.008 | 7.753 | 7.537 | 7.677 | 7.228 | 5.782 | 6.226 |

*, ** and *** denote level of significance 10%, 5% and 1%, respectively. The coefficient β is the coefficient of export dummy in the equation (11) and denotes the level of average annual change in productivity of starters in 2000 over never exporters. Numbers in parenthesis are t statistics.

## 7. DISCUSSION

In this section I will give an overview of my results, explaining what they indicate and what lies behind them. In other words, I explain my findings taking into account factors and measures that may affect them.

Regarding my first hypothesis where I compare the productivity of exporters and non-exporters my results are in line with my expectations and with the majority of the academic research. Exporting firms are more productive than non-exporters for the period 1999-2007 regarding French manufacturers. In particular, taking into account the last column (d) of table 4 where TFP is measured by the LevPet algorithm and I control for employment, exporters are on average 22% more productive relative to non-exporters.

In extension to this finding, I estimated the productivity advantage for different groups of exporters over never exporters. My results give further evidence for the export premium of exporters over their domestic oriented counterparts and they also indicate productivity differences among those groups. More precisely, continuous exporters present the highest productivity level, which is on average 30% higher than never exporters and starters are following next with a productivity advantage of 25% over the control group. My findings are in line with Baldwin and Gu (2003) who investigated Canada.

Overall, I give strong support to my first hypothesis and my extensions show, as indicated by my results, that continuous exporters have the best performance in terms of productivity, starters come next while never exporters present the poorest productivity level.

For my second hypothesis, testing for self-selection, the results again are in line with what I expected to find and with the empirical evidence so far. My first test was to see how an increase in productivity would affect the decision of a non-exporting firm to engage in the export market. The results show that an increase in productivity of 1% will increase the possibilities of a firm to get involved in the export activity by 1%. This finding is not surprising if I take under consideration my theoretical analysis. A proportional increase of productivity may incur additional revenues, with which a

non-exporting firm will be able to cover the fixed costs of entry. Thus, this first result gives evidence to the self-selection hypothesis.

An additional investigation of my research is to test the productivity differences between firms that started exporting in 2004 and non-exporters for each initial year (1999,2000,2001) of my period before entrance of the former group in the foreign market. Based on my findings future exporters are more productive than never exporters for each year tested. Precisely, firms that will start exporting in 2004 are on average 15% more productive than non-exporters for the years 1999, 2000 and 2001. This finding is an additional evidence to my second hypothesis for the self-selection effect.

Furthermore, I measured the average annual growth of both those groups aiming to check the differences in the period before entry. My findings, here, indicate that firms that become exporters have an average annual growth rate 1.8% higher than firms who never exported. Evidence clearly shows that future exporters outperform their domestic counterparts adding some more support to the self-selection hypothesis for French manufacturing firms.

Ultimately, following the methods of Bernard and Jensen (1999) who also found similar evidence for US firms and in line with almost all the empirical evidence, I confirm my expectations as well as my second hypothesis. French manufacturing firms with higher productivity will choose to export because they are capable of doing so as they can cover the sunk costs of entry. In other words, they will self-select into the export market because they can overcome the entry barriers of engagement in international trade.

In contrast to my first two hypothesis, where I find supportive evidence, my third hypothesis with respect to the learning-by-exporting effects is not supported. Unexpectedly, I find evidence of learning effects for France, contrary to the prevalent belief that developed countries do not learn from exporting. A possible explanation could be that, although France belongs to the group of developed countries the main export partners are leading economies around the world, as reported in section 4, and therefore there would be some positive externalities in the trade with them. An additional explanation could be that many of France's main export commodities are products with high R&D involvement, meaning that improvements in production

procedure or in the product itself will foster productivity levels of firms in these sectors, generating a productivity advantage relative to their domestic counterparts that are involved in industries with limited R&D.

