On the role of imports in enhancing manufacturing exports

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Abstract

Making use of a large panel dataset on Italian manufacturing firms, we provide evidence on the effect of imports on the firm export performance. We distinguish imports of intermediates according to their origin and we find that inputs sourced from low labour cost countries promote the firm's export activity. Imports from high-income countries do not significantly contribute to the export orientation of firms, especially when both persistence in export and the possible endogeneity of the import measures are accounted for via System GMM estimation of a linear probability model. Our evidence suggests that the impact of imports on the firms' export activity works through the cost saving channel rather than the technology channel.

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1 Introduction

The expansion of global supply chains has driven an increasing weight of international transactions in intermediate goods. According to WTO, the share of intermediate goods was around 40% of non-fuel merchandise trade in 2008, with wide differences across countries. In this framework, low income countries have played a key role. The entry of China into the WTO and the growing international openness of developing countries have brought an unprecedented opportunity in terms of cheap inputs and firm location choices for industrial countries. While large evidence exists on the effect of imports on employment, high-low skilled wage gap and productivity[1], only recently the effect of imports on the firm's export performance has started being investigated.

There are different channels through which imports may affect the firm export status. First, the literature has shown that the firm internationalisation is characterised by the existence of sunk costs and some of them could be common between the import and the export activities (Roberts and Tybout, 1995; Muûls and Pisu, 2009)[2].

Secondly, importing new and more advanced goods relaxes some constraints in the production processes, thus, positively affecting the firm productivity (Halpern, Koren, and Szeidl, 2005). As a consequence, higher productivity firms may face the export sunk costs and/or adapt or create new goods for the foreign customers (Kasahara and Lapham, 2008; Bas and Strauss-Khan, 2011).

Finally, trade liberalisation may promote the competitiveness of domestic firms through the reduction in input tariffs that, in turn, reduces the relative cost of imported inputs across all firms (Bas, 2009).

Within this framework, we mean to contribute to this new strand of literature estimating the effect of imports on the export probability of Italian manufacturing firms in the period 2000-2004.

As mentioned above, the existing evidence has rather focused on cost complementarities between imports and exports or on the export enhancing effect that works through productivity gains stemming from imports. What we mean to do, instead, is to test whether, once accounted for productivity and common sunk costs, a cost saving or a technology channel is at work. In order to dissect these effects we split our import measure by income level of the origin countries. Although we are not able to directly

[1] To cite only a few works, the seminal papers for the U.S. economy are Feenstra and Hanson (1996), Feenstra and Hanson (1999), Amiti and Wei (2004), Amiti and Wei (2006).

[2] For example, the costs of creating a foreign office concern both international activities. Also, importing from a specific country may allow the firm to gain some additional information on the business environment of that market and this may ease its penetration in such a marketIn this case the linkage between import and export is supposed to be destination specific. Anyway, this channel may also generate the opposite causal nexus: from exports to imports.

investigate whether a cost saving motivation drives imports from low income countries and technology search drives the ones from high income countries, several contributions in the empirical trade literature actually hint at and adopt this split as capturing the two different motivations for imports (Lööf and Andersson, 2010; Jabbour, 2010; Smeets and Warzynski, 2010; Bas and Strauss-Khan, 2011). In addition, we will show that for Italy, the target country of our analysis, this split is rather consistent with a dichotomy between cheaper and higher quality inputs.

The firm level evidence for Italy, so far, has shown that learning by exporting occurs (Serti and Tomasi, 2008; Bratti and Felice, 2011), then if imports directly positively affect the probability to export, the whole country could benefit from important feedback effects, due to the documented productivity gains originating from the firm export activity.

Our results actually show that, once accounted for common sunk costs, firm total factor productivity, size and other firm and sector level characteristics, only imports from low income countries matter for exporting. We then interpret this finding as the increased availability of cheaper imported inputs lowering average costs, delivering higher competitiveness to the firm and enhancing the firm export probability.

The work is structured as follows: the next section reviews the relevant literature, section 3 presents the sample and some descriptive evidence on the import-export nexus, section 4 introduces to the empirical framework, while section 5 discusses the results, finally, section 6 concludes the work.

2 Literature Review

The penetration of foreign markets is an important strategy for a firm in the globalised world and the drivers behind the firms' export entry have drawn the attention of economists. However, out from the literature investigating the productivity sorting of exporters, importers and two-way-traders[3], the papers that directly link the firm import and export activities are a few. Sjöholm (2003) for the period 1994-1997 finds that imports of intermediates importantly affect the Indonesian manufacturing plants' probability of becoming exporters. According to the Author, this finding reveals a cost

[3]Due to the presence of sunk and fixed costs of exporting only more productive firms succeed to sell their goods outside the national boundaries (Roberts and Tybout, 1995; Melitz, 2003) and the existing evidence shows that exporters are in general the best performers in a sector and self-select into the export market (Bernard, Jensen, Redding, and Schott, 2007; ISGEP, 2008; Wagner, 2007). A growing strand of literature, however, is also pointing at self-selection into the import market and focusing on the two way traders. The evidence is quite homogeneous: firms that both import and export are the best performers in a sector, compared to those that either export or import and to domestic firms (Muûls and Pisu, 2009; Vogel and Wagner, 2010; Altomonte and Bekes, 2009; Castellani, Serti, and Tomasi, 2010).

reducing effect stemming from belonging to a foreign network. In his empirical model imports are measured by means of a dummy variable and no productivity measure is directly included among the regressors[4]. More recently, Muûls and Pisu (2009), for the Belgian economy estimate a dynamic probit model for imports and exports and show that firms face sunk costs of imports that are as large as sunk costs of exports. Furthermore, once accounted for firm size and productivity, when the lagged import (export) status is included in the export (import) probability regression, the coefficient on the lagged dependent variable shrinks. The Authors interpret this finding as exporting and importing having common sunk costs: a firm which is already integrated into the international markets through one of these channels may activate the other more easily. However, it is worth to notice that the lagged dependent variable coefficient only modestly decreases in magnitude when the other international activity status is taken into account and this points at other channels behind the shown positive effect, out of the common sunk costs. In other words, although cost complementarieties may be important, export and import sunk costs are not really the same and they do not to exhaust all the possible linkages between imports and exports. In the same line of research a bivariate probit model of exporting and importing is estimated by Aristei, Castellani, and Franco (2011) on a group of 27 Eastern European and Central Asian countries firms over the period 2002-2008. The positive two-way correlation between import and export runs from past imports to current exports and vice versa, however, after controlling for size, the lagged export status turns non significant in the import equation. Also this evidence is only partially consistent with the presence of common sunk costs: regardless of the firm size, importing may ease exporting and the firm competitiveness, while the positive effect of firms' exporting activities on sourcing of foreign inputs is mainly due to the existence of common sunk costs, correlated with firm size thresholds, and, once accounted for that, previous exporting does not make foreign sourcing more likely.

Another stream of research related to our work has focused on the import-productivity-export nexus. Apart from dealing with cost complementarities of imports and exports, the paper by Kasahara and Lapham (2008) represents a bridge between the literature on productivity effects of imported intermediates[5] and the evidence on self-selection into exporting.

[4]Nevertheless, the share of workers with more than primary education, the R&D expenditures and the capital stock per worker are included in the analysis to account for firm specific features deeply related to the firm overall performance.

[5]In effect, an important part of the literature has dealt with the role of imports for productivity. Firms may take advantage from the higher technological content of imported inputs or from their complementarity with domestic materials and other inputs. Empirical works usually confirm the efficiency enhancing effect of firm access to foreign intermediates, especially when they analyse developing countries (Amiti and Konings, 2007; Kasahara and Rodrigue, 2008; Morrison Paul and Yasar, 2009; Halpern, Koren, and Szeidl, 2005).

They extend Melitz's model incorporating imported intermediates. In their theoretical framework imported inputs enhance productivity due to increasing returns (linked to a higher variety of imported intermediates) but, due to the high fixed cost of importing, only more productive firms can import from abroad. Thus, a firm productivity determines its participation in international markets (i.e. importing inputs and/or exporting output), and, in turn, the latter (i.e. importing inputs) has an effect on its productivity that may finally ease the entry in export markets. Trade liberalization in intermediates increases aggregate productivity because more productive firms start importing and achieve within-plant productivity gains which may allow them to start exporting[6]. They estimate their model on plant-level Chilean data and several counterfactual experiments suggest that there are substantial aggregate productivity and welfare gains due to trade. So, due to import and export complementarities, policies which inhibit the import of foreign intermediates can have a large adverse effect on the exports of final goods. The same causal nexus, from import to productivity and from productivity to export, is empirically investigated by Bas and Strauss-Khan (2011) on French data. The work analyses the impact of the number and diversification of imported inputs on the export scope, instead of on the export status, through the effect of imports on productivity. They test for three different mechanisms - better complementarity of inputs, transfer of technology or decreased price index - by distinguishing the origin of imports (developing vs. developed countries) and by means of an exact price index (Broda and Weinstein, 2006). They find that an increase in the number of varieties and diversification of imported inputs has a robust impact on the firm TFP. A causal nexus from import scope/diversification to export scope is also detected. The authors conclude that this effect is mainly driven by the efficiency increase induced by imports, even if this channel has no an exhaustive explanatory power.

