

Trading Activities, Firms and Productivity

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Abstract

We exploit a panel dataset of Hungarian firms merged with product-level trade data for the period 1992-2003 to investigate the relation between firms' trading activities (importing and exporting) and within-firm productivity growth. We find that within-firm productivity growth is systematically related to participation in international trade. Further, controlling for a number of patterns in trade activities (changes in number of traded products and countries of origin and destination, broad economic categories), we find that self-selection of the most productive firms operates for both importers and exporters, with seemingly larger fixed costs characterising the importing activity. As a result, failing to control for the importing activity leads to overstated productivity premia of exporters.

JEL classification: F12, F14, L25

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1 Introduction

The positive relationship between trade exposure and aggregate productivity is nowadays well explained by a vast body of theoretical and empirical literature. In particular, capitalizing on the seminal papers of Melitz (2003) and Bernard et al. (2003), researchers have identified and tested a microeconomic channel in which gains in total factor productivity (TFP) are generated by the reallocation of economic activity across heterogeneous firms within industries. Due to the existence of trade costs, only the most productive firms self-select into export markets. As a result, when trade costs fall, industry productivity rises both because low-productivity, non-exporting firms exit (selection effect) and because high-productivity firms are able to expand through exporting (reallocation effect).

Under these models, therefore, it is the reallocation of activity across firms, not the intra-firm gains in productivity growth, that boosts industry productivity. The main reason for this lack of consideration of the intra-firm changes in productivity induced by trade is essentially the lack of empirical evidence showing that exporting activity has significant feedback on firms' productivity, consistently with heterogeneous firms' models in which plant-level productivity does not vary over time. According to this literature, the most productive firms 'self-select' into exporting.

The lack of evidence for intra-firm productivity growth, however, can be a consequence of limitations in micro-based datasets, which typically record only the exporting activity of a firm. Such datasets did not allow researchers to construct the full spectrum of firms' trade activities (imports and exports). Recent datasets and empirical work, on the other hand, showed that in some cases, within-firm evolution of productivity has been substantial.

Yet, empirical evidence regarding the evolution of within firm TFP is ambiguous. Bellone et al (2007) investigated French firms and found that the typical productivity dynamics of a new exporter is U-shaped, falling ahead of entry to export markets but rising as the benefits from sales to foreign markets are harvested. However, Bekes and Murakozy (2007) found that firms who start exporting start improving their productivity ahead of the entry and this gradual improvement continues smoothly following the foreign market entry. Italian results (Serti and Tomasi 2007) confirm that there is an important post entry efficiency improvement by exporters. These results suggest, that the relationship between exporting and productivity is more complex than usually assumed in empirical models. Exporting activity may be interrelated with other important firm-level decisions, and these interactions may explain differences in performance of exporters. One possible such factor can be the

complex relationship between exporting and importing activities.

Several channels were suggested through which trade can affect firm-level productivity. Learning from the activity of exporting seems to have been limited to firms exporting from underdeveloped countries (e.g. sub-Saharan Africa, as in Van Biesebroeck, 2007) or small open economies (e.g. Slovenia, as in De Loecker, 2007). Another channel was suggested by Bernard et al. (2006) who are among the few authors to provide some evidence of a positive relationship between trade liberalization and within plants TFP growth in a developed economy (United States). They claim that a potential driver of individual firms' productivity as a result of greater trade openness might be the "kick in the pants" (Lawrence 2000) effect that previously protected firms get from international competition, stimulating them to react. Nevertheless they only postulate, without testing, the possible channels through which incumbent firms react to the trade shock: the emergence of Schumpeterian incentives to invest in innovation, itself made easier by the transfer of technology taking place through trade; or the changes in the product mix towards products characterized by a lower elasticity of substitution and, possibly, a higher TFP of the overall output mix¹.

The literature studying the relationships between importing and firm performance is more recent. New results seem to point to the presence of fixed costs not only of exporting but also of importing, and thus to a process of self-selection in both export and import markets. With regard to firm performance, as for the case of exporters, also importers have a variety of positive attributes: they are bigger, more productive and more capital-intensive than nonimporters (e.g. Bernard et al. 2007)

And yet, a number of recent contributions to the literature clearly suggest the existence of a relation in which the importing activity of a firm leads to within-firm gains in TFP, a case overwhelmingly ruled out for the export case. The idea is that there are at least three channels through which imports at the firm-level could directly affect a firm's TFP: a variety effect, in which the broader range of available intermediates contributes to production efficiency; a quality effect, induced by the fact that the same intermediates available abroad might be of better quality than local ones; and a 'learning' effect, in which importing firms acquire part of the technology incorporated in the imported goods. In particular, indirectly testing for these effects, Kasahara and Rodrigue (2005), Halpern et al. (2005) and Amiti and Konings (2007), while they cannot exclude the presence of a self-selection effect induced by the presence of fixed costs of importing, they also find that importing intermediate goods

¹On the relationship of innovation and trade, see Damijan et al., 2008.

improves plant productivity, always controlling for the simultaneity bias induced by both the productivity shock and the import decision on input choices.

All in all, thanks to the increasing availability of disaggregated trade data, in which product-level trade flows are matched to firm balance sheets, a growing literature is also exploring a further potential channel related to intra-firm productivity gains: namely, the fact that firm characteristics, among which their TFP, are systematically related to the firm participation in international trade activities, in terms of both importing and exporting. In other words, it could be the case that an active engagement of firms in various forms of trade (thus, not only exports) might be responsible for some of the intra-firm gains in productivity detected by the literature.

To this extent, analyzing the trading activities of firms in various countries, different studies have found surprisingly similar results: both imports and exports appear to be highly concentrated among few firms, and thus highly correlated ². In all the studies considered, moreover, there is evidence that the increasing global engagement of firms in terms of traded number of countries and products is associated with better performances. For Belgium and Italy, in particular, two-way traders (i.e. firms that both import and export) appear to be the most productive, followed, in descending order, by importers only, exporters only and non-traders.

This research aims at uncovering potential relationship between various stages of internationalisation of productivity. If imports do have a positive effect on (ex post) firms' TFP, then the previously discussed positive correlation detected between importing and exporting activities would entail a precise causal relationship, going from imports to productivity gains to exports. Thus, the productivity advantage of exporters reported in the literature might have been overstated, since part of the effect would be induced by importing activities previously not considered. If, on the contrary, we can rule out a systematic effect of imports on firms' TFP in favor of a self-selection explanation, we could conclude that, similarly for the exporters-only case, the positive overall correlation between firm performance and trade activities is spuriously driven by a selection process, in which higher productivity leads to both imports and exports. To shed some more light on the strength and nature of relationship between firms' trading activities and their TFP gains is thus the aim of this paper.