In order to find evidence for learning-by-exporting hypothesis I tested the average annual growth rate of productivity for starters after their entry in the foreign market. I marked as starters firms which start exporting in the year of 2000 in order to obtain the productivity variation of new entrants in the long run. This is the first year I could obtain an entry. My results based on the two different estimations of productivity (OLS-LevPet) are mixed. While in the case of OLS it is obtained that starters present on average 1% higher growth of productivity relative to non-exporters for all the years after entry, when using the LevPet estimation of TFP this productivity advantage is observed only for the first three years. Basing my test on the latter case due to the fact that I get more reliable results, I can state that entrants in the foreign market experience a learning-by-exporting effect only for the short run after entry while in the long run those effects vanish.

The explanation behind this lies in theory, where many researchers state that firms are getting benefited by international market only in the first years of their trade with them. They get what they get at the beginning of their involvement and then there is nothing more to boost productivity growth. They main conclusion, however, is that I do support my third hypothesis as there is evidence for learning-by-exporting effect regarding French manufacturing firms.

To sum up, I give support to my first and second hypothesis and I reject my third. France presents both self-selection and learning-by-exporting effects similarly to Baldwin and Gu (2003), Girma et al (2004) and Castellani (2002) who find corresponding evidence for Canada, UK and Italy respectively. French manufacturing firms will become exporters in the first place, if their performance in terms of productivity is higher than the average and is enough to cover the sunk costs of entry. In the years after, firms productivity (TFP) will grow even more because of the positive externalities with the international trade, but their growth advantage relative to non-exporters will vanish over time. In the end, and in case they have survived, they will be successful established exporters with the highest productivity in the industry while non-exporters will remain the least productive firms.

## 8. CONCLUSION

The aim of this research was to empirically investigate the causality between exporting activity and productivity for French manufacturing firms. Empirical evidence has proved that exporters outperform non-exporters and my focus is on what lies behind this evidence. Are the good firms that choose to export or export involvement boosts productivity? Using unconsolidated data from Amadeus, including information about 84.946 firms for a nine year period (1999-2007) and following the methodology of Bernard and Jensen (1999) I conclude that there is a both way causality between those two factors. In particular, this study finds that more productive firms will self-select into the export market because they can afford the fixed costs of entry and after that, they will further increase their productivity because of the "learning" effects with the international market but only in the short run. In other words, support is given to both self-selection and learning-by-exporting hypothesis.

Further to those findings, this research realizes that continuous exporters have higher productivity than starters and non-exporters, with the last group being the least productive and starters standing in the middle. The gap in the productivity level between starters and never exporters grows until few years after the former group enters the foreign market. In the long run of export experience advantage in productivity growth of starters relative to non-exporters will vanish, but exporters will continue to be by far more productive.

While evidence of self-selection seems realistic, the finding of learning-by-exporting for France was an unexpected result due to the belief that firms in developed countries do not present learning effect. One explanation of this finding could be that the main export partners of France are also highly developed countries and therefore there would be some positive externalities during the trade with them, while another explanation is that most of the internationally tradable commodities of France face high R&D, and consequently a productivity growth may be connected with this factor and not due to export. Perhaps, some further research could give a more clear view about the effect of R&D in the causality between exports and productivity.

Overall, my findings indicate that French exporting firms have higher productivity than non-exporters which is explained by two factors. High productivity drives firms

to engage in the export market, which in turn further enhances productivity. Therefore, policies promoting and facilitating export participation would be beneficial not only in firm level but also in a country level. Expansion of more productive firms may favor overall economy growth as resources are reallocated from the less productive to the more productive activities. Potential benefits as for example the creation of jobs and the higher plant survival will increase the social prosperity.

### 8.1 Limitations

Regarding my data, there were some few limitations that have to be reported. First, during the construction of data instead of using firm-level product prices when deflating values, to account for heterogeneity in pricing behavior between firms in the same industry, industry deflators were used. To my defense, those variables were not available. Another limitation is that the independent variable "starters" I use in the second and third hypothesis is constructed based on the fact that firms have no export participation till 2003 and 1999, respectively, after which they become exporters. Apart from the fact that I limit the number of my observations, there were many missing values for this category of exporters prior to entry. Perhaps, some of the firms may have entered the export market earlier than the specific year in each case and therefore they should not be included in this variable as they would moderate the results.