Another channel through which imports may help the export activity is highlighted by Bas (2009) who, starting from Melitz and Ottaviano (2008), develops a trade model of heterogeneous firms to study how the access to high quality/cheaper foreign intermediate goods affects domestic firms' export performance. In this framework, changes in the industry imported input intensity or in import duties on intermediate goods reduce relative factor costs and enhance the competitiveness of domestic firms. A reduc-

For advanced economies the general finding seem to point at a rather modest or null effect of imports on productivity (Görg, Hanley, and Strobl, 2008; Forlani, 2010; Vogel and Wagner, 2010; Conti, Turco, and Maggioni, 2011) and when an effect occurs is more related to imports from high income countries (Lööf and Andersson, 2010), while imports from low income countries seem to mainly positively affect the firm profits (Jabbour, 2010).

[6] Additionally, in equilibrium, higher labour demand from new importers and exporters increases the real wage and, as a result, the least productive firms exit from the market, leading to a further increase of aggregated productivity.

tion in trade costs acts as a homogeneous increase of productivity for the firms in a sector. Firms in these sectors, then, experience a higher probability of becoming an exporter and a larger export share of the sales. Thus, the reduction in trade costs or the increase in the intensity of foreign cheaper inputs at the sector level act as a uniform cost saving effect for all the firms in the sector that can consequently enjoy higher competitiveness.

Following this recent literature we mean to test the role of imports on the export probability of Italian manufacturing firms. We claim that once accounted for productivity and export sunk costs, if a positive role exists for imports it is mainly related to the cost saving channel. As the works by Muûls and Pisu (2009) and Kasahara and Lapham (2008) show, even if cost complementarities in imports and exports are relevant, they only partially capture the effect of one internationalisation channel on the other. The latter work, as an example, finds that the parameter measuring the extent of cost complementarities ranges from 0.75 in the Wood industry, to 0.93 in Food, implying that export and import sunk costs overlap for less than 25%. This means that the largest part of sunk cost is specific to the type of international activity and that if imports still significantly affect exports some other channels should be active. The above contributions suggest that the remaining channels are technology flows occurring through imports that affect the firm productivity and, in turn, the firm export status, positive export externalities stemming from network effects and cost saving. We mean to explore the role of imports for the export probability at the firm level, investigating whether the evidence is consistent with the existence of a cost saving or a technology channel.

3 Data

This section is devoted to the presentation of the data and to the discussion of some preliminary evidence on Italian manufacturing firms' export and import activities. The main data source for this work is a balanced panel of Italian limited companies covering a 5-year period from 2000 to 2004. The dataset has been used by the National Statistical Institute (Istat) for a descriptive analysis on offshoring practices by Italian firms published in the Istat Annual Report for 2006 and it has been obtained through the firm level matching between customs trade data and balance sheet data. The sample represents about 40% of total manufacturing employment and output and exactly reproduces their sectoral distribution[7]. The dataset provides detailed information for 40,479 firms[8] on output and inputs, labour

[7]Details on the sample representativeness are not shown here for the sake of brevity but they are readily available from the authors upon request.

[8]The original number of firms was slightly higher, however, as standard in the literature we cleaned the sample removing firms in NACE sectors 16 and 23 and firms with some

costs, tangible and intangible fixed assets, exports, control participation and imports of intermediates.

As in the literature (Feenstra and Hanson, 1996, 1999; OECD, 2007), researchers at Istat have defined as imports of intermediates or offshoring the firm import flows of non-energy material intermediates from all sectors and the imports of finished goods from the firm's sector[9]. Also, they have split firm level imports according to the development stage of partner countries, i.e. high and low income economies. Unfortunately, we are not really able to observe either the detail of the overall imported products and their unit values or the detail of import origin/export destination country.

3.1 Descriptive Evidence

The upper panel in Table 1 shows the share of importers, importers to low and high income countries and exporters for the first and last year of our sample. During our sample period both the share of exporters and importers have slightly increased. When importers are split according to the development level of their source country we can observe that it is the share of input purchasers from low income economies that has particularly grown in the sample period, going from 21% to about 25% of the firms in our sample. On the contrary, the share of firms importing from high income countries has remained basically unchanged, while the proportion of firms engaged in both import activities has also increased, but modestly when compared to the growth of sourcers from low income economies only. This evidence confirms the growing presence of low labour cost countries in international markets and raises questions about the impact of this increasing competitive pressure for the performance of firms in developed countries, in terms of threats but also opportunities. From the Table, it is important to notice that in 2000 about 72% of importers are also importers from high income countries and this share goes a little bit down to 70% in 2004, due to the increasing number of importers that only import from low labour cost countries. Nevertheless, the documented 4% growth in the weight of importers from low income countries mainly concerns firms that import from high income countries too. This suggests the existence of a possible complementarity between the two international activities, thus pointing at different reasons behind them.

anomalous (zero or negative) or missing values for the main variables (output, materials, value added or capital). We have also excluded firms which are outliers for at least one year in the sample period. We consider as outliers those observations from the bottom and top 0.5 percent of the distribution of some main ratio (value added on labour and capital on labour).

[9]These latter flows are also part of the international fragmentation of production and it is important to take them into account: when firms decide to move some parts of their production process abroad they could decide to move the final stages too. Anyway, it is not possible to test the robustness of our results excluding these flows of goods.

Table 1: Importers and Exporters and Importing Exporters

Panel A:						
		% Imp	% Imp_{LI}	% Imp_{HI}	% Imp_{HILI}	% Exp
2000	All firms	37.32	20.88	31.44	15.00	61.34
2004		38.89	24.99	31.50	17.59	63.82
Panel B:						
			% Imp_{LI}	% Imp_{HI}	$impshare_{LI}$	$impshare_{HI}$
2000	All firms		20.88	31.44	1.96	5.04
2004			24.99	31.50	2.58	4.87
2000	Non Exporters		3.47	6.68	0.46	1.45
2004			3.75	6.29	0.44	1.35
2000	Exporters		31.55	46.74	2.91	7.32
2004			36.71	45.51	3.80	6.88

Imp_{LI}, Imp_{HI}, Imp_{HILI} and Exp respectively identify importers from low income countries, importers from high income countries, importers from both groups of countries and exporters. $impshare_{LI}$ and $impshare_{HI}$ are the average import shares across all the firms in the sample from low income and high income countries.

After this preliminary look at our sample composition, Panel B of Table 1 describes the firm import activity by export status. Exporters are extensively more likely to source their intermediates in foreign markets. The share of exporters that import from low income countries increases much more than the corresponding share of non exporters, while the fraction of firms importing from high income countries slightly shrinks for both groups of firms. Finally, the last two columns show that the average import intensity in intermediates is higher when imports originate from high income countries, but it only grows in our sample period when imports are from low income countries and firms are classified as exporters.

This descriptive analysis calls for a more rigorous investigation of the linkages between export and import activity. Especially, it suggests to pay a particular attention on the role of import flows from developing countries that have noticeably grown in the last decades and may have changed the competitive and economic environment where firms operate. As a matter of fact, the time span of our analysis is an interesting one: the entry of China in the WTO in December 2001, the growth in the number of developing members in the organisation and the inclusion of cheap labour cost countries in the EU starting from 1995 have boosted an unprecedented integration in the intermediate good market.

A transition matrix in the export status from 2000 to 2004 delivers us some hints about the relevance of importing for the firm access to the foreign market. We focus on firms that are not exporting in 2000 and we define different groups of non exporters. Especially, we identify domestic firms purchasing their inputs only in the national market, and firms sourcing intermediates from Low Income, High Income Countries and from both groups. The main message we get from Table 2 is that firms with a previous

Table 2: Transition Matrix

Status in 2000	Probability to become exporter in 2004
Domestic Firms	18.29%
$Importers_{LI}$	38.48%
$Importers_{HI}$	38.71%
$Importers_{HILI}$	41.52%

The table only focuses on different groups of Non Exporters in 2000.

experience in foreign markets for the input procurement are more likely to sell their goods abroad in following years. Thus, this previous experience may in some ways ease the firm export activity.

To shed further light on the correlation between the firm entry in foreign markets and the availability of cheaper and high-tech foreign inputs, we focus on a sample of export starters. We define export starters as those firms in our sample that start to export in t and have not exported in the previous three years. According to our panel time span, the adoption of this definition of export starters leaves us with two waves of starters: the 2004 wave includes 1,026 firms and the 2005 one includes 973 firms, for a total of 1,999 export starters. Table 3 shows the difference in the import status (and shares) between export starters and never exporters one year and two years before the entry in foreign markets. The t-Tests reveal that in the pre-entry years export starters are on average more likely than never exporting firms to be importers and they also have a larger share of imports among their intermediate inputs. Even if a positive gap is displayed for purchases from both groups of countries, a larger relative difference between starters and never exporters is recorded for imports from developing countries.