The case of Hungary constitutes an interesting quasi-natural experiment allowing us an ideal control for initial conditions, since our long panel data cover the early years of the

²See Bernard et al. (2005 and 2007) for US, Castellani et al. (2008) for Italy, Muuls and Pisu (2007) for Belgium, Andersson et al. (2007) for Sweden.

transition process of the country (from 1992 onwards), when trade flows received a major boost induced by the signing of the free trade agreements with the European Union and the other Central and Eastern European countries and a substantial inflow of foreign direct investments induced heavy restructuring of firms, followed by later years (after 1999) in which conditions typical of a market economy started to prevail.

Overall, we find that self-selection of the most productive firms operates for both importers and exporters, with seemingly larger fixed costs characterising the importing activity. As a result, failing to control for the importing activity leads to overstated productivity premia of exporters.

The paper is structured as follows. Section 2 presents data and preliminary evidence on trading activity. Section 3 discusses the link between productivity and trade activities, while Section 4 presents a probabilistic model of importing and exporting decision. Section 5 concludes.

2 Data and preliminary evidence

We use a large and comprehensive panel of Hungarian firms obtained by merging tax and customs data for the period 1992-2003. The first dataset contains accounting and financial data of Hungarian firms. The source of data is the Hungarian Tax Authority (APEH). In this exercise we estimate using observations between 1992 and 2003. This database represents more than 90% of Hungarian employment, value added and exports and is almost complete outside the scope of non-trading micro enterprises. To avoid a number of potential problems in the calculation of firms' performance, in this paper we have restricted the analysis to manufacturing data only, with Tables 1 and 2 reporting the number of firms per year and by NACE2 industry³.

[Tables 1 and 2 about here]

The APEH dataset has then been merged at the firm-level with a trade dataset, containing transaction-level data as registered by the customs office. The unit of observation in this trade dataset is firm-product-destination. The dataset includes information on both the dollar value of shipments and their physical quantity. In this paper we define the amount of trade as the dollar value of shipments. We have measures of export and import varieties in terms of number of different HS6 category good the firm trades⁴. We also have information

³The dataset and features of various types of trading firms is presented in Békés-Harasztonyi (2008).

⁴"Motor cars and vehicles for transporting persons" is an example for a 4-digit category, while "Other

on the countries of origins and destinations firms export to or import from.

Finally, the dataset also contains information on a firm's ownership, and thus allows us to control for the presence of multinational firms⁵, a critical dimension of our analysis since foreign-owned firms might be trading within their international network, and thus could differ along several dimension from other firms (Feinberg and Keane, 2001). Table 3 reports how relevant foreign-owned firms are in our dataset.

The first columns of Table 4a show the number of firms by their trade status. In our framework a firm can be in one of the following four trade status δ_z : $z = IE$ for firms that both import and export (two-way traders); $z = I, E$ for firms that either import or export only; $z = L$ for firms not engaged in any trade activity (non traders).

More than 37.9% of firms export and more than 29.9% import in our dataset, showing the important role international trade plays in life of firms operating in a small and open economy, like Hungary. Also, about half of trading firms conducts two-way trade, but we find a large number of firms in each category, showing that importing and exporting are not always go together in manufacturing.

Table 4 also shows the most important descriptive statistics on the performance of firms with different trading status. Trading firms perform better in all dimensions: they are larger, more productive and they also play higher wages. Two-way traders are the highest performers, followed by only importers and only exporters. The differences are huge in all dimensions.

[Tables 3 and 4 about here]

3 Trading activities and productivity

3.1 Productivity measurement

The measurement of firm-level total factor productivity for trading firms is subject to a number of econometric problems. First of all, calculating TFP as the Solow residual of an estimated firm-specific production function (Cobb-Douglas), with no a priori assumption imposed on the industry-specific returns to scale, is subject under OLS to a well-known simultaneity problem, accruing from the fact that profit-maximizing firms can immediately adjust

vehicles, spark-ignition engine of a cylinder capacity not exceeding 1,500 cc" is an example 6-digit category. The number of varieties ranges in case of import from 1 to 797 and in case of export from 1 to 355.

⁵Throughout the paper, a firm is considered as foreign-owned if at least 10% of its capital is controlled by a foreign owner. We carried out robustness checks on the threshold. Given that most foreign acquisition leads to majority ownership within a few years, results are not at all sensitive to raising the 10% threshold to, say, 25%.

their inputs (in particular capital) each time they observe a productivity shock, which makes input levels correlated with the same shocks. Moreover, a second endogeneity problem arises from sample selection, induced by the fact that firms leave the market when productivity falls below a certain threshold. Since surviving firms will have a TFP derived from a selected sample, ignoring this selection mechanism may bias estimates of productivity. Finally, given the differences we have detected in the preliminary analysis, it might be the case that the firm's decision to invest and exit the market is quite different for different types of trading firms, and thus the decision to import or export should not be treated as exogenous when estimating TFP.

In order to tackle all these problems, we measure firms' TFP through an industry-specific two-stage estimation, in which we control for the simultaneity bias induced by the productivity shock, the selection equation of firms' survival and the impact of the firm's trade type (importer, exporter or both) on input choices. To this extent, we improve on the modified Olley and Pakes (1996) procedure proposed by Amiti and Konings (2007), in which the import and export decisions at time $t - 1$ are treated as additional state variables, together with productivity and capital, in the firm's investment demand function. The latter, once inverted, is used as an instrument to properly identify, through semi-parametric procedures and the survival equation, consistent estimates of the input coefficients, and thus recover an unbiased TFP measure.

In terms of regressors, we have deflated our balance sheet data using disaggregated industry price indexes. We have used value added to proxy output, the number of employees as a proxy for the labour input, and the deflated value of tangible fixed assets as a proxy for capital. A problem in dealing with trading firms is that using national PPIs to deflate balance sheet data does not control for the fact that output and factor prices might be different and/or evolve differently over time for trading firms, which might induce an omitted price variable bias in our estimates. The problem is particularly relevant for importing firms, since, as acknowledged by Amiti and Konings (2007), differentials in TFP across firms might accrue from differences in domestic and (imperfectly measured) import prices, rather than actual changes in the quality of imported inputs.

To control for such a price effect in TFP estimation, we have carried on two adjustments. First, we have generated the value added variable by taking into account two potential sources of inputs, domestic and international ones. Since we do not have a deflator for imported inputs, but we have information on the real exchange rate, following Olley and Pakes (1996) we have calculated real value added by deflating output (sales) and domestic

materials through their deflators, and then, for importing firms, subtracting imported inputs deflated through the real exchange rate as derived from central bank statistics.

