Moving skills from hands to heads: does importing technology affect export performance in textiles?

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Abstract

This paper examines the link between imported technologies and a country’s export performance, as measured by product quality. The analysis is set in the background of the process of regional integration between the European Union (EU) and its neighbouring developing countries. The underlying question is whether trade integration fosters or dampens learning and technological upgrading. We find that unit values of exports from these countries to the EU rose steadily between 1988 and 1996, relative to the unit values of world exports to Europe. If increases in unit values satisfactorily proxy increases in product quality, then trade integration has fostered product upgrading and technological learning in the sample countries. We find that imported technologies and other sources of knowledge have a strong bearing on this pattern. Technological inflows are captured by the degree of involvement of European companies in export flows from our sample countries (outward processing trade (OPT)) and by the skill content of the machines imported.

Non-technical abstract

Trade and greater economic integration affect the upgrading of technologies in less advanced areas. The open questions pertain to the direction of such change and to the channels through which technologies are transmitted. This paper explores the role of a few different channels for importing technologies and their impact on export performance. The study is set in the context of the process of economic integration between the EU and its neighbouring developing countries, in particular Central and Eastern European Countries (CEECs) and the Southern Mediterranean Countries (SMCs).

New potential sources of technological inputs become available with declining trade barriers. Some of these technological inputs are deliberately purchased (new machines, foreign investments, skilled personnel) and others are acquired through spillovers, by trading with more technologically advanced partners, by gathering information in foreign markets, by learning from sophisticated imported goods.

In the present paper export performance is defined in terms of the quality of exported products, on the presumption that higher quality products imply the use of more complex technologies and have a strong learning potential. We find that unit values of exports from the sample countries to the EU rose steadily between 1988 and 1996, relative to the unit values of world exports to Europe.

We then investigate whether imported technologies and other sources of knowledge have some bearing on this pattern. Particular attention is devoted to the technologies embodied in the machines imported. We develop a measure of technological complexity

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of the machines imported related to the level of skills required to use them. We also jointly estimate the role of outward processing trade which indirectly captures foreign investments and other forms of involvement of European firms in our sample countries.

These channels of technological imports appear to have a statistically discernible and positive role on product quality for all the countries analysed. Imported machines are the most important determinant of product upgrading in the SMCs, while foreign firms play a dominant role in the CEECs.

This result is consistent with stylised facts. The pattern of trade liberalisation and specialisation was quite different for the two groups of countries. In the CEECs liberalisation was sudden and drastic. Trade patterns changed considerably, both in terms of products and market destination. Foreign companies are playing a crucial role in this pattern of transition. In the SMCs things have been smoother. Trade is being liberalised more gradually and many of these countries have a strong specialisation in textiles. Although based on imported technologies, upgrading and learning appears to be rooted in the local production structure rather than being channelled by foreign companies.

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1. Introduction

Trade and greater economic integration affect technological change in less advanced areas. The open questions pertain to the direction of such change and to the channels through which technologies are transmitted. Why some countries are unable to benefit from the technological opportunities available to open economies is still a puzzle of the debate on globalisation.

This paper explores the role of a few different channels for importing technologies and their impact on export performance. Imported technologies are expected to influence export performance either by making exporters more cost competitive and reduce export prices or by favouring their move to higher quality and value added products. Here we focus on the process of vertical differentiation, and we use export price indices as a measure of the quality of exported products. Although we control for different sources of imported inputs, we are specifically concerned with the impact of the technologies embodied in imported production machines.1 We provide a cursory review of the literature, but the focus of this paper is empirical.

The study is set in the context of the process of economic integration between the European Union (EU) and its neighbouring developing countries which has greatly increased in the last two decades. Under the umbrella of the Europe Agreement, Central and Eastern European Countries (CEECs) have moved from quasi-autarky to quasi-free trade and some of them will enter the EU in the near future. Turkey has implemented very liberal policies in the Eighties and a Custom Union with the EU was finalised in 1995. Finally, many of the Southern Mediterranean Countries (SMCs) have negotiated or are negotiating reciprocal free trade agreements with Europe, under the Euro Mediterranean Agreement. Whereas the restructuring of trade for the EU regional agreements with neighbouring developing countries has been widely studied (Landesmann and Szekely, 1995; CEPR, 1992; Faini and Portes, 1995; Dijankov and Hoekman, 1996), changes in technological flows have rarely been investigated. The availability of three different patterns of liberalisation renders the EU-LDC’s regional integration process particularly suitable and rich for the purpose of our analysis. As we will show below, these patterns have important effects on the impact of imported technologies on trade performance.