Table 3: Export Starters vs Never Exporters

	Starters	Never	t-test
$imp_{LI\ t-1}$	0.066	0.021	-13.252
$imp_{HI\ t-1}$	0.106	0.042	-13.541
$impshare_{LI\ t-1}$	0.007	0.002	-6.207
$impshare_{HI\ t-1}$	0.018	0.010	-5.151
$imp_{LI\ t-2}$	0.061	0.020	-11.835
$imp_{HI\ t-2}$	0.106	0.042	-13.236
$impshare_{LI\ t-2}$	0.007	0.002	-6.129
$impshare_{HI\ t-2}$	0.018	0.010	-5.041

imp_{LI} and imp_{HI} are dummies for the import activity from Low Income and High Income Countries. $impshare_{LI}$ and $impshare_{HI}$ are import share from the two groups of countries. (t-1) and (t-2) refers to one year and two years before the export entry.

The above evidence proves that, despite the larger weight of high income origins in the Italian firms' import activity, imports from low income countries gain importance in our sample period. Especially, future exporters present higher differences in term of their involvement with cheap labour countries. As a consequence, we expect the existence of a causal nexus between the import activity and the export activity and, according to the descriptive analysis, the intensification of imports from developing economies seems to play an important role in the firms' internationalisation process.

However, before moving to the estimate of an empirical model to dissect the role of imports on the manufacturing firm export probability, we mean to assess to what extent different import origins may hide different reasons for imports. The positive relationship existing between the income level of the import source and the quality and technology of the shipped products is widely supported by the existing evidence (Hallak, 2006). However, making use of the import data retrieved from the WITS-COMTRADE online database we mean to clarify whether it is consistent to assume cost saving for imports from low income countries and technology/better quality search for imports sourced in high income economies. Making use of HS96-6 digit Italian imports from the two groups of high and low income countries[10], so as defined in the WITS database, we have firstly assessed the relative importance of high and low income partners for Italy. Table 4 summarises the information on the weight of high and low income economies at the product level for the Italian economy in 2000, the first year of our firm level sample. First of all, the Table shows that there are a number of products that are imported only from one source, more often the high income one. Secondly, with the exception of traditional low income economies' export goods (e.g. textiles, leather and footwear), the average and the median share of imports from High income countries are above the 80% with the overall median equal to 92% and the discrepancy between the two measures hinting at a left skewed distribution. A right skewed distribution, consequently, emerges for the share of imports coming from high income economies. Specularly, the share of imports from low income economies is rather low for the vast majority of products and for some of them it reaches very high levels. Then, there seems to be little overlap between the two types of imports. Although rich partners are the main trading partners, there are some products in which the share of low income countries is rather relevant. More importantly, Table 5 shows, for the year 2000, that across products higher unit values are associated with higher shares from high income economies and, consequently, lower shares from low income exporters. Also, columns 3 and 4 in the Table show that taking differences in import shares and unit values at the product level between 2000 and 2004 - the first and last year of our

[10]The high income group only includes OECD high income economies, thus excluding high income countries exporting oil.

firm level analysis - a within product increase in the unit value is related to an increase in the share of imports coming from high income economies and the reverse holds true for imports from low income economies. Then, this simple evidence is suggestive of a sort of polarisation of imports from high and low income economies respectively in high and low quality products. As a consequence, higher shares of imports from high income economies can be associated with higher quality goods, while higher import shares from low income countries can be associated with cheaper products.

Table 4: High and Low income imports into Italy - 6 digit HS 1996 - year 2000

		Import Share from:					
		High Income			Low Income		
Product category	**Codes**	**Codes**	**mean**	**p50**	**Codes**	**mean**	**p50**
01-05 Animal & Animal Products	199	199	0.85	1.00	114	0.22	0.09
06-15 Vegetable Products	315	315	0.75	0.89	248	0.30	0.20
16-24 Foodstuffs	186	186	0.82	0.97	147	0.21	0.04
25-27 Mineral Products	138	138	0.67	0.79	105	0.38	0.29
28-38 Chemicals & Allied Industries	779	778	0.89	0.98	555	0.13	0.04
39-40 Plastics / Rubbers	198	198	0.86	0.96	178	0.12	0.02
41-43 Raw Hides, Skins, Leather, & Furs	74	74	0.55	0.53	70	0.42	0.39
44-49 Wood & Wood Products	227	226	0.80	0.93	196	0.20	0.07
50-63 Textiles	822	820	0.61	0.63	787	0.37	0.34
64-67 Footwear / Headgear	55	55	0.43	0.42	55	0.53	0.53
68-71 Stone / Glass	195	195	0.81	0.93	168	0.17	0.06
72-83 Metals	535	535	0.83	0.92	438	0.17	0.09
84-85 Machinery / Electrical	804	804	0.88	0.94	727	0.09	0.03
86-89 Transportation	125	125	0.87	0.95	102	0.10	0.03
90-97 Miscellaneous	389	389	0.77	0.88	371	0.19	0.06
Total	5,041	5,037	0.79	0.92	4,261	0.21	0.08

Source: WITS-COMTRADE. Own calculations. We compute the weight of high and low income countries for every six digit products and we present the average and the median shares by groups of two digit HS96 products.

Following these hints, the next section means to develop an empirical model to test the effects of imports in the firm export activity.

4 Empirical framework

In the definition of our empirical framework we express the firm production technology as a function of labour and material inputs. We assume that material inputs is a composite good made up of different varieties, namely a domestic and an imported variety. The latter one is not homogeneous since imports from high and low labour cost countries represent two different varieties. Since the decision to enter the export market follows from the comparison of expected profits and the export sunk costs, we can proceed describing the firm's technology by means of a cost function in the level of output y, the firm specific total factor productivity, ϕ, the price and quality

Table 5: Import share from High and Low Income countries

	Import share:			
	Year 2000		Δ - 2000/2004	
	from HI	from LI	from HI	from LI
logUV	0.014***	-0.021***		
	[0.002]	[0.003]		
Δ *logUV*			0.052***	-0.060***
			[0.008]	[0.010]
Constant	0.779***	0.234***	-0.062***	0.069***
	[0.005]	[0.006]	[0.003]	[0.004]
Observations	7,484	6,396	3,697	2,982
R-squared	0.018	0.025	0.03	0.031

Source: WITS-COMTRADE. Own calculations. Dependent variable share of imports from high income countries in columns 1 and 3 and from low income countries in columns 2 and 4. UV is the product unit value calculated as the total value imports over total quantity.

of labour - w and q_w, respectively - and the price and quality of imported and domestic materials - p_m and q_m and p_d and q_d, respectively. As already mentioned, imported inputs are, in turn, of two different types: the input coming from high income economies is supposed to be of higher quality and its price and quality can be labeled as p_h and q_h, while the price and quality of the input coming from low income economies are labeled as p_l and q_l. Inputs from the two sources are different, since they supply different types of services that in turn are different from the ones supplied by the domestic input. Nevertheless, they are imperfect substitutes and the quality of the input from the low income sources is rather low when compared to the quality of the other imported input. Since the three types of inputs are considered as different varieties of the same homogeneous material input, we can assume that the input coming from high income countries is the latest generation of that type of input, while the input coming from low income economies does not represent the highest technology in the field but is however comparable to what the domestic economy can achieve by itself. In this respect, we can assume that the domestic and low income imported input belong to the same generation of material inputs. Although one of the variety has rather higher quality compared to the other ones, the assumption of imperfect substitutability across varieties here supports the adoption of the three types of inputs at the same time in production. In other words, we may assume $q_d = q_l$ and in particular we may equal the domestic generation quality level to 1 so that $q_d = q_l = 1$ and $q_h > 1$ is a proxy for the higher technology level brought by the input imported from high income economies. A similar approach in modeling imported inputs in technology is followed by Halpern, Koren, and Szeidl (2005) who express each input i as assembled from the combination of a foreign and a domestic

variety, where the foreign variety displays higher productivity. Regardless of the productivity differences the firm uses both varieties in production due to their imperfect substitutability. Their theoretical framework is devoted to the foundation of an empirical model on imports and productivity in Hungary, where the largest share of imports are from high income economies and technology flows through imports may be the relevant channel for that economy. In our framework, instead, we include imports from low income economies too, for which it seems sensible to assume a level of productivity at most equal to the level of the domestic variety. Also, similarly to Kasahara and Lapham (2008) we consider a composite intermediate input, however differently from them, we consider for each input origin (domestic, high income, low income) a unique variety to keep the notation and the reasoning as simple as possible. We are not interested in the number of input varieties, due to the lack of such information in our data, nevertheless relaxing the assumption of a unique variety for each origin would not alter the main conclusions from our model. So the cost function can be expressed as follows:

$$C(w, p_m, p_d, y) = \frac{y}{\phi}(\frac{w}{q_w})^{\alpha}[(\frac{p_h}{q_h})^{\gamma} p_l^{\delta} p_d^{1-\gamma-\delta}]^{1-\alpha} \; with \; 0 \leq \alpha, \; \gamma, \; \delta \leq 1 \quad (1)$$

To keep the framework as simple as possible, we have assumed a unit elasticity of substitution across imported and domestic material inputs[11].