### 8.2 Future research

In this study the causal effect between exports and productivity is explained. The results are clear but they do not indicate what lies behind them. Although, I proved that success leads to exports and exports lead to further success, I cannot be sure about what are the origins of this success. In theory I can base my explanation in many factors but in practice things are different. Do firms improve their production procedure by the technology they gain or they simply learn to be better exporters and provide better services to foreign customers? In addition, it would be interesting to see if the high levels of R&D affect this correlation. For example, firms in an industry with high R&D will eventually improve their productivity and consequently they may join the export market. Subsequently, they will further increase their productivity but

not only because of their participation, but also due to the high R&D levels existing in the industries. Based on the fact that the main French commodities face high R&D levels it would be interesting to control for R&D in a model and see the results. An interesting result would also be to see the variation of productivity for firms that regularly switch export status (switchers) or quit the export market (quitters).

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## Appendix A

**Table 1. Exports and productivity of firms in different countries.**

| Exports and Productivity of firms | | | | | | |
|---|---|---|---|---|---|---|
| | **Authors** | **Country** | | **Self-selection** | | **Learning-by-exporting** |
| 1 | Bernard and Jensen (1999) | USA | | yes | | no, but higher survival rates for exporters |
| 2 | Bernard and Wagner (1997) | Germany | | yes | | no, but higher survival rates for exporters |
| 3 | Roberts and Tybout (1997) | Colombia | | yes | | not examined |
| 4 | Clerides, Lach and Tybout (1998) | Colombia, Mexico and Morroco | | yes | | no |
| 5 | Bigsten and Gebreeyesus (2009) | Ethiopia | | yes | | yes |
| 6 | Bernard and Jensen (2004a) | USA | | yes | | no |
| 7 | Aw, Chung and Roberts (2000) | Korea and Taiwan | | yes for Taiwan | | no for both countries |
| 8 | Blalock ang Gertler (2004) | Indonesia | | yes | | yes |
| 9 | Bernard and Wagner (2001) | Germany | | yes | | no |
| 10 | Baldwin and Gu (2003) | Canada | | yes | | yes, higher for domestic controlled and young plants |
| 11 | Arnold and Hussinger (2005) | Germany | | yes | | no |
| 12 | Bigsten et al. (2004) | Cameroon, Kenya, Ghana and Zimbabwe | | little evidence | | yes, low cost producers choose to become exporters |
| 13 | Castellani (2002) | Italy | | yes | | yes, learning associated with export intensity |
| 14 | Melitz (2003) | - | | yes | | not examined |
| 15 | Fryges and Wagner (2008) | Germany | | not examined | | improvement in labor productivity growth but only within a sub-interval of firms' export-sales ratio |
| 16 | Fernandez and Isgut (2005) | Colombia | | not examined | | yes, more important for young firms and industries that deliver their commodities to high income countries |
| 17 | Dogan, Wong and Yap (2011) | Malaysia | | not examined | | no, negative results for exporters on sector productivity |
| 18 | Kimura and Kiyota (2006) | Japan | | yes, exports and FDI | | yes, impovement of productivity from both exports and FDI |
| 19 | Girma, Greenaway and Kneller (2004) | UK | | yes | | yes |
| 20 | Hahn (2004) | Korea | | yes | | yes, export also increases the level of shipments and employment |
| 21 | Kraay (1999) | China | | not examined | | yes, more pronounced effects for established exporters and not for entrants |
| 22 | Van Biesebroeck (2004) | Sub-Saharan Africa | | yes | | yes |
| 23 | De Loecker (2005) | Slovenia | | not examined | | yes, model is controlled for the self-selection |
| 24 | Delgado, Farinas and Ruano (2002) | Spain | | yes | | no, only some evidence for young exporters |