Rethinking the import-productivity nexus for Italian manufacturing: do exports matter?

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Abstract

We provide evidence on the firm-level productivity effects of imports of intermediates. Exploiting a large panel of Italian manufacturing firms we are able to separately test the role of offshoring to high and low income countries. Contrary to our expectations, no significant impact is found out for purchases from developed countries, while firm efficiency seems to be positively affected by imported inputs from developing countries. Anyway, we prove that this result may be driven by the omission of another important firm internationalisation strategy, the export activity. Due to the strict linkage existing between export and import activity at firm level, we investigate whether the significant role of offshoring still stay after controlling for the firms' sales in foreign markets. Positive effects of offshoring disappear, while we confirm the existence of learning-by-exporting, already displayed in literature for Italy.

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1 Introduction

The widespread documented increase in international fragmentation of production is actually posing new questions to the academic debate and the policy makers. In particular, it is of interest to understand in which ways firms engaged in such offshoring practices are affected. From a developing country perspective, imports of intermediates may allow for the use of higher quality inputs and give the opportunity to exploit new complementarities in production and take advantage from potential technology transfers. As a consequence, firm productivity may benefit from the sourcing of foreign inputs and *learning by importing* may be at work. From a developed country perspective, things are a bit different. Imports from other developed countries may always consist in higher quality and knowledge intensive inputs, but the positive impact on firm activity may be weaker. On the other hand, imports of intermediates from developing countries often follow offshoring strategies and may hide just cost saving reasons. Nevertheless, moving abroad the less efficient parts of the production process may induce static gains from specialisation. Firms may specialise in high value-added phases of production process and this may drive to efficiency gains. Thus, for developed countries, the net effect of offshoring is not clear and may also depend on the origin of inputs.

Understanding the consequences of imports on the firm performance has become an interesting area of research. The attention of the firm level international trade literature has, in fact, moved from exports to imports and to the investigation of the complementarities and linkages between these two activities. In this framework, we mean to study the effect of imports of intermediates on the productivity of Italian manufacturing firms, dissecting the role of imports from high and low income countries. The case of Italy is interesting since the increase in imports of intermediates in recent years has often been caused by the deepening of the offshoring strategies of the firms in developing countries. Such strategies are bringing ahead the restructuring of the manufacturing production towards less labour intensive techniques with the consequent difficulty of creating new jobs in the sector. Then, ascertaining whether such production restructuring positively affects productivity is an important step for the overall evaluation of the firm internationalisation strategies. Additionally, we investigate whether the findings concerning the nexus between imports and firm efficiency may be biased by omitting the export activity of firms. Building on the evidence for Italy about the existence of learning-by-exporting effects (Serti and Tomasi, 2008), we test whether the potential benefits that firms could reap from imported inputs are robust to the inclusion of the share of their sales in foreign markets.

Our work is structured as follows: the next section reviews the relevant literature; section 3 discusses the data and some descriptive evidence on the import-productivity nexus and the linkages between export and import

activities and section 4 presents the empirical strategy based both on the propensity score matching technique (PSM) (section 4.1) and on the direct estimate of the productivity effects within a dynamic framework (section 4.2). Results on the import-productivity nexus and the role of exports are presented in Section 5. Finally, conclusions follow in section 6.

2 The Literature

Our work is related to a number of strands in the recent empirical literature pointing at imports as a productivity enhancing activity. The channels that are usually stressed for these potential efficiency effects are the higher quality of imported goods, the transfers of technology incorporated in inputs, learning and complementarity effects.

A first stream of research deals with the effects of trade liberalisation at firm level. Amiti and Konings (2007) dissect the effect of input tariffs from the one of output tariffs. Their findings show that productivity gains due to input tariffs are much higher than those from reducing output tariffs and importers benefit even more from input trade liberalisation, regardless of their export or foreign ownership status. The channels that fuel productivity are not identified.[1]

More directly related to our work a strand of literature looks for the causal effect of firm-level imports on productivity abstracting from trade liberalisation episodes[2]. Halpern, Koren, and Szeidl (2005) build a theoretical model where firms use both domestic and imported intermediates and then estimate it exploting a panel of Hungarian firms. Their findings support a positive effect of the share of intermediates imports on the firm productivity. Kasahara and Rodrigue (2008), for Chile, prove that switching from non importing to importing can immediately improve productivity at the plant level and there seems to be some evidence on positive dynamic effects too. Paul and Yasar (2009) for the textile and apparel industries in Turkey show that plants that outsource internationally (i.e. importers) perform better than those that outsource domestically[3]. Analysing labour productivity gaps, they find that more productive plants both initiate outsourcing and

[1]Fernandes (2007) explores the effect of trade liberalisation in the period 1977-1991 on Colombian manufacturing firms' Total Factor Productivity (TFP), anyway the main focus is on the role of increased import competition driven by output tariff reduction.

[2]Blalock and Veloso (2007) making use of a panel of Indonesian firms for the period 1988-1996 focus on the impact of imports in the supply chain. They test the idea that imports foster competition more for domestic suppliers than for domestic users of a good and their findings are in line with this argument: while own sector imports display no significant effect on productivity, downstream sector imports display a positive and significant effect.

[3]Girma and Görg (2004) have focused on the overall outsourcing intensity in UK manufacturing industries which turns to be positively related to plant-level labor productivity and TFP growth, especially in foreign establishments.