Second, we have modified the Olley and Pakes (1996) semi-parametric algorithm. With respect to the original algorithm, Amiti and Konings (2007) have included two dummy variables, one for importing firms and another one for exporting firms. Given that productivity may be differently affected by the quality of imports, and that the latter is likely to be correlated to the factor intensities of the country from which imports are sourced (**a reference here...., quality and capital intensity...maybe Romalis or Nunn??**), we have refined further the Olley and Pakes algorithm by including two separate dummies for firms importing the largest part of their inputs from countries splitted according to their capital vs. labor intensity. Hence, the investment demand equation in our estimation algorithm incorporates three state variables related to the trade status of the firm⁶

Overall, treating imported inputs differently from domestic ones, and considering as separate cases firms importing from low vs. high income countries should reduce the risk of picking up a price effect in our estimated TFP for imported firms.

3.2 Trade status and productivity

In terms of productivity, Table 4b shows that two-way traders are almost twice as productive as non-trading firms⁷. Interestingly, the difference between non-traders and exporters is relatively small, while the productivity of only importers is closer to that of two-way traders. In other words, importing seems to be in a much closer relationship with productivity than exporting. This may mean that selection process is different in exporting and importing or it is also possible that importing leads to higher productivity advantages than exporting.

Graph 1 confirms this ranking of productivity by trade status, showing the cumulative distribution of (log) TFP, using both the modified Olley and Pakes (1996, OP) and the Levinsohn-Petrin (2003) as robustness check. The same ranking remains constant within each sector of our dataset⁸. In terms of variations over time, the ranking is constant across

⁶Three dummy variables taking value 1 if the firm imports from a labor intensive economy, if it imports from a capital intensive economy, or if it exports, and 0 otherwise. Relative labor intensive economies were defined as having no more than 50% higher wages than the destination country, Hungary. Relative capital intensive economies were defined as having more than 50% higher wages than Hungary. Relative capital intensive economies are basically from Western Europe, North America, Japan, etc. All Central and Eastern Europe and most of Asia belongs to the other category.

⁷For robustness, we also present results where TFP has been calculated following the standard semi-parametric estimation suggested by Levinsohn and Petrin (2003) as well as plain OLS.

⁸The only slight deviations have been detected in industry NACE-19 (leather) with exporters slightly more productive than importers, and NACE-26 (metals), where exporters and non traders showed a very similar TFP. These are however sectors accounting for less than 7% of total firms in our sample, as reported in Table

the years, but the size of the different premia varies. In particular, Graph 2 shows that while importers have a roughly constant TFP premium over time, the exporter-only premium is shrinking as transition to the market economy progresses, while the TFP gains for two-way traders grows in line with the increasing modernization and opening of the Hungarian economy.

[Graphs 1 and 2 about here]

The ranking of productivity by trade status is also confirmed when partitioning our sample according to ownership, as shown in Table 5. For both domestic and foreign-owned firms, two-way traders are the most productive group, followed by importers, exporters and non traders. Actually, simple TFP averages reveal that foreign-owned firms are more productive than domestic ones, consistently with the theory. However, when disentangling this information across the trade status, domestic and foreign-owned firms do not differ much in terms of productivity when they are either non trading or exporting only⁹, while foreign-owned firms become significantly more productive than domestic ones if they are importer or two-way traders.

[Table 5 about here]

Clearly, these results should be validated via a multi-variate regression, since it could well be the case that some unobserved firms' characteristics, associated to both TFP and the trade status, might induce a spurious correlation between the trading activity and productivity. To this extent, we have regressed the level of TFP of each firm against a number of firms' characteristics (employment, foreign ownership, age proxied by time spent in the sample), industry and time dummies.

EQ2 here:

The results, presented in Table 6, show that, when considering exporters, as it is standard in the literature (Column 1) we retrieve the usual positive correlation with TFP, even when controlling for firms' characteristics typically associated with productivity. However, recalling our results on the importing activity of firms, such a model specification overlooks

2.

⁹A closer look at the productivity distribution of these firms for those two trade status reveals that the least productive firms are domestic non-traders, and the most productive ones are foreign-owned exporters, consistently with the theory. Some slight deviations from the log-normal distribution of TFP then lead to simple means becoming quite similar.

the fact that some of those exporters might also be involved into importing activities, and thus their productivity premium might actually derive from their import, rather than their export, status. In fact, if we add the import status in our regression (Column 2), we find that also the importing activity is positively and significantly correlated with productivity and, most importantly, that the inclusion of the import dummy lowers the extent of the productivity premium for exporters. A possible explanation of this finding is that import matters more or the import and export dummy might be correlated, to the extent that the majority of our firms are two-way traders. The latter trading activity would then be driving both results. To clarify things, in Column 3 we have thus partitioned our sample in mutually exclusive categories (only importers, only exporters, two-way traders), always controlling for firms' characteristics and keeping non traders as the control group. As it can be seen, every trade activity is positively and significantly associated to productivity, with our ranking of productivity premia by trade status confirmed. As a final check, we have run the import and export dummies on the restricted sample of exporting firms and importing firms: again, we find that the premium in terms of TFP accruing to two-way traders is larger when it comes from exporters adding the importing activity, rather than importers which add export and become two-way traders, always controlling for firms' characteristics.

All the above evidence is thus consistent with the conclusion that exporters are relatively more similar in terms of productivity to non-traders, while importers and two-way traders are much more productive. In other words, there is evidence of a self-selection effect of importers and the associated productivity premium, which the literature has by and large neglected insofar.

[Table 6 about here]

3.3 Switching firms

The descriptive statistics in the previous section suggests that trade status is importantly correlated with all dimensions of firm performance. Castellani et al. (2008) also found that any trade activity improves TFP for a sample of Italian firms. We found similar but not identical results. The ranking of firms is the same in both cases: non-traders, only exporters, only importers followed by two-way traders. The main difference is that their results suggests that the productivity of only exporters and only importers is very similar, while we found large differences between them¹⁰.

¹⁰Castellani et al. (2008) do not control for the trade status in their TFP measure, as we do. However, results holds with standard measures as well.

To explore the latter issue further, we have concentrated our analysis on firms who have switched from one trading status to another. We start by characterizing a transition matrix of the various trade status δ_z in which firms are engaged, in order to evaluate the persistency of the import and export status and the transition probabilities from one type of trading activity to the other.

In terms of data, although the import and/or export status is quite persistent¹¹, it could be that some firms enter and exit quite frequently from their trade status, a phenomenon which would bias upwards our definition of ‘switchers’. To counter this potential problem, we employ a more restrictive definition of ‘switchers’, defining a firm as importer or exporter if it has imported/exported at least 5% of its output for at least 50% of the time in which it has been present in the data. This allows international comparison as in Mayer and Ottaviano (2007). According to this (stricter) definition, there are about 3,800 export ‘switchers’ in our data, i.e. firms who started to export, and about the same number of firms who started to import, whatever their previous trading status was, as reported in Table 7. We thus investigate how the move from one status to another affects TFP.