The empirical analysis we carry out focuses on the textile industry. Textiles are a major export industry for all the countries considered and it has been heavily affected by trade liberalisation. Textile machines can be easily linked to the products they produce and classified according to the skills necessary to operate them. Finally, foreign investors had a relatively prominent role in this industry.

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1 Embodied technology is measured by an index of technological complexity of the machines imported based on the minimum skills required to operate such machines. This methodology was developed in (Barba Navaretti et al., 2000).
This paper is related to the now quite broad empirical literature estimating the impact of foreign technologies on economic performance (see Barba Navaretti et al., 2000 for a review), starting from the seminal work of Coe and Helpman (1995). However, no other contribution has linked embodied technology to export performance. The nearest contributions are Dijankov and Hoekman (1996, 1997), who examined the role of imported technologies on the export performance of a sample of Central and Eastern European countries as measured by revealed comparative advantage (RCA), working on panels of local companies. Another related contribution is Mody and Yilmaz (2001), who look at the impact of imported equipment of countries’ export competitiveness, using an aggregate export price index. Both studies find that imported inputs enhance export competitiveness, but none of them looks at embodied technologies and at vertical differentiation. The argument of our contribution is quite trivial, but nonetheless it was never empirically proven: it is not just importing that matters but what countries do actually import. On the export side, looking at quality ladders is important to understand how and whether more sophisticated inputs also lead to product upgrading rather than mere reductions in production costs.

The paper finds that imported technologies do indeed have an effect on the quality upgrading of the exported products of our sample countries. It is organised as follows. Section 2 discusses the literature on imported technologies and economic performance and discusses the novelty of this paper. Section 3 discusses the data and the main descriptive facts. Section 4 develops an econometric analysis and Section 4 concludes.

2. Background

2.1. A review of the literature

The theoretical literature on endogenous growth highlights two alternative paths through which trade affects technological development. The first one is the way in which trade affects the pattern of specialisation of a given country. Trade will induce technological upgrading if opening up countries face a higher incentive to specialise in high tech products than in autarky (Krugman, 1987; Stokey, 1988; 1991; Young, 1991). In fact, learning and technological upgrading is faster if countries specialise in goods with higher learning potential, both in terms of learning by doing and of deliberate learning investments. Goods with higher learning potential are generally more technologically sophisticated from the viewpoint of production technology, product quality or product varieties.

The second path is new potential sources of technological inputs becoming available under free trade. Some of these technological inputs are deliberately purchased (new machines, foreign investments, skilled personnel) and others are acquired through spillovers, by trading with more technologically advanced partners, by gathering information in foreign markets, by learning from sophisticated imported goods. Of course, these two strings are intertwined, in that the easier and the cheaper the imported technological inputs the more likely are countries to specialise in high tech products.

Rivera-Batiz and Romer (1991) and Grossman and Helpman (1991) analyse the relationship between international flows of technology and endogenous growth with symmetric and asymmetric countries, respectively. Both contributions provide strong theoretical backing to the hypothesis that inflows of technology positively affect growth. This result is supported by empirical findings in the seminal work by Coe and Helpman (1995) and for developing countries by Coe et al. (1997). These papers examine whether aggregate trade flows serve as channels for the transmission of R&D spillovers. Keller (2000) extends this approach by looking at sector level effects. Eaton and Kortum (2000) relate productivity differences to the quality of the capital equipment imported.

An important dimension of this issue is the link between imported technologies and export performance. There is good evidence of a positive correlation between exports and productivity at the firm level, although the causal direction of such link is still disputed (Pack, 1992; Bernard and Jensen, 1997; Clerides et al., 1998; Aw et al., 2000). Thus, an indirect way of looking at the impact of imported technologies on growth is to look at their impact on export performance.