subsequently increase their productivity. The linkage between international outsourcing and efficiency is also investigated by Görg, Hanley, and Strobl (2008) using plant-level data for Irish manufacturing between 1990 and 1998. Estimating a production function where international outsourcing is assumed to affect TFP, they show that a positive effect only originates from outsourcing of services inputs for exporters, while non exporting firms do not appear to be statistically affected. No impact is detected for material international offshoring. This finding is at odds with the one in Forlani (2010) on the service and manufacturing firms in the same country, Ireland, and might be due to the different period of analysis (between 2000 and 2006). When controlling for endogeneity of the intermediate import intensity via Difference GMM the author finds that it positively affects productivity in manufacturing while it does not in services sectors, the result is mainly driven by domestic firms and mainly concerns imports of materials. Additionally, taking into account the distance from the frontier, Irish laggards seem to benefit more from imports, while only foreign owned firms close to the frontier gain more. Finally, no evidence of self-selection into importing is found out. Evidence supporting the sel-selection hypothesis is shown in Vogel and Wagner (2010) for German manufacturing firms: using PSM with difference-in-differences they find that more productive firms self select into importing while no learning by importing can be detected. Also, their work points at *two way traders* (firms that both import and export) as the best performers in a sector, compared to those that either export or import and to domestic firms (Altomonte and Bekes, 2009; Castellani, Serti, and Tomasi, 2010)[4]. All the cited works treat imports from developed and developing countries as having an homogeneous impact on efficiency. This is a strong assumption as we can suppose that the quality and technological content of inputs is different across source countries. Two works extend the analysis and deal with heterogeneity driven by the origin country of imports. First, Lööf and Andersson (2010) find that imports from highly R&D (knowledge) intensive countries (measured as the firm-level fraction of imports from the G7 countries) are an important source of productivity in their sample of Swedish firms, especially for small and non affiliated firms. In the same line, Jabbour (2010) studies the effect of offshoring - share of imports from foreign independent suppliers and share of imports from foreign affiliates - by French manufacturing firms to developed and developing countries on productivity and profitability and finds an opposite result: both performance measures are positively affected by international outsourcing to developing countries only, however the stronger effect on profitability confirms that outsourcing to low income economies is especially motivated by profit more than efficiency enhancing reasons.

[4]These papers deal with two-way traders, but they do not test for a causal relationship between the involvement in international markets and productivity.

Bas (2009) extends the scope of the analysis to the relationship between trade liberalisation, importing and exporting. The empirical findings on Argentinean and Chilean manufacturing firms confirm the theoretical predictions of her model, based on Melitz and Ottaviano (2008), where the access to high quality/cheaper foreign intermediate goods affects domestic firms' export performance: changes in the industry imported input intensity (or in import barriers on intermediate goods) reduce relative factor costs and enhance the competitiveness of domestic firms. Thus, firms in liberalised sectors experience a higher export probability and a larger export share. The linkages between imports and productivity and between productivity and exports are also highlighted by Kasahara and Lapham (2008). They build on the evidence of Chilean manufacturing two-way traders being larger and more productive than only exporters or only importers and extend Melitz's model incorporating imported intermediates at firm level. Trade liberalisation in intermediates increases aggregate productivity because more productive firms start importing and achieve within-plant productivity gains which may also allow them to start exporting. In this framework, Bas and Strauss-Khan (2010) model and test a positive efficiency effect of an increase in the number of varieties and diversification of imported inputs that works through both the technology and complementarity channels. They also investigate whether, in turn, the import induced productivity enhancement affects the firm export scope. Their work is inspired by Goldberg, Khandelwal, Pavcnik, and Topalova (2008) who, following the suggestions of growth theory, explore the effect of trade liberalisation through new imported varieties on the introduction of new products in Indian manufacturing firms. They document that trade liberalisation increases the number of varieties of imported inputs and that input trade liberalisation increases the scope of domestically produced products.

Our research line is more focussed on the import-productivity nexus at the firm-level and on the role of imports from different origin countries, namely High and Low income countries. In this respect it is closer to the works by Lööf and Andersson (2010) and Jabbour (2010). Differently from Lööf and Andersson (2010), who use the share of destination-specific import share over total imports in their analysis, we weigh the imported inputs on the total output, since this indicator better captures the firm involvement in foreign sourcing markets. Additionally, we do not limit our analysis to the import side, but we jointly analyse firm exports and imports. Thus, we also add evidence on the learning-by-exporting hypothesis that has already been verified for Italy by Serti and Tomasi (2008). We ask whether imports have an own positive role in shaping the firm efficiency after controlling for firm sales into foreign markets. In this research line, previous studies have found mixed results. Lööf and Andersson (2010) split their sample of Swedish firms in non-exporters, temporary exporters and persistent exporters and display a significant efficiency enhancing effect of imports only for the first

two groups, anyway, they do not rigorously dissect the import impact from the one of exports. Vogel and Wagner (2010) find no effect either for import or for export in Germany. In opposite, Görg, Hanley, and Strobl (2008) and Forlani (2010) for Ireland show no evidence for learning-by-exporting hypothesis[5].

Is for the efficiency of Italian manufacturing firms more important to penetrate foreign markets, to purchase intermediates from foreign suppliers or do both strategies matter? To answer this question we rely both on PSM combined with difference-in-difference (DID) strategies and on the direct estimation of a linear dynamic model for total factor productivity (TFP). To the best of our knowledge this is the first research to address the firm level effects of imports on productivity in Italian manufacturing[6] and to jointly test the learning-by-importing and learning-by-exporting hypothesis.

3 Data and descriptive evidence

The main data source for this work is a balanced panel of surviving Italian limited companies covering a 5-year period from 2000 to 2004. The data set 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 merging custom trade and balance sheet data. Our sample represents about 40% of total manufacturing employment and output and reproduces their sectoral distribution[7]. The data set provides detailed information for about 40,000 firms[8] on output and inputs, labour costs, tangible and intangible fixed assets, exports, control participation, offshoring (imports of intermediates). The amount of offshored inputs are split according to their origin, developed or developing countries[9]. The firm activity sector is at 3-digit NACE. Throughout the paper we distinguish sectors between Traditional and Non Traditional. This breakdown is established at three digit levels according to the Pavit-

[5]These papers control for export status in the investigation of learning-by-importing.

[6]Mazzola and Bruni (2000) and Calabrese and Erbetta (2005) have focused on firms' production linkages respectively for a sample of southern firms and for firms in the automotive industry respectively, finding important effects of outsourcing on the firms' performance, however did not deal with international linkages.

[7]Details on the sample representativeness are available from the authors upn request.

[8]The original number of firms was slightly higher, however, as standard we cleaned the sample removing firms in NACE sectors 16 and 23 (these sectors include a small number of firms and for the nature of the performed activities they may behave differently from the rest of manufacturing sectors) and firms with some anomalous (zero or negative) or missing values for the main variables (output, materials, value added or capital). We have also excluded firms which are considered as 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 distribution of some main ratio (value added on labour and capital on labour).