[Table 7 about here]

To this extent, Table 8 shows the transition matrix of these firms observed for two periods: from 1993 to 1997 and from 1998 to 2003. We can see that the dynamics do not differ much among the two periods, thus signalling that the transition process did not seem to alter dramatically the trading strategies of firms throughout our sample¹². Two features characterize our transition matrixes. First of all, we find evidence of the persistency of the two extremes in the trade status. Looking at the relative magnitude of the figures for non traders or two-way traders along the diagonal of the matrix, it is in fact true that firms who were in one of these two trade statuses at the beginning of the period (1993 or 1998) are likely to remain in the same trade status at the end of the period (1997 or 2003).

Second, differently from the findings of Castellani et al. (2008) for Italy, but similarly to the results of Kasahara and Lapham (2008) for Chile, we find that firms who originally only import or export have a relatively high probability not only of remaining in the same

¹¹The average time spent as importer or exporter by a given firm is 62.7% vs. 58.9%, respectively, of the years in which they are present in the dataset.

¹²The only consideration here is that no-traders are slightly less likely to remain in the same status in the second period of our analysis, with 79% of firms not engaged in any trade activity in 1993 remaining such in 1997, compared to 68% for the period 1998-2003. The latter findings are consistent with the increasing opening up of the Hungarian economy along the transition to the market.

trade status, but also of becoming either two-way traders or non traders¹³. Such persisting turbulence in the off-diagonal part of the transition matrix thus signals the fact that some firms have a transitory experience of trading, then reverting back to a non trading status, while some others, once they start trading, tend to move to the full spectrum of the trading activities, becoming two-way traders (the probability being the same whether they come from an import or export status). It thus seems that -in an open economy- importing or exporting only is not a steady state equilibrium strategy of firms, and this is especially true for exporters only, which are in all cases less than 10% of our firms.

[Table 8 about here]

To explore this issue further, we have assessed whether adding the exporting activity while the import activity is already being performed (i.e. becoming a two-way trader from the importing status) has a higher incremental effect on performance (TFP) than adding the exporting activity in isolation. Or, in other words, we assess whether the marginal return to imports (exports) increases as the level of exports (imports) also increases. To properly measure the latter, we look at firms switching their trade status at year t and then measure the average change in productivity obtained in the two years after the switch with respect to the performance of the two years before the switch, i.e. we construct the variable

$$D = [\ln(TFP)_{t+2} + \ln(TFP)_{t+1}] - [\ln(TFP)_{t-2} + \ln(TFP)_{t-1}]$$

Such a measure is consistent with our notes in the introduction regarding the TFP evolution through the switching process. Also, to control for possible common industry and time-specific shocks which, in a given industry/year might affect productivity for all firms (thus including the switchers), we have constructed a variable D^* where the firm-specific TFP of the switcher has been normalized for the industry mean in the corresponding year used in the calculation.

Table 9 summarizes our findings, with TFP always calculated following the modified algorithm of Amiti and Konings (2007), based on of Olley and Pakes (1996). Three stylized facts can be derived from this Table.

First of all, comparing the productivity of the switchers in the year before they add the

¹³This is especially the case in the period 1993-1997, and, to a certain extent, also in the period 1998-2003 for exporting firms. The importing status seem to persist more in the 1998-2003 period. Note that the detected ‘noise’ is present even including the relative strict definition of switchers we have employed in the analysis.

new trade activity with respect to the TFP of firms already in that category, we find that switchers are in general less productive than incumbents, consistently with the findings of the literature (Kasahara and Lapham, 2008). In addition, adding any new trade activity has always a positive impact on firm performance: both our variables D and D^* are always positive and very similar. The latter finding might be consistent with some evidence of learning from trade, a feature already detected for both exporting firms in a transition economy (De Loecker, 2007 on Slovenia) and for importing firms (Halpern et al., 2005, on similar Hungarian data).

[Table 9 about here]

Second, we find that, when performed jointly, the importing and exporting activity tend to be associated to the largest productivity gains ($D = 0.28$), again consistently with the findings of Kasahara and Lapham (2008)¹⁴. However, we do not find robust evidence indicating that adding export (import) when a firm is already an importer (exporter) yields a higher ex-post increase in TFP than adding exports (imports) alone from a non-trade status. The latter result thus seems to exclude a causal relationship going from importers to exporters or vice versa.

Third, and more relevant for the purposes of this paper, the average ex-ante productivity of firms who switch into import from no trade activities is significantly higher than the ex-ante TFP of non-trading firms switching into export (1.05 vs. 0.84); in addition, the productivity threshold at which firms switch to imports from an export status (thus becoming two-way traders) is lower than the threshold at which importers become two-way traders, thus adding exports (1.03 vs. 1.40). We thus have another piece of evidence consistent with the idea that considering a generic ‘export-premium’ in terms of productivity might be just picking up an ‘import-premium’: our data reveal in fact that the high average productivity of firms switching into export (1.19, higher than that of firms switching into imports, 1.04), is essentially driven by the fact that, among the switchers into exports, there are very productive importing firms. Failing to account for the presence of importers would thus overstate the relevance of export switching in terms of productivity performance.

These results are confirmed by a multivariate regression, presented in Table 10, in which we regress our D variable with respect to various dummies signaling the switch into different trading activities and a number of firm, industry and time-specific characteristics.

¹⁴They show that in the Chilean case a firm can save approximately 20 per cent of the per-period fixed costs associated with trade by simultaneously engaging in both export and import activities.

Not surprisingly, when we explicitly control among regressor (column 2) for the share of imported materials the significance of the productivity premia for firms switching into imports decreases slightly. However, it remains significant and well above the premia for firms switching into export, thus providing further robustness to our results. Further controls include age and size of the firm, foreign ownership as well as structure of both import and export in terms broad (BEC) categories such as capital, consumption goods and raw materials/parts/intermediate goods.

Graph 3 summarizes all these findings, showing that the importing activity is a key driver of performance of firms in the international market: looking at the ex-ante TFP level, it seems slightly more difficult to become an importer than an exporter, but once you have made this step, adding export is relatively easy, and over time leads to higher productivity gains.