In equation 1, $0 \leq \gamma, \; \delta \leq 1$ represent firm specific technology parameters[12].

Assuming that firms face monopolistic competition in the unique export market and that the representative consumer's utility function is a C.E.S. over a continuum of varieties (Dixit and Stiglitz, 1977; Krugman, 1980; Melitz, 2003), we can express the price of final output as a constant mark

[11] We are aware that the empirical evidence on the elasticity of substitution across (imported) varieties reports estimates of such elasticity being around 3 (Broda and Weinstein, 2006; Broda, Greenfield, and Weinstein, 2006), and possibly a CES specification would be more general, nevertheless we are not addressing the estimation of the elasticity of substitution across varieties and, even in this case, also the CES could appear as inappropriate due to the assumption of a constant elasticity of substitution across the three types of material inputs. Then we have preferred to stick to the more tractable Cobb-Douglas form which rules out strict complementarity, as it is ruled out from the empirical evidence, and allows yet for a certain degree of substitutability across varieties.

[12] We can assume that $\gamma \neq 0$ and $\delta \neq 0$ imply

$$\frac{y}{\phi}(\frac{w}{q_w})^{\alpha}[(\frac{p_h}{q_h})^{\gamma} p_l^{\delta} p_d^{1-\gamma-\delta}]^{1-\alpha} - \frac{y}{\phi}\frac{w}{q_w}^{\alpha} p_d^{(1-\alpha)} \quad < \quad f_m$$

With f_m representing a firm specific sunk cost of entrance into the import market. Just as for productivity, firms draw their f_m from a distribution and realise whether they can have access to the imported inputs or not. This treatment of the import sunk cost is similar to Kasahara and Lapham (2008), however we will not go in depth in this since we do not mean to model the entrance in the import market, instead we mean to model the effect of imports on exports.

up over marginal cost

$$p_y = \frac{\sigma}{\sigma - 1} * \frac{(\frac{w}{q_w})^{\alpha}[(\frac{p_h}{q_h})^{\gamma} p_l^{\delta} p_d^{1-\gamma-\delta}]^{1-\alpha}}{\phi} \tag{2}$$

with σ expressing the elasticity of substitution across varieties of the final good. The assumption of a unique export market is imposed by our data that only contain information on the overall export status of the firm without making any distinction across destinations. Another implicit assumption in equations 1 and 2 is that trade and transport costs are absent in our model. The choice not to model them follows from the observation that both import and export tariffs do not really vary in our five-year time span, by the same token. Additionally, due to the lack of detailed information on destination and origin countries, the inclusion of distance from import and export markets is superfluous since it would be time, sector and firm invariant. Thus, we abstract from the inclusion of iceberg costs in export and imports to avoid any unnecessary complications. From the above equations it follows that profits are

$$\Pi = \left[\frac{(\frac{w}{q_w})^{\alpha}[(\frac{p_h}{q_h})^{\gamma} p_l^{\delta} p_d^{1-\gamma-\delta}]^{1-\alpha}}{(\sigma - 1)\phi} \right] y \tag{3}$$

In equilibrium we can express output of each variety in terms of its demand as

$$y = Y \left[\frac{p_y}{P} \right]^{-\sigma} \tag{4}$$

with Y representing the aggregate good made up of the varieties consumed and $P = [\int_{\omega} p(\omega)^{1-\sigma} d\omega]^{\frac{1}{1-\sigma}}$ representing the aggregate price.

Finally, plugging 4 into 3 we get the following expression

$$\Pi = \frac{YP}{\sigma} \left[\frac{(\sigma - 1)}{\sigma} \frac{\phi P}{(\frac{w}{q_w})^{\alpha} (\frac{1}{q_h^{1-\mu}})^{\gamma(1-\alpha)} p_l^{\delta(1-\alpha)}} \right]^{\sigma-1} \tag{5}$$

where the domestic price p_d is taken as the numeraire and, following Halpern, Koren, and Szeidl (2005), we further assume that the relative price of the high income country variety only imperfectly reflects the higher quality so that $\frac{p_h}{p_d} = q_h^{\mu}$ with $\mu < 1$.

Now, the only fixed cost of production is represented by an entry sunk cost in the export market, F_{exp}. A firm will enter the foreign market if the expected profits are higher than this sunk entry cost. Ruling out uncertainty about future profits and defining r the interest rate

$$\frac{\Pi}{r} = \frac{\frac{YP}{\sigma} \left[\frac{(\sigma-1)}{\sigma} \frac{\phi P}{(\frac{w}{qw})^{\alpha} (\frac{1}{q_h^{1-\mu}})^{\gamma(1-\alpha)} p_l^{\delta(1-\alpha)}} \right]^{\sigma-1}}{r} > F_{exp} \tag{6}$$

We index sectors with j and define the export sunk cost as made up of a sector specific δ_j component and a sector-firm idiosyncratic shock, ρ_{ijt}

$$F_{exp} = e^{\delta_j + \rho_{ijt}} \tag{7}$$

Substituting 7 into 6, taking the variables in logarithm and assuming ρ_{ijt} is normally distributed, we get an empirical model for the probability to export:

$$\begin{aligned} Pr(Exp_{ijt} = 1) \quad = \quad & Pr(\beta_0 + \beta_1 ln\phi + \beta_2 lnq_{h\ it} - \beta_3 lnp_{l\ it} - \beta_4 lnw_{it} + \\ & + \beta_5 lnq_{w\ it} - \beta_4 lnr - \delta_j > \rho_{ijt}) \end{aligned} \tag{8}$$

This simple empirical framework predicts that, *ceteris paribus* a reduction in the price of inputs sourced from low income economies and an increase in the quality of imports coming from high income suppliers (that proxies for the relative price of inputs from developed countries with respect to domestic variety) increases the probability to export. To this purpose we include in our empirical model the share of imports from low and high income countries over total intermediate inputs to proxy for the firm search of higher quality and cost saving. If, as documented above, the share of imports from low income economies increases as import prices from these sources decline and such an increase in the import share fosters the exports activity, then we can interpret this finding as cost saving favouring exporting[13]. Furthermore, if higher product quality is related to an increase in the share of imports from high income economies we can interpret a positive effect stemming from the increase in the share of imports from these origins as higher quality of imported inputs fostering exports. The remaining variables that we include in our probit model are the logarithm of the firm total factor productivity and the logarithm of the firm-level average wage. Our data do not provide any information on the skill level of labour inputs and, as a consequence, as far as higher labour productivity is reflected in a higher average wage the latter, in this setting, could capture either higher labour costs or higher average quality of the labour force employed. In other words, we are uncertain about the sign of this coefficient, which often turns positive in firm level studies (Bernard and Jensen, 1998). Although firms face different interest rates in financial markets according to their location, size and economic activity, we do not have the availability of such a detailed information and so we are compelled to consider the interest rate as constant across all of the firms in the empirical specification. Since the Italian credit market is mainly geographically segmented, a location dummy could be informative here, but unfortunately our dataset does not include this information. Even if the model does not include the firm size among the export determinants, we have chosen to include the logarithm of the number of

[13] See Feenstra (2004) page 119.

employees among our right hand side variables as standard in the literature (Bernard and Jensen, 1999, 1998). This variable could also account for the financial constraints faced by the firm that can not be controlled for with other indicators[14]. We have also included a full set of two digit sector and time dummies to account for sector time invariant export costs and common time shocks that may affect the overall export probability of manufacturing firms. Unfortunately, we are not able to control for the foreign ownership of the firm in this sample. We also lack any information on the firm foreign investments abroad. The inclusion of inward and outward FDI dummies would be desirable in such an empirical setting, due to the large intra-firm share of trade that is generally operated by multinationals. To assess whether the omission of such controls may result in a serious misspecification of our empirical model, we made a check using complementary information from the EFIGE database on comparable firm level data on manufacturing firms from seven European countries[15]. According to this survey, foreign owned firms (firms with 10% or more of foreign owned capital) represent about 5% of the total manufacturing firms. At the same time, only 2.5% of the firms declare to invest abroad. In addition, only 7% of the exporters and 9% of importers are foreign owned and only 4% of exporters and 5% of importers are foreign investors. These figures confirm that the multinational activity is not very common within the Italian manufactuting sectors, and that the majority of exporters are not part of a multinational group. Thus, we are confident that our results are not considerably affected by the lack of this control.