[9]This breakdown has been performed by ISTAT researchers according to the level of income.

t's taxonomy and Non Traditional activities include Specialised Suppliers, Economies of Scale and High-Tech sectors[10].

Table 1 reports the overall share of importers and the share of firms importing from low and high income countries. About 31% of our sample in 2004 is composed by firms purchasing inputs from developed countries; this share lowers to about 25% when we turn on the supply from developing economies. Among offshorers to developed countries one half of them are also importing from the other country group, while about 70% of importers from low labour cost economies are purchasing inputs from both origins. Thus, even if there exist some complementarities between purchases from the two kinds of country groups, some firms only rest on one type of origin. This suggests that the two international linkages may present different underlying motivations and characteristics and may have a different impact on the firm production processes. Concerning the time evolution, the most interesting finding is the deepening of the firm involvement with developing suppliers, jointly with an unchanged share of importers from advanced economies. These trends are shared by both Traditional and Non Traditional Sectors.

Thus, from our evidence it emerges that, even if Italian manufacturing firms are highly integrated in international networks with suppliers from advanced countries, in the recent years developing economies have become an important market where firms outsource parts of their production process and buy intermediates at lower prices. The growing role of low wage countries for Italian manufacturing is mainly due their recent economic growth and opening to international trade in last decades.

Now, consistently with the evidence on two-way traders, we show that export and import activities are strictly linked and we present the productivity premia for importers. Table 2 displays the coefficients associated to the import status from Low and High Income countries (respectively β_1 and β_2) in the following regressions:

$$y_{it} = \alpha + \beta_1 Imp_{it}^{LI} + \beta_2 Imp_{it}^{HI} + \delta size_{it} + \eta_i + \epsilon_{it}$$

where y_{it} is the variable for which we are interested to obtain the import premia, it is alternatively the labour productivity of firm i at time t, lp, its total factor productivity, tfp, its average unit wage, $wage$, its capital intensity, kl, and export status and share, Exp and $ExpSh$. Imp^{LI} and Imp^{HI} are two dummies capturing respectively the import status from Low and High Income countries. All regressions also include a control for the size of firm, measured with the logarithm of the employment. Estimations are obtained both from Pooled and Fixed effects regressions. Results show that firms purchasing inputs from both country groups are more productive than

[10]The following sectors are classified as Traditional: activities in 2-digit sectors from 15 to 20, and activities in 3-digit sectors 212, 245, 246, 251, 286, 287, 361, 362, 364, 365, 366. The remaining ones are classified as non-Traditional (Pavitt, 1984).

non importers, and this finding is confirmed both when we use pooled OLS estimation and Fixed Effect (FE) estimation and using both labour productivity and the TFP index, computed following Good, Nadiri, and Sickles (1996). Also, importers present a significantly higher average wage and capital intensity. The existence of import premia for efficiency and other firm level characteristics is in line with previous literature (Vogel and Wagner, 2010; Kasahara and Lapham, 2008). Furthermore, when we focus on the firm export activity we detect a higher probability for importers to enter foreign markets. This linkage emerging between the two internationalisation strategies should be taken into account when the learning-by-importing hypothesis is tested.

In the appendix we also show the kernel density of labour productivity for the three different groups of firms: importers from the two origins and non importers. Figure 1 delivers us the same insights from the estimated import premia in Table 2. The distribution for importers is shifted to the right of that of non importers, and this proves the superiority of firms buying foreign intermediates, when we do not restrict the analysis to the mean value of efficiency indicator as in the previous regression. The graph also suggests that, even if we can not detect the significance in the productivity gap between the two kinds of importers, it seems that there do not exist great differences between the productivity distribution of importers from Low Income countries and advanced countries.

Anyway, the evidence we have shown only reveals a positive correlation between internationalisation strategies of firms and their efficiency and does not give any information about the causal nexus that we investigate in the following section.

4 The Empirical Strategy

To evaluate the effect of imports on productivity we follow two alternative procedures.

Firstly, we rely on PSM techniques and compare the before/after difference in labour productivity and TFP[11] bewteen the group of import starters and the control group, made up by never importers that are properly matched with import starters. Secondly, we estimate a dynamic linear model where the import intensity is assumed to affect firm efficiency. The use of System GMM allows us to instrument our right hand side variables, in particular the import measures.

In both cases, we will test the robustness of the import-productivity nexus to the control for the firm export involvement and we will test whether any differences exist between firms in Traditional and Non Traditional activities. The relevance of imported inputs and of their origin in enhancing

[11] Calculated as in Good, Nadiri, and Sickles (1996).

productivity may differ according to the complexity of the tasks performed within the firm. The productivity boost coming from the technological advances incorporated in imported intermediates may be higher for Non Traditional firms, due to their larger innovation scope. On the other hand, the specialisation gains that follow the relocation abroad of less skill intensive production fragments may particularly foster productivity in Traditional sector firms, that are usually focussed on low skill and manual labour intensive productions.

4.1 Propensity Score Matching

To estimate the learning-by-importing effects we apply PSM techniques that allow us to select a proper control group, made up of those never importing firms that are the most similar to the import starters in all relevant pre-treatment (observable) characteristics (Blundell and Costa Dias, 2000). Import *starters* are defined as firms starting to import in year t and not importing in the previous three years (i.e. *t-1*, *t-2* and *t-3*). We consider imports from low income countries and imports from high income countries as two different treatments. The sample of starters consists of two cohorts: firms that start importing in 2003 and the ones that start importing in 2004. We end up with 2,636 starters for imports from low income countries and 1,898 starters for imports from developed economies. To select the "never importers" for the control group we specify a probit model for the probability to import from high and low income countries for the first time. In these probit models, we include the third lag of the following variables as regressors: the firm size measured in terms of units of labour, lab, TFP index, tfp, capital/labour ratio, kl, real average wage, $wage$, stock of intangible assets to output ratio, ky_{int}, export status (Exp) and import status from high (low) income countries, Imp^{HI} (Imp^{LI}) for the probability of importing from low (high) income countries. Finally, the models contain a full set of two-digit sector dummies.