[Table 10 and Graph 3 about here]

4 The decision to trade

Once endowed with this prima facie evidence of the role of imports in driving the firms' performance, we are interested in exploring the possible channels leading to the import decision. To this extent, we have followed Bernard and Jensen (1999) estimating a linear probability model of starting a trading activity of the form

$$T_{it} = \alpha + \beta X_{it-1} + \gamma T_{it-n} + \Phi + \varepsilon_{it}$$

where T is a dummy variable taking value 1 if a firm is an exporter (importer) and 0 otherwise. Plant characteristics, such as size, wages, ownership and productivity are included in the vector X , while Φ is a vector of industry, region and time fixed-effects. Regressors are lagged one year to reduce possible simultaneity problems.

Table 11 contains the estimates for different categories of firms: exporters, importers, and switchers into imports and exports. The results on the average importer and exporter (columns 1 and 2) confirm the hypothesis that the trade activity is highly persistent (the variable T_{-n} is always positive and significant), and associated to certain firm's characteristics (foreign ownership, size). Most importantly, productivity is a strong predictor of the probability of becoming a trader, with the coefficient higher for importing firms, thus signalling the fact that *ceteris paribus* an increase in TFP has a marginally higher impact on the

probability to import than to export (due to fixed-costs of importing rather than exporting). A similar result has been obtained for switching firms (columns 3 and 4).

Again, these findings are consistent with the results of Table 9 and 10, which suggest that the ex-ante TFP of switch-import is higher than switch-export.

Finally, we have looked at the characteristics of firms switching into import, export or two-way trade within the period 1993-1997. The results, shown in Table 12, clearly indicate that firms switching to two-way trade are different than the rest of firms: after the switch, they are larger and tend to export and import a larger number of products. Moreover, they also tend to be part of multinational groups to a larger extent than other trading firms.

Moreover, we also find that firms switching to (or remaining) importers, tend to be larger than those switching to (or remaining) exporters, tend to import a larger number of products than those exported, import relatively more from high wage countries than firms export to, and less from neighbouring countries. These findings are all consistent with the above story of self-selection of importers.

[Table 12 about here]

5 Conclusions and further lines of research

All in all, we thus derive a picture in which importing firms implement more complex strategies than exporting firms, in terms of distance at which they trade, complexity of the traded product mix, and competitiveness of the markets with which they interact. It then follows that the importing strategy per se might generate a selection process of firms of an inherently different nature than the simple fixed costs approach traditionally associated to the exporting activity. In other words, we do not exclude the existence of fixed costs of exports leading to self-selection of firms; however, we find evidence that the strategic choice of importing seems to require a more complex organization of production than the choice of exporting, inducing the detected ex-ante selection in terms of productivity we have found in our paper.

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Table 1. Number of firms in sample per year

Year	N. of firms
1992	11,036
1993	12,832
1994	14,207
1995	15,686
1996	17,741
1997	19,896
1998	20,974
1999	21,063
2000	14,815
2001	14,723
2002	14,889
2003	14,486
Total	192,348

Table 2. Number of firms in sample by NACE2 industry / year

NACE 2	1992		1997		2002		
	N.	%	N.	%	N.	%	
17	Textiles	465	4.21%	944	4.74%	683	4.59%
18	Clothes	761	6.90%	1155	5.81%	979	6.58%
19	Leather	271	2.46%	411	2.07%	345	2.32%
20	Wood	651	5.90%	1387	6.97%	1096	7.36%
21	Paper	124	1.12%	262	1.32%	258	1.73%
22	Publishing	1545	14.00%	2954	14.85%	1474	9.90%
23	Coke, Petroleum	8	0.07%	18	0.09%	9	0.06%
24	Chemicals	395	3.58%	649	3.26%	523	3.51%
25	Rubber, Plastic	610	5.53%	1141	5.73%	1046	7.03%
26	Non-metallic minerals	455	4.12%	835	4.20%	665	4.47%
27	Basic metals	148	1.34%	235	1.18%	195	1.31%
28	Fabricated metals	1554	14.08%	2895	14.55%	2356	15.82%
29	Machinery	1765	15.99%	2704	13.59%	1848	12.41%
30	Office equipment	117	1.06%	226	1.14%	134	0.90%
31	Electric	452	4.10%	865	4.35%	619	4.16%
32	Audio, Video	374	3.39%	639	3.21%	473	3.18%
33	Medical, precision	488	4.42%	926	4.65%	687	4.61%
34	Motor Vehicles	148	1.34%	246	1.24%	241	1.62%
35	Other transport	75	0.68%	152	0.76%	130	0.87%
36	Furniture	590	5.35%	1139	5.72%	1029	6.91%
37	Recycling	39	0.35%	113	0.57%	99	0.66%
Total		11035	100%	19896	100.00%	14889	100.00%

Table 3. Share of foreign-owned firms by NACE2 industry and year

NACE 2		1994	1997	2002
17	Textiles	40%	32%	27%
18	Clothes	39%	29%	25%
19	Leather	42%	41%	37%
20	Wood	28%	27%	20%
21	Paper	42%	35%	29%
22	Publishing	27%	29%	20%
23	Coke, Petroleum	.	.	.
24	Chemicals	42%	43%	32%
25	Rubber, Plastic	37%	33%	28%
26	Non-metallic minerals	42%	38%	25%
27	Basic metals	40%	33%	29%
28	Fabricated metals	29%	26%	22%
29	Machinery	30%	28%	22%
30	Office equipment	34%	28%	22%
31	Electric	31%	30%	30%
32	Audio, Video	32%	31%	30%
33	Medical, precision	32%	32%	23%
34	Motor Vehicles	46%	41%	41%
35	Other transport	39%	34%	20%
36	Furniture	32%	26%	22%
37	Recycling	28%	34%	22%
	mean	33%	30%	24%

Table 4a. Trading activity and firms' characteristics

<i>Trade status</i>	<i>N. of obs.</i>	<i>Firms' characteristics</i>			
		Sales ^(a)	Employment	VA ^(a)	Avg. wage ^(a)
No traders	101,485	42.25	9.59	12.70	0.55
Exporters	12,074	83.41	17.29	23.56	0.67
Importers	28,627	155.44	17.31	42.33	0.84
Two-way traders	50,162	1409.62	117.43	375.50	0.95

^(a) In Million HUF

^(b) LP: Levinsohn-Petrin (2003) semi-parametric algorithm;
OP: modified version of Olley-Pakes (1996) algorithm as in Amiti and Konings (2007).