A relevant question in this context is the role played by imported inputs in the link between export, learning and productivity growth. In other words, does learning also take place because firms, by exporting, have access to a wider range of imported interme-
diate inputs? Dijankov and Hoekman (1996, 1997) use trade data to relate imports of inputs and FDI to the export performance of the CEECs. There, export performance is measured by an index of revealed comparative advantage for 23 sectors. Different inflows of technology are taken into account: imported inputs, estimated on the basis of input–output tables, foreign direct investment, and outward processing trade (OPT), which measures the import of intermediate goods under subcontracting and through FDIs. The authors find that imported inputs are particularly significant in explaining trade performance. Mody and Yılmaz, 2001 also find evidence that imported production equipment boosts aggregate export competitiveness of export oriented developing countries.

2.2. What is new in this paper

This paper is a first attempt to relate specifically import of technology to the quality of exported products at the sector level. Its main contribution is to provide a new empirical approach on how to relate imported technologies and the technological upgrading of exports. Anyway, the empirical analysis is inspired by two important theoretical features concerning the process of international technology diffusion.

The first one is that it acknowledges the importance of embodied technologies and focuses on imports of capital goods (see Salter, 1960 for an early discussion on the importance of embodied technologies and vintage capital). Earlier contributions assume that the international diffusion of technology takes place as an externality of trade, whatever trade is made of (Coe and Helpman, 1995; Coe et al., 1997; Keller, 1998; Dijankov and Hoekman, 1996, 1997; Mody and Yılmaz, 2001). To our knowledge, only Eaton and Kortum (2001) relate differences in aggregate real GDP per capita to the quality of imported inputs for a sample of 34 countries.

We believe it is important to look at the technology embodied in machines. The types of machines imported from any given country will differ. The import of the same total value of machines from different countries has a different effect on economic performance and growth if the bundles of imported machines also differ across countries. High tech machines may generate more growth simply because they are more efficient or they induce more efficient learning processes, not necessarily because they convey positive externalities from the country producing such machines.

The second important issue is that we acknowledge that the choice of machines and the effect that machines have on export performance are jointly determined. If a firm in a given country chooses a machine it is because it expects such machine to increase its productivity or the quality of its exports in the future. Therefore, when estimating the effects of machines on the quality of exported products we will recognize the potential endogeneity of this link and apply instrumental variable techniques to deal with it.

Our exercise is similar to Dijankov and Hoekman (1996, 1997), but it is more focused on the learning process enticed in the imported technologies-export performance link. We use a measure of export performance which is related to the process of technological learning: the unit value of the exported products, as a proxy for quality (Aw and Roberts, 1986). Dijankov and Hoekman use RCA as their measure of export performance. But RCA is an index of the ability of the exporters to stay in the market and increase their market share and not of technological upgrading. A high RCA can be achieved with low skills and poor quality products. Product quality is basically an ex-post index of the technological skills of exporting producers in our sample country. It indicates the ability to achieve a given technical level, even though the performance in terms of RCA could be negative.

Mody and Yılmaz find that imported equipment boosts export competitiveness by raising efficiency and reducing export prices. This outcome is also possible and the empirical evidence below will show whether prices decline (because an efficiency effect prevails) or rise (because a quality effect prevails). However, their price measure is aggregate and hides product specific patterns which could go in both directions. Here, we use product specific data for the textile sector.

3. Empirical analysis: policy background, data and description

3.1. The sample

Sample countries are in CEECs and in the Southern Mediterranean (SMCs). The former includes Bul-
garia, Hungary, Czechoslovakia (for consistency we have pooled together the Czech and Slovak republics after 1992), Poland, Slovenia and Croatia, while the latter is comprised of Cyprus, Israel, Morocco, Turkey, Egypt, Malta, Tunisia, and Syria. Israel is certainly not a developing country, and its income per capita is much closer to the average EU one than for the other sample countries. Still, it is important to include it in the sample, as it provides a useful benchmark.

We can broadly classify these countries into three groups according to the evolution of their trade policy regime: Turkey, which is an early liberaliser with a custom union with the EU, the CEECs which have virtually moved to a free trade regime after 1989 and the remaining SMCs which are liberalising at a very slow pace. We focus on the period between 1996 and 1998.

The empirical analysis on the three groups of countries focuses on the textile industry. Textiles are a major export industry for all the countries considered and have been drastically affected by trade liberalisation and particularly by the loosening of the multifibre arrangement (MFA). Imported inflows of technology had a major role in the industry: a large share of European foreign investments in neighbouring developing countries is in textiles and clothing. Moreover, European firms in the sector are heavily redeploying their labour intensive production facilities. This process has taken place either through the setting up of subsidiaries and joint ventures (direct investments) or through arm-length production agreements with local firms. Imports of textile machines are also important.