As already mentioned, we apply the PSM strategy separately for the two status of importers from low and high income countries. This choice is based on our belief that, although some common features[12] exist between the two "treatments", different motivations may be hidden behind them that may lead to different effciency outcomes.

It is important to notice that in the control group selection equation for each treatment we include a dummy to control for firms undergoing the other treatment and we also include the firm export status, thus taking into account the firm involvement in foreign markets in terms of export activity. Since exporting and importing are strictly linked, as from the recent literature on "two-way traders" and from our descriptive statistics,

[12] As an example common sunk costs may orignate from the setting up of an office to deal with foreign suppliers.

we select never importers that in the pre-entry period do not present a significant difference in the export status with respect to future importers.

Table 3 shows the results from the probit estimations of the import entry used for the computation of the propensity score in the selection of the control units. Columns 1 and 3 confirm our expectations: larger and more productive firms are more likely to start importing, the same is true for firms characterised by a higher capital intensity and having a large endowment of intangible assets. Also, previous internationalisation strategies, both in terms of exports and imports from other origins, ease the establishment of linkages with suppliers in new foreign origins. The role of all determinants is pretty similar between the two import status. The only exception concerns the average wage that has no significant impact on the probability of starting importing from advanced countries, while has a negative and significant effect on the purchases from suppliers in developing economies. The usual interpretation of the average wage as a proxy for the average firm skill intensity (Bernard and Jensen, 1999, 2004) may suggest that, *ceteris paribus*, firms with higher skill intensity have a lower probability to start importing from low income countries. This could actually represent quite an intuitive interpretation, due the possible substitution between imports from low labour cost countries for low skill intensive (in-house or domestically produced) intermediates.

Using the estimated scores, we then apply the "Nearest Neighbour" (NN) matching on the "common support", that is we match the starter with the single never importer[13] having the most similar propensity score. Columns 2 and 4 display the goodness of the matching emerging from the re-estimation of the probit on the sample of treated units and matched controls. We find that all of the coefficients are not significant and, consequently, the pseudo-R^2 is not statistically different from 0. This proves that treated units and their matched controls have the same probability to start importing from low income or high income countries. In Table 8 in the Appendix, we also show the t-tests of the differences in the relevant characteristics: while before the matching there are large and significant gaps in the investigated variables, afterwards any difference disappears. In addition, figure 2 shows that the distribution of the propensity score for matched controls overlaps the one of treated firms after the matching procedure. All this evidence confirms the validity of the matching for the two treatments, i.e. importing from high and low income countries.

After the PSM, we apply a Difference-In-Difference (DID) estimation on the matched sample, thus comparing the before/after productivity differences for the import starters to the same differences for the matched controls[14].

[13] Also, the matching is applied "with replacement": the same never importer may be used as a match more than once.

[14] As affirmed by Blundell and Costa Dias (2000) the use of matching estimator in combination with difference-in-difference approach can "improve the quality of non-experimental

Once defined t as the starting year of the intermediate import activity, we compare the productivity growth between t and $t-1$ and between $t+1$ and $t-1$. The average treatment effects on the treated (ATT) are calculated as follows:

$$M^{DID-PSM} = \frac{1}{n_i} \sum_{i \in I} [(Y_{i,post} - Y_{i,pre}) - \sum_{j \in C} \omega(i,j)(Y_{j,post} - Y_{j,pre})] \quad (1)$$

Y is the outcome (in our case the productivity), subscripts *post* and *pre* denote that the variable concerns the pre or post-entry period; I denotes the group of import starters in the region of common support, while C denotes the control group of never importers, always in the region of common support. n_i is the number of treated units on the common support. $\omega(ij)$ is a weight equal to the inverse of the number of control firms that are matched with a starter and, in our analysis it is equal to 1 due to the single nearest neighbour matching.

4.2 The dynamic model for TFP

PSM techniques do not allow to capture the beneficial effects from the sourcing of foreign inputs linked to the firm import intensity and to consider the import experience of always importing firms and switchers into and out from imports. Furthermore, firms may require time to take advantage from imported inputs and the analysis on a couple of years may not be enough to capture the real effects of this activity. In opposite, it could also be the case that imports of intermediates show significant effects the first year the firm enters in supply foreign markets, but then any positive impact disappears. For these reasons, we have decided to explore the relationship between imports and productivity in a linear dynamic model. Within this setting we also mean to investigate whether any significant role of imports is robust to the inclusion of a measure of the firm export activity.

We assume that the firm total factor productivity, *TFP*, is a function of the import share from developed and developing economies:

$$TFP \quad = \quad e^{\gamma_0 ImpSh^{Low} + \gamma_1 ImpSh^{High} + \delta_0 D_j + \delta_1 D_t}$$

Thus, taking the logs of variables and including the lag of TFP to account for the autoregressive nature of productivity, we obtain the following equation to estimate:

$$tfp_{it} = \alpha\ tfp_{it-1} + \gamma_0\ ImpSh_t^{LI} + \gamma_1\ ImpSh_t^{HI} + \delta_0\ D_j + \delta_1\ D_t + \epsilon_{it} \quad (2)$$

evaluation results significantly".

tfp is the TFP index computed following Good, Nadiri, and Sickles (1996), $ImpSh^{LI}$ and $ImpSh^{HI}$ are firm import share from Low and High Income countries, D_j and D_t are two digit sector and time dummies and ϵ_{it} is an idiosyncratic shock.

Due to the presence of the lagged dependent variable, we apply System-GMM (Blundell and Bond, 1998) that also allows us to correct for the potential endogeneity of imports. The lagged levels of the variables[15] are used to instrument the differenced equation and the lagged differences of the variables (first or second lag) become instruments for the level equation. The Hansen test of over-identifying restrictions and test of second order correlation in the differenced residuals (AR2) have been used to test for the validity of instruments.