Table 4b. Trading activity and firms' performance

<i>Trade status</i>	<i>N. of obs.</i>	<i>TFP ^(b)</i>			
		LP	OLS	OP	OP(1)
No traders	101,485	0.69	2.44	0.64	0.68
Exporters	12,074	0.70	2.85	0.83	0.87
Importers	28,627	1.32	2.79	1.26	1.29
Two-way traders	50,162	1.48	4.15	1.54	1.61

^(b) LP: Levinsohn-Petrin (2003) semi-parametric algorithm;
OP: modified version of Olley-Pakes (1996) algorithm as in Amiti and Konings (2007).
OP1: modified version of Amiti and Konings (2007) with different import dummies

Table 5. Trading activity, productivity premium and firms' ownership ^(a)

<i>Trade status</i>	<i>All</i>	<i>Domestic</i>	<i>Foreign-Owned</i>
No traders	0.68	0.68	0.69
Exporters	0.87	0.88	0.84
Importers	1.29	1.22	1.49
Two-way traders	1.61	1.44	1.77
Average	1.07	0.94	1.42

^(a) TFP retrieved from modified version of Amiti and Konings (2007) with different import dummies.

Table 6. Productivity level, firm characteristics and trading activity

Dep var: ln TFP in levels ^(a)	1	2	3	4	5
Sample	Full	Full	Fulll	Exporters only	Importers only
Importer		0.427*** [65.78]		0.430*** [39.80]	
Exporter	0.334*** [53.14]	0.147*** [21.59]			0.142*** [16.14]
Only Importer			0.415*** [53.71]		
Only Exporter			0.123*** [11.46]		
Two-way trader			0.578*** [79.42]		
Age: (Time spent in sample)	0.0574*** [67.75]	0.0524*** [62.41]	0.0524*** [62.47]	0.0516*** [40.11]	0.0526*** [42.46]
Employment	0.154*** [76.19]	0.135*** [67.28]	0.134*** [66.31]	0.131*** [48.94]	0.138*** [53.09]
Foreign ownership	0.216*** [34.47]	0.154*** [24.55]	0.152*** [24.29]	0.242*** [29.56]	0.260*** [33.06]
Dummies: sectors	yes	yes	yes	yes	yes
Dummies: years	yes	yes	yes	yes	yes
Constant	-0.0966 [-0.166]	-0.00272 [-0.00474]	-0.179 [-0g.312]	-1.409*** [-23.78]	-1.055*** [-20.97]
Observations	149797	149797	149797	56695	69822
R-squared	0.266	0.286	0.286	0.306	0.248

Value of t statistics; * significant at 10%; ** significant at 5%; *** significant at 1%

^(a) TFP retrieved from modified version of Amiti and Konings (2007) with different import dummies.

Table 7. Share of switchers (future or past) with respect to trading activity in 1997

NACE 2		Switch to: Export	Import
17	Textiles	14%	14%
18	Clothes	12%	12%
19	Leather	12%	12%
20	Wood	13%	15%
21	Paper	19%	17%
22	Publishing	11%	12%
23	Coke, Petroleum	.	.
24	Chemicals	19%	14%
25	Rubber, Plastic	20%	19%
26	Non-metallic minerals	13%	19%
27	Basic metals	17%	15%
28	Fabricated metals	17%	17%
29	Machinery	16%	14%
30	Office equipment	9%	15%
31	Electric	12%	13%
32	Audio, Video	13%	14%
33	Medical, precision	16%	13%
34	Motor Vehicles	17%	11%
35	Other transport	16%	18%
36	Furniture	15%	15%
37	Recycling	18%	18%

Table 8. Transition matrixes of trading activities*(Transition matrix 1993-1997)*

N. of firms		1997				
1993		No traders	Only Exporter	Only Importer	Two-way traders	N. Firms
No traders		4272	236	462	425	5395
Only Exporter		202	130	30	146	508
Only Importer		552	56	489	400	1497
Two-way traders		274	114	231	1709	2328
N. Firms		5300	536	1212	2680	9728

Percentages		1997					
1993		No traders	Only Exporter	Only Importer	Two-way traders	Total	N. Firms
No traders		79%	4%	9%	8%	55%	5395
Only Exporter		40%	26%	6%	29%	5%	508
Only Importer		37%	4%	33%	27%	15%	1497
Two-way traders		12%	5%	10%	73%	24%	2328
Total		54%	6%	12%	28%	100%	9728
N. Firms		5300	536	1212	2680	9728	

Transition matrix 1998-2003

Num. Firms		2003				
1998		No traders	Only Exporter	Only Importer	Two-way traders	N. Firms
No traders		2916	322	658	382	4278
Only Exporter		246	244	60	176	726
Only Importer		523	59	840	444	1866
Two-way traders		367	185	395	2758	3705
N. Firms		4052	810	1953	3760	10575

Percentages		2003					
1998		No traders	Only Exporter	Only Importer	Two-way traders	Total	N. Firms
No traders		68%	8%	15%	9%	44%	4278
Only Exporter		34%	34%	8%	24%	7%	726
Only Importer		28%	3%	45%	24%	19%	1866
Two-way traders		10%	5%	11%	74%	38%	3705
Total		42%	8%	20%	39%	100%	10575
N. Firms		4052	810	1953	3760	10575	

Table 9. Productivity premia from switching into different trading activity ^(a)

		N. of firms	TFP _t	TFP _{t-1}	D ^(b)	D* ^(b)
Switching to import in year <i>t</i>	Total firms:	3398	1.14	1.04	0.22	0.16
	- from no trade status	2164	1.14	1.05	0.23	0.17
	- from export status	1234	1.14	1.03	0.20	0.14
Switching to export in year <i>t</i>	Total firms:	3363	1.26	1.19	0.18	0.13
	- from no trade status	1273	0.92	0.84	0.14	0.10
	- from import status	2090	1.47	1.40	0.20	0.15
Switching to two-way trade in year <i>t</i>		512	1.05	0.89	0.28	0.24

		N. of firms	TFP _t	TFP _{t-1}
No switcher	No switcher	144043	1.07	1.12
	o/w. Non traders	70088	0.68	0.76
	o/w. Exporters	21254	1.31	1.36
	o/w. Importers	8951	0.86	0.89
	o/w. Two-way traders	43750	1.62	1.63

^(a) TFP retrieved from modified version of Amiti and Konings (2007) with different import dummies.