It is also particularly convenient to focus on textiles as it is possible to link technological inflows to export performance. Textile machines are specific purpose machines which can be distinguished according to the segment of the industry which uses them. It is therefore possible to establish a link between types of machines imported and textile products exported. This would not be the case with general-purpose machines, like metalworking.

The analysis proceeds in three steps. We first discuss the process of trade integration at the regional level for the sample countries. We then provide some stylised facts on import of technologies and export performance. We devote particular attention to the construction of an index that classifies machines according to the minimum skills necessary to use them (the skill index). We then present some econometric evidence on the link between inflows of technologies and export performance.

3.2. Regional integration and trade reforms between EU, CEEs and SMCs

All the economies included in our analysis have undergone a process of trade liberalisation which has affected the structure of their trade flows to Europe. Yet, the extent and timing of trade reforms and export restructuring have not been uniform across regions. Indeed, it is possible to tell at least three different stories. The first one concerns the CEECs. Starting from 1989, these countries have practically moved from a situation of autarky under the CMEA to a situation of virtually free trade with a dramatic geographic reorientation and restructuring of their exports. The second one refers to Turkey, an early liberaliser, which has implemented a very considerable programme of trade reforms starting from the early Eighties. The third one concerns the other SMCs, which have been slow and resilient reformers.2

As for the CEECs, there is overwhelming consensus that the extent of trade reforms has been considerable; equally, trade concessions from the EU were generous. Shortly after the fall of the Berlin Wall, the extension of the Generalised System of Preferences (GSP) immediately enhanced the access of CEECs exports into Europe. The Europe Agreement, signed in 1991, by Czechoslovakia, Hungary, and Poland and in 1993 by Romania and Bulgaria, strengthened this pattern by abolishing all quantitative restrictions on industrial imports from the CEECs, as well as tariffs on over 50% of EU imports (Faini and Portes, 1995).3 Although

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2 These countries are grouped together, in that their pace of reforms has indeed been much slower than the CEECs. Still, there are considerable differences. Particularly non-oil-exporting countries like Morocco, Tunisia, Israel, and Jordan are moving much faster in the direction of free trade than the other countries in this group.

3 Sensitive products like textiles and clothing are an exception: trade concessions were made dependent upon the phasing out of the multi fibre agreement (MFA) as negotiated within the Uruguay Round. In any case MFA quotas granted to the CEECs were sufficiently loose not to be binding. Utilisation rates of MFA quotas never exceeded 65% in 1992 (Corado, 1995).
there is some debate on the effectiveness of the Europe Agreement in liberalising trade, the CEECs exports to Europe rose dramatically between 1989 and 1995: 26.3% for the Czech and Slovak republics, 19.8% for Bulgaria 18.7% for Poland and 13.7% for Hungary. This increase implied a very considerable geographic reorientation of exports: the share of exports to Europe rose from below 40 to above 70% for most of the CEECs, whereas the share of the former COMECON countries shrank dramatically. CEECs also underwent a change in specialisation of the products exported. It is now well established that the increase in exports to Europe consisted for a large part of new products, i.e. products not previously exported, even to the CMEA countries (Dijankov and Hoekman, 1996, 1997).

The second story concerns Turkey. This country has implemented extremely liberal policies already in the Eighties and it has recently decided to implement a Custom Union with Europe, applying the EU common external tariff to third countries’ imports. Liberalisation policies have drastically changed the export structure: the share of manufacturing in total exports went from 36% in 1981 to 79% in 1987. Turkey also established itself as an important exporter of textile products to Europe and its share of European imports of clothing products was 5.79% in 1994.