5 Results

PSM results - Table 4 shows the ATT effects from PSM-DID estimations both for imports from high and low income countries. Starting to purchase intermediates from high income countries does not have any significant impact on firm's productivity. This finding is against the expectations of potential benefits that firms can reap from the higher knowledge and technology incorporated in foreign intermediates. According to our results, the firm efficiency does not improve thanks to supply linkages with developed countries. The positive correlation that we have found between offshoring to advanced countries and productivity (see Table 2) may be due either to the existence of the opposite causal relationship (self-selection) - the more efficient firms look for foreign suppliers from high-income countries - or to some other unobserved factors that are positively related to both variables. Inputs from advanced countries may be close substitutes for the ones available domestically and the simple purchase of these goods could not be enough to affect significantly the innovation level of the firms and to enhance the efficiency of their production processes. The lack of any effect holds regardless of the type of sector where the firm operates. Jabbour (2010) for France finds no effect of imports from high income countries on productivity, while the findings by Lööf and Andersson (2010) go in the opposite direction, although it is worth to notice that they measure the share of imports from high income countries on total imports and this is not exactly a measure of intermediate import intensity or of share of imports in production. This measure is neither capturing the particular firm import status with respect to a specific origin.

[15]We use the second and third or third and fourth lags of variables according of the specification we estimate. The indication of the instruments we used is reported at the bottom of each table.

For the start of importing from low income countries the findings highly mimic the ones shown for purchases from advanced partners. In this case also we could expect an increase in efficiency driven by a within firm re-organisation of the production toward more value-added stages of the production process and the moving abroad of high labour-intensive and low technologies phases. Anyway our estimates do not support this hypothesis.

Dynamic model results - It is worth to consider that the lack of significant efficiency gains from imports may be linked to the empirical strategy we used. PSM-DID only tests for the status of firms, and no attention is paid to the degree of the firm international involvement. Additionally, as already mentioned, importers may need time to exploit the advantages offered by foreign supply markets.

Thus, when we turn to the estimation of model 2 on the whole sample of firms and we consider the import intensity, highly different findings with respect to the ones obtained with PSM emerge. Imported inputs from developed countries still display no significant impact (Table 5). In opposite, our results reveal an efficiency enhancing effect coming from purchases from low wage countries. Purchases from suppliers in developing countries contribute to boost the performance of firms and this is confirmed both in Traditional and Non Traditional sectors even if the significance level is higher for this latter kind of activities. The Hansen test shows some problems with instruments for the whole sample of sectors, anyway instruments are valid on the two groups of Traditional and Non Traditional firms[16]. In all the regressions, the lagged dependent variable is positive and significant. Thus, from this evidence it seems that offshoring strategies to low wage economies may be exploited by firms to gain efficiency in their production. The opening to international markets of developing countries may allow Italian firms to benefit from cost savings, substituting for example domestic suppliers with foreign suppliers selling cheaper intermediates, or may allow them to focus on more productive phases and high-value added tasks, externalising the less efficients parts of the production processes. This could be more effective in Non Traditional sectors where the success of the firm may rely on the most sophisticated and high-tech phases of production.

The above descriptive statistics and the literature display a strict linkage between the export and import involvement of firms and the doubt that the previous findings are affected by the lack of the control for export emerges. Is the productivity effect of imports from developing countries robust to the inclusion of export? The last three columns of Table 5 answer this question

[16]We use the second and third lags of variables to instrument the differenced equation in the regressions for Traditional activities since second order correlation and Hansen tests support the validity of these instruments. In opposite, for Non Traditional sectors and the whole sample the second lag of variables is found to be an invalid instrument according to both tests, thus we stay on the third and fourth lags of variables (Bond, 2002).

and reveal an interesting evidence. Unlikely previous evidence that jointly tests the role of export and import on firm efficiency (Vogel and Wagner, 2010; Görg, Hanley, and Strobl, 2008; Forlani, 2010), we find that learning-by-exporting is at work, while offshoring activity has no additional impact. This is confirmed both using current and lagged regressors. The Hansen test for regressions in Non Traditional sectors reveals some problems with the validity of instruments after the inclusion of export share, anyway these are solved in the following analysis when we add other firm and sector level controls.

However, it is possible that firms may need some time before reaping the potential beneficial effects of imports. To explore this hypothesis, we have also tried to include the lagged import shares in Table 6 which displays the relative findings. We essentially confirm the absence of any role for purchases from advanced economies, while considering the first three columns, offshoring to low wage countries now stay significant only in Traditional sectors. Again when the lagged export share is included the import share from low income countries turns non significant, thus mimicking again the above results.

Thus, the significant effects for imports from low income countries found in the first three columns of Table 5 and 6 are driven by firms that export. This investigation shows that the omission of the check for other important internationalisation strategies, i.e. exports, may erroneously drive us to attribute to import activity potential positive effects that are in opposite actually generated by exports. The disappearance of the effect from imports from developing countries may be justified by the significant linkage that exist between these purchases and exports.

As robustness check, Table 9 in the Appendix reproduces the same evidence when we use an indicator of labour productivity, value added per employee, instead of total factor productivity and we control for the firm capital intensity.

In addition, we test the robustness of our results to the inclusion of firm and sector level variables. In Table 7 we add the firm stock of intangible assets and the ratio between materials and output as a proxy for the firm total outsourcing (both domestic and foreign), then, at sector level we include the ICT capital stock at 2-digit level and the 3-digit level import penetration. All these controls are assumed to have a potential role in shaping the firm efficiency. Our main findings stay unchanged: import shares, regardless of the origin countries, are not significant, while the firm intensity of foreign sales preserve a positive and highly significant impact on firm productivity. Concerning the control variables, it is interesting to notice that the stock of intangible assets, k_{int} that may capture the investments of firms in innovation, quality, R&D, advertisement, and thus the level of sophistication of their activity, drives to efficiency gains. The outsourcing strategy of firms is beneficial only for firms in Traditional sectors, where it could be easier

for firms to externalise some parts of their production. The sectoral ICT capital stock, ict_{sect}, bears a significant and positive coefficient only in Non Traditional sectors. The sector import penetration, imp_pen_{sect}, that should capture the pressure from foreign competitors is not significant and could reveal that firms do not invest in efficiency improvements to escape from a deepening of foreign competition.