^(b) $D = [\ln(TFP)_{t+2} + \ln(TFP)_{t+1}] - [\ln(TFP)_{t-2} + \ln(TFP)_{t-1}]$; D* is constructed in similar way, with the firm-specific TFP of the switcher normalized to the industry mean in the corresponding year used in the calculation

Table 10. Productivity premia of switchers and firms' characteristics

Dep var: D ^(a)	(1)	(2)
Switch: from no trade to new exporter	0.129*** [4.669]	0.113*** [3.884]
Switch: from no trade to new importer	0.170*** [7.530]	0.140*** [5.833]
Switch: from exporter to 2-way trader	0.137*** [3.253]	0.091** [2.139]
Switch: from importer to two-way trader	0.162*** [6.013]	0.119*** [4.216]
Switch: from no-trader to two-way trader	0.317*** [4.355]	0.292*** [3.975]
Industry-year average TFP growth	0.943*** [17.61]	0.927*** [17.35]
Age (time spent in sample)	-0.012*** [-6.533]	-0.014*** [-7.686]
Size (ln employment)	-0.007** [-2.174]	-0.073*** [-7.433]
Size t-1		0.064*** [5.028]
Size t-2		0.0003 [0.0408]
Foreign ownership	0.013 [1.287]	-0.004 [-0.392]
Share of imported materials (in total)		0.070* [1.877]
Share of imported materials (t-1)		0.013** [2.275]
Share of imported materials (t-2)		0.003 [1.294]
Share of imported materials x REER		-0.065* [-1.781]
D_(Imports capital goods=1)		0.072*** [4.245]
D_(Imports consumption goods=1)		-0.042* [-1.693]
D_(Imports parts, intermed goods=1)		0.052*** [4.252]
D_(Exports capital goods=1)		0.002 [0.113]
D_(Exports consumption goods=1)		-0.019 [-0.967]
D_(Exports parts, intermed goods=1)		0.043*** [3.075]
Constant	0.086** [1.987]	0.104** [2.409]
Dummies: sectors	yes	
Dummies: years	yes	
Observations	33267	32968
R-squared	0.05	0.06

Value of t statistics; * significant at 10%; ** significant at 5%; *** significant at 1%

^(a) $D = [\ln(TFP)_{t+2} + \ln(TFP)_{t+1}] - [\ln(TFP)_{t-2} + \ln(TFP)_{t-1}]$; TFP retrieved from modified version of Amiti and Konings (2007) with different import dummies.

REER: real effective exchange rate

Table 11. Probability of becoming importer / exporter

VARIABLES	Exporters	Importers	Export switchers	Import switchers
T-1	2.385***	2.327***		
	[221.6]	[229.8]		
T-n-1	0.910***	0.900***		
	[48.29]	[52.51]		
TFP	0.174***	0.246***	0.00974	0.0598***
	[32.14]	[49.50]	[0.877]	[6.571]
Size: ln(employment)	0.246***	0.195***	-0.0291***	-0.0646***
	[63.84]	[53.26]	[-3.644]	[-9.844]
Avg. Wage	-0.0133**	-0.0126***	-0.0692***	-0.0569***
	[-2.383]	[-2.596]	[-3.835]	[-4.484]
Foreign ow.	0.460***	0.515***	-0.242***	-0.277***
	[40.39]	[46.42]	[-8.394]	[-11.62]
Constant	-2.084***	-1.989***	-2.214***	-1.895***
	[-29.21]	[-32.16]	[-16.07]	[-16.80]
Dummy: Sector	yes	yes	yes	yes
Dummy: Year	yes	yes	yes	yes
Dummy: Region	yes	yes	yes	yes
Observations	149041	149041	132011	132011
Pseudo R-squared	0.598	0.578	0.0321	0.0454

^(a) TFP retrieved from modified version of Amiti and Konings (2007) with different import dummies.

Table 12. Characteristics of switchers into different trade statuses, 1993-1997

Trading status and values in 1997
Average Sales (M HUF)

Trading status in 1993:	Only Exporter	Only Importer	Two-way traders
No traders	64.8	121.5	525.4
Only Exporter	112.9	88.6	1526.0
Only Importer	101.7	161.1	818.0
Two-way traders	103.3	235.2	1808.8

Foreign ownership in 1997

Trading status in 1993:	Only Exporter	Only Importer	Two-way traders
No traders	18%	26%	40%
Only Exporter	23%	27%	27%
Only Importer	25%	33%	53%
Two-way traders	36%	42%	61%

N. of HS6 products exported

N. of HS6 products imported

Trading status in 1993:	N. of HS6 products exported		N. of HS6 products imported	
	Only Exporter	Two-way traders	Only Importer	Two-way traders
No traders	3.2	7.3	5.1	21.1
Only Exporter	3.8	6.9	3.2	14.8
Only Importer	3.1	6.6	9.5	25.2
Two-way traders	2.8	13.5	14.2	46.2

% exports to high-wage countries

% imports from high-wage countries

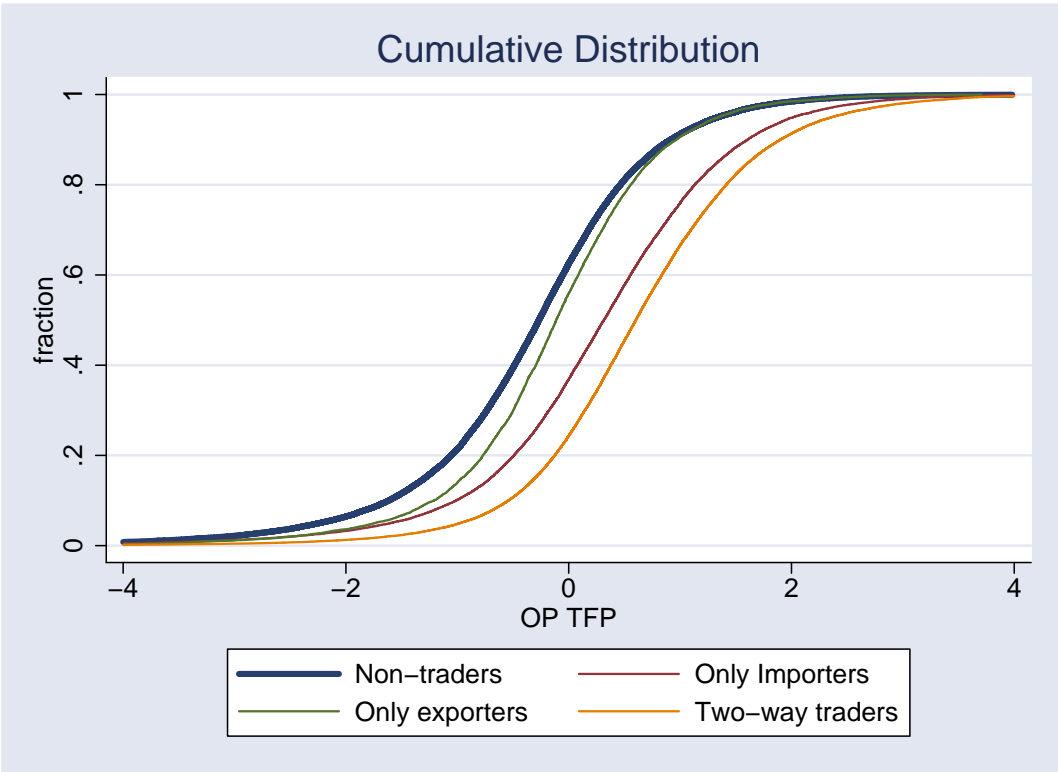
Trading status in 1993:	% exports to high-wage countries		% imports from high-wage countries	
	Only Exporter	Two-way traders	Only Importer	Two-way traders
No traders	57%	66%	79%	82%
Only Exporter	66%	71%	79%	81%
Only Importer	64%	53%	81%	84%
Two-way traders	67%	75%	82%	85%