5 Results

In order to appraise whether the firm export probability is enhanced by the increased import intensity in intermediates, our empirical strategy is twofold: firstly we focus on a sample of export starters and never exporters and we estimate a simple pooled probit model of the export probability; secondly, we extend our investigation to the whole sample of manufacturing firms, including firms exiting the export market, always exporters and export switchers, and we take into account of the persistence in the decision to export estimating a linear probability model (LPM) by means of the System

[14]Usually a strict linkage between the financial constraints and the firm size is found in the literature (Beck, Demirgüç-Kunt, and Maksimovic, 2005; Beck, Demirgüç-Kunt, Laeven, and Levine, 2008).

[15]The *European Firms in a Global Economy: internal policies for external competitiveness* (EFIGE) project examines the pattern of internationalisation of European firms. The project has developed and gathered harmonised statistical information at the firm level for seven EU countries. The collected database is representative of the country population of firms with more then 10 employees. The focus is especially on the firm international activity. More information on the project and the firm level survey and database can be found at $www.efige.org$.

GMM. Accounting for sunk costs in exports by means of the past export experience allows us to better identify the role of imports. Any positive role of imports in the probit for the export starters may, in fact, originate from the sunk cost complementarities in export and imports highlighted by Muûls and Pisu (2009) and not properly controlled for by sector dummies.

Table 8 shows the descriptive statistics for the variables used in our model while Table 9 shows their pairwise correlations. In these Tables and in the following ones $impshare_{LI}$ and $impshare_{HI}$ stand for the share of imports coming respectively from low and high income countries, TFP_{ind} is the total factor productivity index[16], l is the logarithm of labour and captures the firm size and w is the firm average wage. Finally, the results in each of the Tables in the text show the baseline specification in column 1, the specification with all regressors lagged one year in column 2, the inclusion of intangible and tangible assets in columns 3 to 6 and the substitution of the labour productivity measure for the TFP index in the last column.

5.1 Starters

The focus on the sample of starters - firms never exporting in the previous three years, ad defined in the descriptive analysis - and never exporters allows us to disregard the role of the previous firm export experience (that is, the lagged export status) on the probability to export at time t, then we detect sunk entry costs via the inclusion of two digit sector dummies. We estimate a model as in equation 8 on the sample of starters in their entry year in the export market and never exporters for all the years they are in our dataset. Results are from pooled probit regressions and are shown in Table 6. In the base specification of column 1 the right hand side variables are entered in their value at time *(t-2)*. As column 2 in the Table shows, the results do not substantially change when we include them in their value at time *(t-1)*, however the base specification of column 1 is our preferred, since it allows for a reduced influence of endogeneity and reverse causality problems on our results. The Table shows that an increase in the imported input intensity from cheap labour cost countries, $impshare_{LI}$, is associated to an increase in the probability to become an exporter. The involvement with suppliers from developed countries, $impshare_{HI}$, seems to have a less significant impact in the export entry and this effect is not robust across the different specifications.

As standard in the literature we confirm that larger and more efficient firms are more likely to start exporting. Also, although the finding of the positive and significant relationship between higher wages and the export probability is at odds with our empirical framework where higher unit labour

[16]TFP has been computed using the multilateral index suggested by (Good, Nadiri, and Sickles, 1996). The index is centered with respect to the average firm in each two digit sector in the first year of the sample.

costs are expected to negatively affect the firm export probability, this is very common in the literature where higher wages are interpreted as a proxy of the firm human capital (Bernard and Jensen, 1998). As a matter of fact, the firm level average wage may capture a number of firm specific features that are highly correlated to this variable and that are not included in the regression. We may suppose that for Italian manufacturing firms, the higher the firm human and fixed capital stock and intensity, the higher the average wage paid by the firm. Unfortunately, we are not able to control for the firm level skill intensity, but we have information on the firm tangible and intangible capital stocks. When we include the logarithm of the real stocks of intangible and tangible capital, k_{int} and k_{tan}, and the logarithm of their share over output, ky_{int} and ky_{tan} in columns 3 to 6, both sets of indicators display positive and significant coefficients and when the tangible capital stock is included the wage turns to be negative. This evidence may then go in favour of our interpretation of the wage as capturing the capital/skill intensity at the firm level. The same result emerges in the last column when labour productivity substitutes for the total factor productivity index, as labour productivity is highly correlated with capital intensity[17].

The same insights are confirmed when, as a further robustness check, we include sector-level controls in Table 10. Here we have controlled for some relevant sector-level variables: the export openness, Exp_Open, the import penetration from high and low income countries, Imp_Pen_{HI} and Imp_Pen_{LI}[18], and the output and input tariffs from high and low income countries, $OutputTariff_{HI}$, $OutputTariff_{LI}$, $InputTariff_{HI}$ and $InputTariff_{LI}$ [19]. All these results confirm the evidence from the baseline specification of a possible positive role of imports from low income countries in the export status of manufacturing firms, regardless of the sector of activity. On the contrary, there seems to be no role for imports from high income countries, especially when we also control for the firm capital intensity and the sector level openness measures. It is worth to notice that the results stay unchanged also when input tariffs are included in the specification, thus suggesting that cost saving from increased imported input intensity is not

[17]In our sample the correlation between the tangible capital stock and labour productivity is 0.49 while the correlation between the tangible capital stock and the total factor productivity index is much lower and is 0.19. The two productivity measures instead show a correlation of 0.86.

[18]Export Openness and Import Penetration ratio are obtained making use of sectoral trade data from Istat (COE dataset) and the Italian firms economic accounts (Conti Economici delle Imprese, Istat) and are defined at 3-digit NACE level. For some 3-digit sectors trade indicators are missing. The Export Openness measure is the ratio between the total sector exports over the sector total output, while the Import Penetratio measure is the ratio between total sector imports over the sector absorption, i.e. the summation of the sector output and imports minus exports.

[19]Output Tariff data are from WITS and concern 2-digit NACE sectors. Input Tariffs have been computed combining Output Tariffs and information from Input-Output Tables (ISTAT).

uniquely derived by trade liberalisation.

Among sector variables, the export openness seems to contribute to the firm export success. Especially, this variable could capture, better than sector dummies, the extent of sunk costs in the export market and could then reveal the existence of spillover effects from the presence of exporters in the same sector, that have already been documented in literature (e.g. as in Serti and Tomasi (2008) for Italy). At the same time, the coefficient on the export openness may simply capture the comparative advantage of the sector. Although two digit sector dummies may already account for this, again the three digit export openness measure may better capture cross sector differences within the same two digit code and may also better capture a different time evolution pattern across sectors.

Concerning the foreign good flows in the sector, import penetration from low income countries positively affects the probability to export, import penetration from high income countries displays a negative coefficient but it is never significant. A higher share of imports from low labour cost countries may push cost saving or quality upgrading strategies to escape competition from these countries, thus enhancing the overall export probability.

Tariffs are not significant at all, and this may be linked to the fact that EU average tariffs - both with respect to high and low income countries - basically stayed unchanged in our sample period up to 2003 and only experienced a reduction in 2004. Then, their low time variability together with the use of two digit level indicators may explain why tariffs do not significantly affect the export probability in our sample.

5.2 A dynamic model of the export determinants

In the previous section the role of sunk entry costs was assumed sector specific and it was detected mainly via the inclusion of sector dummies. However, this may not be an appropriate way to identify such costs, especially if the effect of imports on the probability to export works through the common sunk costs channel as suggested by Muûls and Pisu (2009). Then, to control for the importance of sunk costs in the export activity and to ascertain that the results we have found for the import variables are not driven by common entry costs, we estimate a dynamic linear probability model on the overall sample. Once accounted for past export experience, we might ascertain whether increased imported intermediate intensity still turns as a significant determinant of the export status. Furthermore, the dynamic model also permits us to estimate the role of imports including continuous exporters and switchers into the previous sample. Importing, in fact, may be relevant both to cross the border and to help the firm to preserve its position on the international markets.