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 here, due to the large intra-firm share of trade that is generally operated by multinationals and to the higher efficiency sourcing from being a multinational. To assess whether the omission of such controls may result in a serious misspecification of our empirical model, we made a check on the EFIGE representative data base on comparable firm level data on manufacturing firms from seven European countries[17]. This data base reports that 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.

Summing up, our analysis confirms the existence of learning-by-exporting for Italy that has already been highlighted by Serti and Tomasi (2008), which is a peculiar finding for an advanced economy (ISGEP, 2008). No additional role is instead detected for firm imports, neither from developing nor from developed countries. The lack of learning-by-importing is in line with the finding highlighted by Vogel and Wagner (2010) for Germany, while it is at odds with the evidence on Irish, Swedish and French manufacturing (Jabbour, 2010; Lööf and Andersson, 2010; Forlani, 2010; Görg, Hanley, and Strobl, 2008), although it is worth to notice that in the latter two cases no explicit control for exports is taken into account in the estimations.

6 Conclusion

Within the recent strand of literature on the role of intermediate inputs in the manufacturing firm performance, we contribute offering evidence of the effect of imports from high and low labour countries on the firm productivity. We proceed by means of PSM techniques and of the estimation of a linear dynamic panel data model to appraise the effect of both the import status and intensity on the productivity of import starters and all impor-

[17]For the details see $http://www.efige.org$.

ting firms respectively. While no significant productivity enhancing effect is found from being an import starter, an increase in the import intensity from low income countries emerged as positively affecting productivity in Italian manufacturing. This finding that could be attributed to the relocation abroad of lower productivity tasks in favour of specialisation on more productive segments of the production process, however, disappears when the firm export intensity is included in the specification. Then, the evidence of *learning-by-importing* was mainly driven by the lack of control for another relevant international activity, namely exports. Our findings, together with other evidence on advanced countries in the literature, may suggest that gains from imports may be rather modest for developed economies, thus marking an important distinction with respect to the evidence on the fundamental role of imports for manufacturing in developing countries. Further evidence on advanced countries would be needed to explore the simultaneous role of imports and exports in enhancing productivity to gather a complete picture of this story. In addition, the availability of a longer time span and of more detailed data on the firm internationalisation and its sophistication could help to refine this analysis in order to shed further light on the net effect of each international strategy and to exactly identify the causal links.

Finally, some policy implications may be drawn from our analysis: the lack of any significant productivity effect for imports and the confirmation of a positive role of the export activity should push policy makers to adopt all the necessary tools useful to ease the access to foreign markets for the firm products. In this line, fostering the Italian manufacturing firm innovation activity and investment in human capital would turn into a virtuous circuit that, allowing the firm to gain competitiveness and become an exporter would turn into higher innovation and efficiency originating from the *learning-by-exporting* process.

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Tabella 1: Distribution of Importers

Sectors	Importers	Importers LIc	**2000 %** Importers HIc	Importers Hic & LIc
All	37.32	20.88	31.44	15.00
Traditional	34.14	17.41	29.87	13.14
Non Traditional	42.01	26.02	33.76	17.76
Sectors	Importers	Importers LIc	**2004 %** Importers HIc	Importers Hic & LIc
All	38.89	24.99	31.50	17.59
Traditional	35.82	21.61	30.30	16.09
Non Traditional	43.59	30.13	33.33	19.87

Tabella 2: Import Premia

		Imp^{LI}		Imp^{HI}	
		Coeff	Pvalue	Coeff	Pvalue
Pooled	*lp*	0.084	0.000	0.200	0.000
	tfp	0.060	0.000	0.166	0.000
	Wage	0.008	0.003	0.093	0.000
	kl	0.167	0.000	0.239	0.000
	Exp	0.163	0.000	0.231	0.000
	ExpSh	0.019	0.000	0.023	0.000
Fixed Effects	*lp*	0.014	[0.000]	0.030	0.000
	tfp	0.014	0.000	0.028	0.000
	Wage	0.004	0.005	0.014	0.000
	kl	0.012	0.013	0.021	0.000
	Exp	0.113	0.000	0.120	0.000
	ExpSh	0.010	0.000	0.014	0.000

All Variables are in logarithm with the exception of Exp and $ExpSh$.

Tabella 3: Probit for First-time Import Entry

Import from Low Income countries			**Import from High Income countries**		
	All Sample	Matched Sample		All Sample	Matched Sample
	[1]	[2]		[3]	[4]
lab_{t-3}	0.200***	-0.0111	lab_{t-3}	0.205***	0.00702
	[0.014]	[0.022]		[0.016]	[0.029]
tfp_{t-3}	0.258***	-0.0156	tfp_{t-3}	0.266***	-0.023
	[0.034]	[0.058]		[0.039]	[0.070]
kl_{t-3}	0.0747***	-0.00551	kl_{t-3}	0.0776***	0.0109
	[0.010]	[0.018]		[0.011]	[0.020]
$wage_{t-3}$	-0.221***	0.114	$wage_{t-3}$	0.0232	0.040
	[0.045]	[0.079]		[0.051]	[0.094]
$ky_{int\ t-3}$	0.0117***	0.00125	$ky_{int\ t-3}$	0.00987***	-0.00754
	[0.003]	[0.006]		[0.003]	[0.007]
Exp_{t-3}	0.595***	-0.0408	Exp_{t-3}	0.528***	0.00596
	[0.025]	[0.051]		[0.025]	[0.051]
Imp^{HI}_{t-3}	0.424***	0.0143	Imp^{LI}_{t-3}	0.392***	-0.0311
	[0.024]	[0.040]		[0.035]	[0.055]
Cons	-1.578***	-1.069	Cons	-3.684***	-0.610
	[0.433]	[0.753]		[0.485]	[0.896]
Obs	53020	5130	Obs	46115	3704
Pseudo-R^2	0.152	0.002	Pseudo-R^2	0.113	0.00188
Wald Chi^2	3135	12.74	Wald Chi^2	1765	9.662
LogLik	-8724	-3549	LogLik	-6895	-2563

*** p<0.01, ** p<0.05, * p<0.1. All regressions include a full set of two-digit sector and time dummies. Robust standard errors are in brackets.