% exports to neighboring countries

% imports from neighboring countries

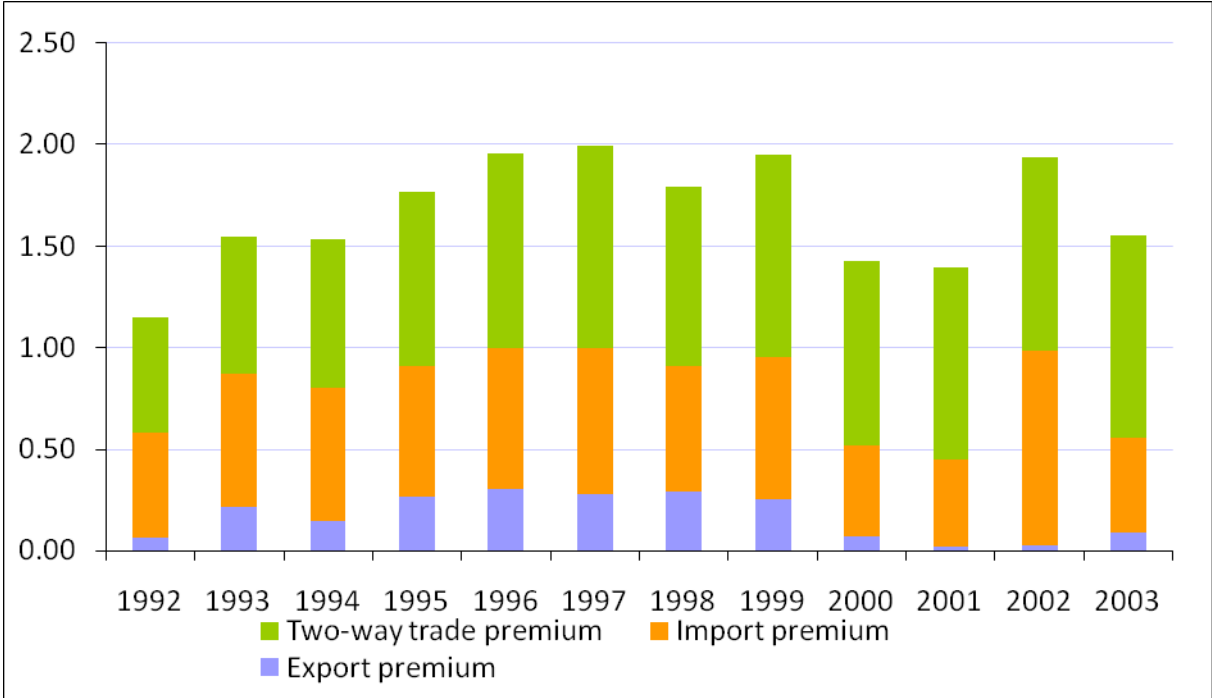
Trading status in 1993:	% exports to neighboring countries		% imports from neighboring countries	
	Only Exporter	Two-way traders	Only Importer	Two-way traders
No traders	41%	35%	21%	24%
Only Exporter	37%	31%	21%	27%
Only Importer	50%	45%	17%	17%
Two-way traders	36%	27%	21%	19%

Graph 1: Cumulative TFP distributions ^(a)

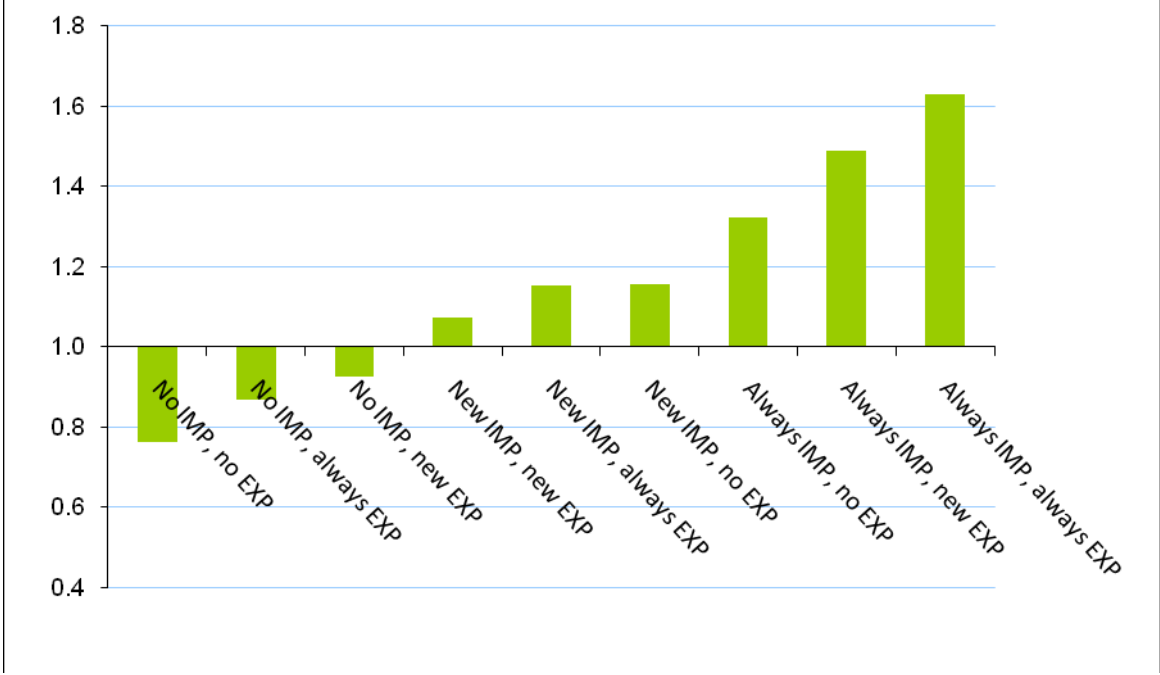


^(a) TFP retrieved from modified version of Amiti and Konings (2007) with different import dummies.

Graph2 TFP premia by trader status through time



Graph 3: Average group TFP by trading activity (ex ante, at time $t-1$)



^(a) TFP retrieved from modified version of Amiti and Konings (2007) with different import dummies.