The inclusion of the lagged dependent variable poses a well known endogeneity issue due to its correlation with the individual specific effect. GMM

Table 6: Probit Model

	[1]	[2]	[3]	[4]	[5]	[6]	[7]
	Base	1-year Lagged regressors	Intangible assets		Tangible assets		Labour Productivity
$impshare_{LI\ t-2}$	1.681***	1.529***	1.700***	1.562***	1.522***	1.677***	1.551***
	[0.343]	[0.33]	[0.346]	[0.395]	[0.345]	[0.343]	[0.345]
$impshare_{HI\ t-2}$	0.287*	0.292*	0.283*	0.294*	0.203	0.286*	0.199
	[0.154]	[0.157]	[0.154]	[0.165]	[0.155]	[0.154]	[0.154]
$TFP_{ind\ t-2}$	0.190***	0.148***	0.175***	0.194***	0.275***	0.251***	
	[0.043]	[0.0438]	[0.042]	[0.046]	[0.042]	[0.046]	
l_{t-2}	0.175***	0.172***	0.154***	0.160***	0.0826***	0.172***	0.186***
	[0.017]	[0.0172]	[0.018]	[0.019]	[0.02]	[0.017]	[0.017]
w_{t-2}	0.00779	0.103*	0.00453	0.0305	-0.116**	-0.0328	-0.140***
	[0.052]	[0.0535]	[0.051]	[0.055]	[0.053]	[0.053]	[0.052]
LP_{t-2}							0.339***
							[0.039]
$k_{int\ t-2}$			0.0204***				
			[0.004]				
$ky_{int\ t-2}$				0.0126*			
				[0.007]			
$k_{tan\ t-2}$					0.0980***		
					[0.011]		
$ky_{tan\ t-2}$						0.0366***	
						[0.012]	
Const.	-1.927***	-2.874***	-2.008***	-2.017***	-1.713***	-1.443***	-4.055***
	[0.507]	[0.527]	[0.505]	[0.544]	[0.499]	[0.525]	[0.364]
Observations	22838	22841	22838	19107	22838	22838	22872
pR2	0.026	0.0276	0.0286	0.0241	0.0324	0.0268	0.0301
LL	-6590	-6584	-6573	-5721	-6547	-6585	-6568
	315.4	333.2	344	250.7	393.4	325.8	370.6

*** p<0.01, ** p<0.05, * p<0.1. The Dependent Variable is the probability to start exporting. Pooled Probit Regressions.

All regressions include a full set of sector and year dummies. Robust standard errors are in brackets.

estimators have usually been adopted to account for this endogeneity source (Arellano and Bond, 1991; Blundell and Bond, 1998; Bond, 2002) and as far as the linear probability model is concerned Bernard and Jensen (1998) adopt this empirical strategy on a panel of U.S.A. firms[20]. Thus, we exploit the System GMM to deal with the role of firm import activity on export status in a dynamic framework. The use of the GMM estimator also allows us to instrument our variables of interest, $impshare_{LI}$ and $impshare_{HI}$, and then to deliver causal effects to our estimates, under the validity and exogeneity of our instruments[21]. The test for the absence of second order autocorrelation in the differenced errors ($AR2$) rejects the null, thus third and fourth lags of the level of variables have been used as instruments in the differenced equation (Bond, 2002). Unfortunately, we have no way to test for third order autocorrelation, as our sample time span prevent us from doing it, nevertheless the failure to reject the null from the Hansen tests in each specification makes us confident of the validity of our instruments and of our estimation choice.

The results in Table 7 for the dynamic probability model in general confirm the previous finding of a positive effect of imports from low labour cost countries on the export probability regardless of the firm activity sector. Purchases from high income economies still remain non significant.

Some differences with respect to the findings on the pooled probit on the export starters and never exporters can be detected for other firm level variables. Wages are now significant and positive all over the specifications. To explore the drivers of this finding which is in contrast to the previous one on the sample of export starters we start observing that the wage positively contributes regardless of the inclusion of the capital measures. We then hypothesize that this result may follow from the inclusion of always exporters, that, in our sample, represent the largest share of exporters and that may be characterised by a higher skill intensity. To check the consistency of this interpretation we cannot use our data due to the lack of any information on the labour force composition, then once again we rely on complementary information from the EFIGE database from which we can retrieve information for export starters, persistent exporters and their respective skill intensity. It emerges that persistent exporters are more skill intensive than switchers, in addition to have a higher skill endowment than

[20]The GMM estimation of linear probability models is also used in other areas of applied economics: as an example, Stewart (2007) uses GMM to estimate a model of persistence in low pay.

[21]We are aware that including further exogenous instruments might deliver more robustness to our estimates, so, in the lack of firm level instruments, we tried to include some sector level instruments, such as sectoral import penetration and tariffs in the German economy and the interaction between the low-wage industrial production with a sectoral indicator of labour intensity, and the interaction of advanced economies'industrial production with sectoral skill intensity to instrument import flows from developing and developed countries respectively (Auer, 2008). However, our results were unchanged.

non exporters. Thus, in this sample the skill gap between exporters and non exporters is much higher than in the previous sample where only starters where included, and this may drive the positive impact we find for wage. A puzzling evidence is now shown for the capital intensity that turns to be significant and negative when we move to a dynamic framework and we extend the analysis to all firms in the sample. A tentative explanation of this result may be related to the evidence on investments and exports being substitutes under financial constraints. While innovation and export are normally complement activities, the presence of credit constraints forces these activities to become substitutes (Gorodnichenko and Schnitzer, 2010). Although an increase in the capital intensity may well provide enhanced efficiency and competitiveness after some years, as from the probit estimates, a contemporaneous increase in the stock of capital relative to the level of output raises the average cost, lowers the degree of competitiveness and may reduce the probability to export in the same year, if firms are financially constrained. This result, however, would deserve further investigations.

Finally, the dynamic framework allows us to investigate the role of the previous firm export experience on its future foreign involvement. The regressions confirm the existence of important sunk export costs: the probability of exporting in t is 60% higher for previous exporters in (*t-1*) than for non-exporters. This coefficient is slightly smaller than the one found by Bernard and Jensen (1998) on the linear probability model with no plant effects and higher than the 0.39 they find with GMM-difference, which traditionally bears lower coefficient estimates of the autoregressive parameter than the System GMM. Nevertheless, when they move to a random effect probit with initial condition the estimated coefficient is 0.61, which is mimicked by our result.

Concerning the magnitude of our main results, we find that, in our sample, an increase of one percentage point in the firm import share from low income countries increases its probability of exporting of 0.24%, according to our baseline specification. Even if this effect may seem to be small, firms that heavily take adavantage in their production processes of cheaper inputs sourced in developing countries may gather important benefits in terms of higher probability of exporting. As a matter of fact, firms offshoring to low labour cost countries have an average import share from these economies of about 10%, then moving from non importing to be an average importer from low cost countries increases the probability to export by 2.4%.

The robustness checks in Table 11 support the previous findings. Again export openness is positive and significant. Tariffs mainly remain non significant, while import penetration has a significant and positive impact, especially for goods coming from developing countries.

We have also tested for the existence of heterogeneity in the results according to the innovation pattern of the sector. Then, we have split the sample according to the Pavitt's taxonomy (Pavitt, 1984) in firms belonging

Table 7: Dynamic LPM - SYS GMM estimates

	[1]	[2]	[3]	[4]	[5]	[6]	[7]
	Base	1-year Lagged regressors	Intangible assets		Tangible assets		Labour Productivity
exp_{t-1}	0.598***	0.590***	0.596***	0.581***	0.595***	0.598***	0.594***
	[0.038]	[0.038]	[0.038]	[0.042]	[0.038]	[0.038]	[0.038]
$impshare_{LI\ t}$	0.241***	0.201***	0.239***	0.247***	0.232***	0.240***	0.236***
	[0.041]	[0.039]	[0.041]	[0.043]	[0.041]	[0.041]	[0.041]
$impshare_{HI\ t}$	-0.109	-0.0483	-0.115	-0.131	-0.107	-0.109	-0.112
	[0.087]	[0.054]	[0.087]	[0.090]	[0.088]	[0.087]	[0.087]
$TFP_{ind\ t}$	0.0442***	0.0440***	0.0427***	0.0536***	0.0525***	0.0541***	
	[0.005]	[0.005]	[0.005]	[0.006]	[0.006]	[0.006]	
l_t	0.0528***	0.0508***	0.0484***	0.0211***	0.0364***	0.0252***	0.0531***
	[0.005]	[0.005]	[0.005]	[0.005]	[0.004]	[0.005]	[0.006]
w_t	0.0202***	0.0204***	0.0185***	0.0443***	0.00604	0.0352***	0.0056
	[0.005]	[0.004]	[0.005]	[0.006]	[0.005]	[0.005]	[0.004]
LP_t							0.0584***
							[0.006]
$k_{int\ t}$			0.00357***				
			[0.000]				
$ky_{int\ t}$				-0.00159***			
				[0.000]			
$k_{tan\ t}$					0.0147***		
					[0.002]		
$ky_{tan\ t}$						-0.00717***	
						[0.001]	
Const.	-0.101**	-0.0956**	-0.102**	-0.100**	-0.108**	-0.168***	-0.574***
	[0.046]	[0.0410]	[0.046]	[0.050]	[0.046]	[0.050]	[0.073]
Observations	159770	159837	159770	140471	159770	159770	159880
Number of id	40224	40236	40224	37703	40224	40224	40231
Hansen	0.411	0.312	0.317	0.244	0.4	0.415	0.474
AR1	0	0	0	0	0	0	0
AR2	0	0	0	0	0	0	0

*** p<0.01, ** p<0.05, * p<0.1. All regressions include a full set of sector and year dummies. Robust standard errors are in brackets. GMM estimates are obtained using the 3^{rd} and 4^{th} lags of the dependent variable and regressors as instruments for the equation in differences and the 2^{nd} lag of the differenced variables for the equation in levels. The instrumented variables are the lagged dependent variable, $impshare_{LI}$ and $impshare_{HI}$. AR1 and AR2 show the P-value for the tests of the null hypothesis of no first and second order serial correlation in the differences of residuals. Hansen shows the P-value of the test of the validity of the over-identifying restrictions.

to traditional and non traditional (high tech, scale and specialised suppliers) sectors and the results do no reveal any meaningful difference. This shows that the impact of imports from low income countries on exports does not seems to be related to some sector characteristics, but, in opposite, seems to come from firm strategies. This set of estimates is not shown for brevity but it is readily available from the authors upon request.