Tabella 4: ATT effects of Import Entry

Import from Low Income countries					**Import from High Income countries**				
	ALL SECTORS					**ALL SECTORS**			
	$\Delta tfp_{t,t-1}$	$\Delta tfp_{t-1,t+1}$	$\Delta lp_{t,t-1}$	$\Delta lp_{t-1,t+1}$		$\Delta tfp_{t,t-1}$	$\Delta tfp_{t-1,t+1}$	$\Delta lp_{t,t-1}$	$\Delta lp_{t-1,t+1}$
Imp^{LI}	0.011	0.010	0.010	0.022	Imp^{HI}	0.006	0.017	0.001	0.020
	[0.009]	[0.023]	[0.009]	[0.022]		[0.010]	[0.025]	[0.010]	[0.026]
Obs	5130	1160	5130	1160	Obs	3704	822	3704	822
	TRADITIONAL SECTORS					**TRADITIONAL SECTORS**			
	$\Delta tfp_{t,t-1}$	$\Delta tfp_{t-1,t+1}$	$\Delta lp_{t,t-1}$	$\Delta lp_{t-1,t+1}$		$\Delta tfp_{t,t-1}$	$\Delta tfp_{t-1,t+1}$	$\Delta lp_{t,t-1}$	$\Delta lp_{t-1,t+1}$
Imp^{LI}	0.008	0.006	0.013	0.018	Imp^{HI}	0.007	0.028	-0.001	0.045
	[0.015]	[0.037]	[0.015]	[0.036]		[0.016]	[0.044]	[0.016]	[0.044]
Obs	2094	495	2094	495	Obs	1534	342	1534	342
	NON TRADITIONAL SECTORS					**NON TRADITIONAL SECTORS**			
	$\Delta tfp_{t,t-1}$	$\Delta tfp_{t-1,t+1}$	$\Delta lp_{t,t-1}$	$\Delta lp_{t-1,t+1}$		$\Delta tfp_{t,t-1}$	$\Delta tfp_{t-1,t+1}$	$\Delta lp_{t,t-1}$	$\Delta lp_{t-1,t+1}$
Imp^{LI}	0.013	0.013	0.009	0.026	Imp^{HI}	0.005	0.012	0.003	0.004
	[0.012]	[0.031]	[0.012]	[0.030]		[0.014]	[0.033]	[0.014]	[0.034]
Obs	3036	665	3036	665	Obs	2170	480	2170	480

Tabella 5: TFP impact of Imports

	Baseline Model			Control for Export		
VARIABLES	All Sectors	Trad	Non Trad	All Sectors	Trad	Non Trad
	[1]	[2]	[3]	[4]	[5]	[6]
$L.tfp$	0.547***	0.376***	0.550***	0.586***	0.379***	0.562***
	[0.026]	[0.017]	[0.040]	[0.0243]	[0.0169]	[0.0317]
$ImpSh^{LI}$	0.187***	0.148*	0.380**	0.085	0.010	0.366
	[0.060]	[0.081]	[0.185]	[0.0818]	[0.0998]	[0.251]
$ImpSh^{HI}$	-0.241	0.156	-0.077	-0.154	-0.001	0.182
	[0.163]	[0.176]	[0.202]	[0.236]	[0.198]	[0.133]
$ExpSh$				0.232***	0.245***	0.208***
				[0.0454]	[0.0606]	[0.0672]
$Cons$	-0.0301***	-0.0792***	-0.0462	-0.0532***	-0.0941***	-0.157***
	[0.008]	[0.014]	[0.029]	[0.00990]	[0.0164]	[0.0437]
Obs.	161,758	64,593	97,165	160,675	63,788	96,887
Number of firms	40,468	16,600	24,719	40,344	16,497	24,693
Hansen	0.000	0.210	0.190	0.000	0.670	0.000
AR1	0.000	0.000	0.000	0.000	0.000	0.000
AR2	0.000	0.406	0.000	0.000	0.328	0.000

*** p<0.01, ** p<0.05, * p<0.1. All regressions include a full set of two-digit sector and time dummies. Robust standard errors are in brackets. GMM estimates are obtained using the 3^{rd} and 4^{th} lags (2^{rd} and 3^{th} lags) of the dependent variable and regressors as instruments for the equation in differences and the 2^{nd} (1^{st}) lag of the differenced variables for the equation in levels for All Sectors and Non Traditional Sectors (Traditional sectors). 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.

Tabella 6: TFP impact of Imports

	Base			Control for Export		
VARIABLES	All Sectors	Trad	Non Trad	All Sectors	Trad	Non Trad
$L.tfp$	0.555***	0.376***	0.544***	0.584***	0.378***	0.595***
	[0.025]	[0.017]	[0.042]	[0.024]	[0.018]	[0.038]
$L.ImpSh^{LI}$	0.172***	0.133**	0.256	0.078	0.020	0.081
	[0.044]	[0.066]	[0.161]	[0.065]	[0.072]	[0.192]
$L.ImpSh^{HI}$	0.025	0.020	-0.104	0.012	-0.006	0.044
	[0.023]	[0.114]	[0.162]	[0.028]	[0.119]	[0.046]
$L.ExpSh$				0.167***	0.162***	0.230***
				[0.038]	[0.041]	[0.060]
Cons	-0.046***	-0.076***	28.502	-0.050***	-0.089***	-0.160***
	[0.004]	[0.012]	[60.948]	[0.005]	[0.014]	[0.043]
Obs.	161,758	64,593	97,165	160,702	63,807	96,895
Number of firms	40,468	16,600	24,719	40,355	16,505	24,696
Hansen	0.000	0.255	0.186	0.000	0.669	0.024
AR1	0.000	0.000	0.000	0.000	0.000	0.000
AR2	0.000	0.388	0.000	0.000	0.342	0.000

As Note for Table 5.