Summing up, the previous evidence, our findings both from the probit and linear dynamic probability model confirm that only imports from low income countries positively affect the export probability of manufacturing firms. This evidence recalls the finding by Jabbour (2010) on imports of intermediates from low income countries fostering profitability of French manufacturing firms[22].

6 Conclusions

Within the recent strand of empirical literature on the reationship between exports and imports, we have tried to add some evidence on the role of imports in enhancing the export probability of manufacturing firms. We confirm that exporting and importing are two importantly interrelated strategies, and, once accounted for productivity and export sunk costs, we find that only imports from cheap labour countries positively and significantly affect the export probability of Italian manufacturing firms. We interpret this finding as the working of the cost saving channel, opposed to the technology channel, usually identified in the literature with imports from high income countries, that in our study never turn significant. This evidence on the Italian data suggests that imports from low income countries represent one of the key characteristics that allow firms to easily gain and preserve competitiveness in the export markets. Investigating the role of imports in manufacturing can have important implications on the understanding of the manufacturing firm competitive strategies. This is of particular interest for the target country of our analysis, where a productivity slowdown is threatening the competitiveness of the manufacturing firms. The Italian export vocation especially relies on traditional products that have a low technological content and, consequently, face a fierce competition from emerging manufacturing economies. Competitive strategies in this setting may call for the use of cheaper inputs or/and quality upgrading of existing products. This latter process would imply an important role for inputs from developed economies, which however does not seem to emerge from our data. In op-

[22]Our evidence may seem at odds with the findings by Bas and Strauss-Khan (2011) on the export scope of French exporters being positively affected by the number of imported products from high income countries only. However, the latter analysis is focused on the different issue of the determinants of the export scope and not on the export probability and is only run on the sample of exporters, thus, it is not able to capture the role of imports for firms to start exporting or preserving their exporter status.

posite, firms seem to have postponed/downsized their investments in favour of a cost reduction strategy to face the current combination of higher average costs and tough international competition. This appears to be valid in general, also for advanced activities, where the scope of innovation is larger. However, the recent evidence on learning-by-exporting (Serti and Tomasi, 2008; Bratti and Felice, 2011) together with the evidence from this paper imply that if imports, by means of cost saving, positively affect the probability to export, then this represents a good opportunity for Italy, due to productivity gains originating from the firm export activity.

Further empirical studies on other high income economies would be needed to investigate whether our finding on the nexus between imports and competitiveness in manufacturing is a general phenomenon or it is only confined to the case of Italy. In addition, under data availability on a much longer period than the one at our disposal, a natural extension of this research would be to investigate how actually imports of both cheaper and high tech inputs foster persistence in the export market. Finally, in the analysis of the relationships between different internationalization strategies, future work might be directed to test the role of foreign direct investments in enhancing both importing and exporting.

References

Altomonte, C., and G. Bekes (2009): "Trade Complexity and Productivity," IEHAS Discussion Papers 0914, Institute of Economics, Hungarian Academy of Sciences.

Amiti, M., and J. Konings (2007): "Trade Liberalization, Intermediate Inputs, and Productivity: Evidence from Indonesia," *American Economic Review*, 97(5), 1611–1638.

Amiti, M., and S. Wei (2004): "Fear of Service Outsourcing: Is It Justified?," NBER Working Papers 10808, National Bureau of Economic Research, Inc.

——— (2006): "Service Offshoring and Productivity: Evidence from the United States," NBER Working Papers 11926, National Bureau of Economic Research, Inc.

Arellano, M., and S. Bond (1991): "Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations," *Review of Economic Studies*, (58), 277–297.

Aristei, D., D. Castellani, and C. Franco (2011): "Firms' exporting and importing activities: is there a two-way relationship?," Discussion paper, mimeo.

Auer, R., F. A. (2008): "The Effect of Trade with Low-Income Countries on U.S. Industry," Discussion paper.

Bas, M. (2009): "Trade, foreign inputs and firms' decisions: Theory and Evidence," CEPII Working Paper Series 35, CEPII.

Bas, M., and V. Strauss-Khan (2011): "Does importing more inputs raise exports? Firm level evidence from France," mimeo.

Beck, T., A. Demirgüç-Kunt, L. Laeven, and R. Levine (2008): "Finance, Firm Size, and Growth," *Journal of Money, Credit and Banking*, 40(7), 1379–1405.

Beck, T., A. Demirgüç-Kunt, and V. Maksimovic (2005): "Financial and Legal Constraints to Growth: Does Firm Size Matter?," *Journal of Finance*, 60(1), 137–177.

Bernard, A., and J. Jensen (1999): "Exceptional exporter performance: cause, effect, or both?," *Journal of International Economics*, 47(1), 1–25.

Bernard, A., J. B. Jensen, S. J. Redding, and P. K. Schott (2007): "Firms in International Trade," *Journal of Economic Perspectives*, 21(3), 105–130.

Bernard, B. A., and J. B. Jensen (1998): "Why some firms export.," *Journal of Econometrics*, (87), 115–143.

Blundell, R., and S. Bond (1998): "Initial conditions and moment restrictions in dynamic panel data models," *Journal of Econometrics*, (87), 115–143.

Bond, S. (2002): "Dynamic panel data models: a guide to microdata methods and practice," *CeMMAP Working Paper*, (09/02).

Bratti, M., and G. Felice (2011): "Are Exporters More Likely to Introduce Product Innovations?," Development Working Papers 306, Centro Studi Luca dÁgliano, University of Milano.

Broda, C., J. Greenfield, and D. Weinstein (2006): "From Groundnuts to Globalization: A Structural Estimate of Trade and Growth," NBER Working Papers 12512, National Bureau of Economic Research, Inc.

Broda, C., and D. E. Weinstein (2006): "Globalization and the Gains from Variety," *The Quarterly Journal of Economics*, 121(2), 541–585.

Castellani, D., F. Serti, and C. Tomasi (2010): "Firms in International Trade: Importers' and Exporters' Heterogeneity in Italian Manufacturing Industry," *The World Economy*, 33(3), 424–457.

Conti, G., A. L. Turco, and D. Maggioni (2011): "Rethinking the import-productivity nexus for Italian manufacturing: do exports matter?," FREIT Working Paper Series 348, FREIT.

Dixit, A., and J. Stiglitz (1977): "Monopolistic Competition and Optimum Product Diversity," *American Economic Review*, 67(3), 297–08.

Feenstra, R. C. (2004): "Advanced International Trade. Theory and Evidence," Princeton and oxford, Princeton University Press.

Feenstra, R. C., and G. H. Hanson (1996): "Globalization, Outsourcing, and Wage Inequality," *American Economic Review, American Economic Association*, 86(2), 240–245.

——— (1999): "The Impact Of Outsourcing And High-Technology Capital On Wages: Estimates For The United States, 1979-1990," *The Quarterly Journal of Economics*, 114(3), 907–940.

Forlani, E. (2010): "Irish firms' productivity and imported inputs," Core discussion papers, Université catholique de Louvain, Center for Operations Research and Econometrics (CORE).

Good, D. H., M. I. Nadiri, and R. C. Sickles (1996): "Index Number and Factor Demand Approaches to the Estimation of Productivity," NBER Working Papers 5790, National Bureau of Economic Research, Inc.

Gorodnichenko, Y., and M. Schnitzer (2010): "Financial constraints and innovation: Why poor countries don't catch up," NBER Working Papers 15792, National Bureau of Economic Research, Inc.

Görg, H., A. Hanley, and E. Strobl (2008): "Productivity effects of international outsourcing: evidence from plant-level data," *Canadian Journal of Economics*, 41(2), 670–688.

Hallak, J. C. (2006): "Product quality and the direction of trade," *Journal of International Economics*, 68(1), 238–265.

Halpern, L., M. Koren, and A. Szeidl (2005): "Imports and Productivity," CEPR Discussion Papers 5139, C.E.P.R. Discussion Papers.

ISGEP (2008): "Understanding Cross-Country Diffences in Exporter Premia: Comparable Evidence for 14 Countries," *Review of World Economics (Weltwirtschaftliches Archiv)*, 144(4), 596–635.

Jabbour, L. (2010): "Offshoring and Firm Performance: Evidence from French Manufacturing Industry," *The World Economy*, 33(3), 507–524.

Kasahara, H., and B. Lapham (2008): "Productivity and the Decision to Import and Export: Theory and Evidence," CESifo Working Paper Series 2240, CESifo Group Munich.

Kasahara, H., and J. Rodrigue (2008): "Does the use of imported intermediates increase productivity? Plant-level evidence," *Journal of Development Economics*, 87(1), 106–118.

Krugman, P. (1980): "Scale Economies, Product Differentiation, and the Pattern of Trade," *American Economic Review*, 70, 950–59.

Lööf, H., and M. Andersson (2010): "Imports, Productivity and Origin Markets: The Role of Knowledge-intensive Economies," *The World Economy*, 33(3), 458–481.

Melitz, M., and G. I. P. Ottaviano (2008): "Market Size, Trade, and Productivity," *Review of Economic Studies*, 75(1), 295–316.

Melitz, M. J. (2003): "The Impact of Trade on Intra-Industry Reallocations and Aggregate Industry Productivity," *Econometrica*, 71(6), 1695–1725.

Morrison Paul, C., and M. Yasar (2009): "Outsourcing, productivity, and input composition at the plant level," *Canadian Journal of Economics*, 42(2), 422–439.

Muûls, M., and M. Pisu (2009): "Imports and Exports at the Level of the Firm: Evidence from Belgium," *The World Economy*, 32(5), 692–734.

OECD (2007): "Offshoring and Employment: Trends and Impacts.," Discussion paper, OECD.

Pavitt, K. (1984): "Sectoral Patterns of Technical Change: Towards a Taxonomy and a Theory.," *Research Policy*, (13), 343–373.

Roberts, M. J., and J. R. Tybout (1995): "An empirical model of sunk costs and the decision to export," Policy Research Working Paper Series 1436, The World Bank.

Serti, F., and C. Tomasi (2008): "Self Selection and Post-Entry effects of Exports. Evidence from Italian Manufacturing firms," *Review of World Economics*, 144, 660–694.

Sjöholm, F. (2003): "Which Indonesian firms export? The importance of foreign networks," *Papers in Regional Science*, 82(3), 333–350.

Smeets, V., and F. Warzynski (2010): "Learning by Exporting, Importing or Both? Estimating productivity with multi-product firms, pricing

heterogeneity and the role of international trade," Working Papers 10-13, University of Aarhus, Aarhus School of Business, Department of Economics.

Stewart, M. (2007): "The inter-related dynamics of unemployment and low pay," *Journal of Applied Econometrics*, 22, 511–531.

Vogel, A., and J. Wagner (2010): "Higher productivity in importing German manufacturing firms: self-selection, learning from importing, or both?," *Review of World Economics (Weltwirtschaftliches Archiv)*, 145(4), 641–665.

Wagner, J. (2007): "Exports and Productivity: A Survey of the Evidence from Firm-level Data," *The World Economy*, 30(1), 60–82.

Table 8: Descriptive Statistics

Variable		Mean	Std. Dev.	Observations
exp	overall	0.63	0.48	N = 200964
	between		0.44	n = 40385
	within		0.21	T-bar = 4.9762
TFP_{ind}	overall	-0.06	0.42	N = 202246
	between		0.37	n = 40472
	within		0.20	T-bar = 4.99718
l	overall	2.89	1.06	N = 202395
	between		1.05	n = 40479
	within		0.17	T = 5
w	overall	10.04	0.38	N = 202387
	between		0.36	n = 40479
	within		0.13	T-bar = 4.9998
$impshare_{LI}$	overall	0.02	0.09	N = 201293
	between		0.09	n = 40406
	within		0.03	T-bar = 4.98176
$impshare_{HI}$	overall	0.05	0.13	N = 201293
	between		0.13	n = 40406
	within		0.05	T-bar = 4.98176

Table 9: Pairwise correlation coefficients

	TFP_{ind}	l	w	exp	$impshare_{LI}$	$impshare_{HI}$
TFP_{ind}	1					
l	0.31	1				
w	0.65	0.5	1			
exp	0.23	0.35	0.25	1		
$impshare_{LI}$	0.07	0.12	0.0022ns	0.16	1	
$impshare_{HI}$	0.2	0.27	0.23	0.21	0.07	1

All significant at 1%. ns=not significant

Appendix A

Table 10: Robustness checks - Sector Level Controls

	[1]	[2]	[3]	[4]
	Export Openness	Import Penetration	Output Tariffs	Input Tariffs
$impshare_{LI\ t-2}$	1.676***	1.653***	1.677***	1.677***
	[0.372]	[0.372]	[0.343]	[0.343]
$impshare_{HI\ t-2}$	0.25	0.243	0.285*	0.286*
	[0.159]	[0.159]	[0.154]	[0.154]
$TFP_{ind\ t-2}$	0.194***	0.187***	0.192***	0.192***
	[0.0455	[0.0457	[0.043]	[0.043]
l_{t-2}	0.163***	0.157***	0.175***	0.175***
	[0.0189]	[0.0188]	[0.017]	[0.017]
w_{t-2}	-0.0057	-0.00201	0.005	0.006
	[0.0551]	[0.0553]	[0.052]	[0.052]
$Exp.Open_{t-2}$	0.626***			
	[0.109			
$Imp.Pen_{HI\ t-2}$		-0.12		
		[0.144]		
$Imp.Pen_{LI\ t-2}$		1.594***		
		[0.537]		
$OutputTariff_{LI\ t-2}$			0	
			[0.016]	
$OutputTariff_{HI\ t-2}$			-0.025	
			[0.028]	
$InputTariff_{LI\ t-2}$				0.007
				[0.029]
$InputTariff_{HI\ t-2}$				-0.058
				[0.055]
$Constant$	-1.678	-3.074***	-1.536**	-1.327**
	[1.141]	[1.137]	[0.603]	[0.665]
Obs.:	18864	18741	22838	22838
pR2	0.0268	0.0243	0.026	0.026
LL	-5539	-5505	-6589	-6589
chi2	276.3	247.2	317	317.3

*** p<0.01, ** p<0.05, * p<0.1. The Dependent Variable is the probability to start exporting. Pooled Probit Regressions. All regressions include a full set of sector and year dummies. Robust standard errors are in brackets.

Table 11: Dynamic LPM - Robustness Checks -Sector-level controls

	[1]	[2]	[3]	[4]
	Export Openness	Import Penetration	Output Tariffs	Input Tariffs
exp_{t-1}	0.583***	0.582***	0.598***	0.598***
	[0.0405]	[0.0404]	[0.038]	[0.038]
$impshare_{LI\ t}$	0.203***	0.203***	0.242***	0.243***
	[0.0396]	[0.0398]	[0.041]	[0.041]
$impshare_{HI\ t}$	-0.103	-0.113	-0.11	-0.111
	[0.0889]	[0.0894]	[0.087]	[0.087]
$TFP_{ind\ t}$	0.0449***	0.0452***	0.044***	0.044***
	[0.00531]	[0.00532]	[0.005]	[0.005]
l_t	0.0515***	0.0525***	0.053***	0.053***
	[0.00544]	[0.00551]	[0.005]	[0.005]
w_t	0.026***	0.027***	0.020***	0.020***
	[0.00562]	[0.00566]	[0.005]	[0.005]
$Exp.Open_t$	0.185***			
	[0.0202]			
$Imp.Pen_{HI\ t}$		0.0189*		
		[0.00982]		
$Imp.Pen_{LI\ t}$		0.314***		
		[0.0452]		
$OutputTariff_{LI\ t}$			-0.001	
			[0.001]	
$OutputTariff_{HI\ t}$			-0.001	
			[0.001]	
$InputTariff_{LI\ t}$				-0.001
				[0.002]
$InputTariff_{HI\ t}$				-0.002*
				[0.001]
$Constant$	0.781	0.45	-0.088*	-0.082*
	[0.546]	[0.523]	[0.047]	[0.048]
Obs.:	143145	142068	159770	159770
id:	36510	36273	40224	40224
Hansen	0.283	0.396	0.431	0.444
AR1	0	0	0	0
AR2	0	0	0	0

*** p<0.01, ** p<0.05, * p<0.1. All regressions include a full set of sector and year dummies. Robust standard errors are in brackets. GMM estimates are obtained using the 3^{rd} and 4^{th} lags of the dependent variable and regressors as instruments for the equation in differences and the 2^{nd} lag of the differenced variables for the equation in levels. The instrumented variables are the lagged dependent variable, $impshare_{LI}$ and $impshare_{HI}$. AR1 and AR2 show the P-value for the tests of the null hypothesis of no first and second order serial correlation in the differences of residuals. Hansen shows the P-value of the test of the validity of the over-identifying restrictions.