Tabella 7: Firm and Sectoral Controls

	ALL SECTORS				TRAD				NON TRAD			
VARIABLES	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]
$L.tfp$	0.571***	0.537***	0.583***	0.593***	0.381***	0.369***	0.382***	0.377***	0.606***	0.584***	0.561***	0.613***
	[0.025]	[0.026]	[0.024]	[0.025]	[0.015]	[0.017]	[0.020]	[0.018]	[0.039]	[0.037]	[0.031]	[0.043]
$ImpSh^{LI}$	0.033	-0.093	0.019	0.04	0.083*	-0.055	0.062	0.057	-0.041	-0.095	-0.074	-0.039
	[0.047]	[0.058]	[0.048]	[0.049]	[0.049]	[0.065]	[0.059]	[0.056]	[0.096]	[0.104]	[0.095]	[0.100]
$ImpSh^{HI}$	-0.034	0.042	-0.005	0.023	0.025	-0.039	0.035	0.031	0.026	0.135	0.091	0.141
	[0.105]	[0.118]	[0.107]	[0.111]	[0.107]	[0.113]	[0.119]	[0.120]	[0.142]	[0.148]	[0.144]	[0.150]
$ExpSh$	0.169***	0.191***	0.221***	0.201***	0.197***	0.180***	0.212***	0.200**	0.217**	0.322***	0.239***	0.267***
	[0.046]	[0.048]	[0.046]	[0.048]	[0.064]	[0.061]	[0.074]	[0.081]	[0.102]	[0.078]	[0.070]	[0.095]
k_{int}	0.013***				0.011***				0.013***			
	[0.002]				[0.003]				[0.003]			
$MatOut$		0.569***				0.552**				-0.026		
		[0.128]				[0.219]				[0.198]		
ict_{sect}			0.143**				1.328				0.239***	
			[0.066]				[1.735]				[0.065]	
imp_pen_{sect}				-0.015				0.136				-0.003
				[0.017]				[0.166]				[0.118]
Cons	-0.175***	-0.399***	-1.132**	-0.074***	-0.184***	-0.400***	-10.197	-0.115***	-0.249***	-40.445	-2.079***	-33.849
	[0.023]	[0.077]	[0.508]	[0.007]	[0.028]	[0.130]	[13.192]	[0.030]	[0.065]	[32.472]	[0.575]	[36.334]
Obs.	140,705	159,578	160,015	143,385	55,269	63,135	63,379	61,643	85,436	96,443	96,636	81,742
Number of firms	37,749	40,266	40,271	36,555	15,311	16,442	16,447	16,072	23,211	24,668	24,668	21,100
Hansen	0.000	0.000	0.000	0.000	0.155	0.006	0.913	0.930	0.160	0.105	0.000	0.300
AR1	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
AR2	0.000	0.000	0.000	0.000	0.132	0.271	0.341	0.340	0.000	0.000	0.000	0.000

*** p<0.01, ** p<0.05, * p<0.1. All regressions include a full set of two-digit sector and time dummies. Robust standard errors are in brackets.

The following firm and sector level controls are included: firm intangible capital stock, k_{intang}, firm total material outsourcing, $MatOut$, two-digit ICT capital intensity, ict_j, 3-digit sector import penetration, Imp_Pen_j. GMM estimates are obtained using the 3^{rd} and 4^{th} lags (2^{rd} and 3^{th} lags) of the dependent variable and regressors as instruments for the equation in differences and the 2^{nd} (1^{st}) lag of the differenced variables for the equation in columns 1-4 and 9-12 (in columns 5-8). 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.

7 Appendix

Figura 1: Kernel Density of Labour Productivity

Tabella 8: T-Tests

	Imp^{LI}			Imp^{HI}	
	Before	After		Before	After
lab_{t-3}	-30.292	-0.348	lab_{t-3}	-22.240	-0.761
kl_{t-3}	-9.550	0.447	kl_{t-3}	-7.729	-1.050
lp_{t-3}	-17.355	-0.632	lp_{t-3}	-15.667	-0.577
tfp_{t-3}	-15.027	-0.784	tfp_{t-3}	-13.875	0.008
$wage_{t-3}$	-13.893	-1.275	$wage_{t-3}$	-14.257	-0.794
Exp_{t-3}	-38.924	0.384	Exp_{t-3}	-31.493	-0.231
Imp^{HI}_{t-3}	-42.143	-0.309	Imp^{LI}_{t-3}	-24.520	0.250
$ky_{int\ t-3}$	-4.8462	-0.331	$ky_{int\ t-3}$	-3.385	1.197

Figura 2: Kernel Density of Propensity Score

Tabella 9: Labour Productivity impact of Imports

	Base			Control for Export		
VARIABLES	All Sectors	Trad	Non Trad	All Sectors	Trad	Non Trad
$L.lp$	0.755***	0.346***	0.529***	0.578***	0.353***	0.583***
	[0.020]	[0.017]	[0.052]	[0.0308]	[0.0151]	[0.0393]
kl	0.0441***	0.0268***	-0.012	-0.001	0.0282***	0.001
	[0.005]	[0.010]	[0.008]	[0.00631]	[0.00841]	[0.00689]
$ImpSh^{LI}$	0.238***	0.175**	0.569***	0.147*	0.119	0.372
	[0.080]	[0.072]	[0.211]	[0.0856]	[0.0857]	[0.248]
$ImpSh^{HI}$	0.914***	-0.149	0.006	-0.250	-0.082	0.085
	[0.287]	[0.235]	[0.266]	[0.289]	[0.175]	[0.175]
$ExpSh$				0.292***	0.186***	0.322***
				[0.0446]	[0.0564]	[0.0658]
Cons	2.076***	6.618***	40.48	4.462***	6.509***	4.449***
	[0.186]	[0.218]	[43.590]	[0.345]	[0.186]	[0.447]
Obs.	161,806	64,614	97,192	160,723	63,809	96,914
Number of firms	40,472	16,602	24,721	40,348	16,499	24,695
Hansen	0.000	0.423	0.192	0.001	0.048	0.028
AR1	0.000	0.000	0.000	0.000	0.000	0.000
AR2	0.000	0.302	0.000	0.000	0.203	0.000

As Note for Table 5.