Finally, the picture is quite different for the other SMCs. Although some of these countries (Tunisia, Morocco, Israel, Jordan, and Egypt) have negotiated or are negotiating reciprocal free trade agreements with Europe, trade regimes have been up to now, and often still are, quite protectionist. In particular, there are high rates of effective protection, substantial dispersion of protection across industries and non-transparent implementation of trade policies. Average tariffs have declined since the mid-eighties, but they are still between 25 and 35%, whereas countries that have undergone radical liberalisation processes have now average tariffs ranging between 10 and 20%. The Euro-Mediterranean agreement is certainly likely to affect trade patterns between the undersigning SMCs and the EU, even though there are doubts that such agreement will really improve accessibility to the European market, but its impact is just starting to be visible. Up to now, the relative restrictiveness of trade regimes is reflected in the poor performance of the SMCs in terms of exports to Europe. Whereas the average yearly growth rate of exports to Europe between 1989 and 1993 has been of 18.7% for the CEECs, it was only 2.5% for the SMCs.

3.3. The construction of the skill index and stylised facts on imports of technology

The skill index measures the minimum skills necessary to use a machine efficiently. Note that we are not looking at the technology embodied in the machine (complexity in construction) but at how difficult it is to use it. We let the index take on values from 1 to 4. The higher the index, the more sophisticated the required minimum skills to use the machine. When the index is one or two, machines are basically operated by skilled or unskilled workers (skills in the hands). When it takes values 3 or 4 they require technicians and engineers (skills in the heads). For textile machines the index takes mostly values of 2 or 3. For other types of machines, not examined in this work, like metal working machines, the index takes also value 4.

The subsequent step is to classify imported textile machines according to the skill index. This can be done because EU trade statistics are highly disaggregated: at the eight digits level of the harmonised code. By sitting with engineers familiar with the industry, it was possible to assign the right index to each of the machines listed in trade statistics. As we are able to do this exercise for machines imported from the EU only, before moving any further we need to check how significant are imports of European machines on total imports of textile machines. To this end Table 1 shows the share of European machines on total machines imported by the countries listed (which are the major importers among our sample countries) in 1996. As we can see the share is never below 66%.

We can now compute an aggregate weighted average skill index for each of our sample countries and

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4 Liberalisation on agricultural products is still modest and anti-dumping and contingent protection clauses may cause uncertainty on the effective nature of the new trade regime (see CEPR, 1992).

5 This index can arise some controversy as it is sometimes argued that automated machines require very unskilled personnel at the shop floor. This is true, but the index considers the minimum skills necessary to run the machine and automated machines cannot be run without technicians and engineers.
for each year examined (1988–1996), using values of machines imported as weights:

\[ S_{i,c,t} = \frac{\sum (V_{c,j,t}S_j)}{V_{c,t}} \]  

(1)

where \( S_{i,c,t} \) is the average skill index in country \( c \) in year \( t \), \( S_j \) the skill index of machine \( i \) classified at the eight digit level, \( V_{c,j,t} \) the value of machines \( i \) imported by country \( c \) in year \( t \), and \( V_{c,t} \) the total value of textile machines imported by country \( c \) in year \( t \).

It is therefore possible to look at the time trend of total imports of textile machines and of the skill index between 1988 and 1996 (Fig. 1A and B). To make trends more stable we have computed 3 years averages for the skill index. To understand these trends it is convenient to maintain the three country groupings used in Section 2: the CEECs, Turkey and the SMCs.

As for the CEECs, it seems to have been constantly upgrading its textile technology. Finally, the index is quite stable or declining for most SMCs.

We now move beyond aggregate evidence. Textile machines can be classified into four broad categories, following the production cycle: spinning, weaving, knitting, finishing and clothing machines. Each of these group of machines have a different average skill index. Furthermore, within each of these categories there are machines which embody different technologies. Thus, when we observe a variation in the index, we cannot say whether this change has occurred because the country has changed the overall structure of the machines imported (e.g. from spinning to weaving machines) (structural effect) or the technology of machines performing the same functions (e.g. from hand looms to automated looms) (substitution effect).

To disentangle these two effects, we decompose the variation of the index between the first (1988–1992) and the last period averages (1992–1996) as follows:

\[ S_{i,c,t} - S_{i,c,t-1} = \sum_j \left[ \left( \frac{V_{c,j,t}}{V_{c,t}} - \frac{V_{c,j,t-1}}{V_{c,t}} \right) \left( S_j - S_{j-1} \right) \right] \]

\[ + \sum_j \left( \Delta V_{c,j,t} / \Delta V_{c,j,t-1} \right) \left( S_j - S_{j-1} \right) \]

\[ + \sum_j \left( \Delta V_{c,j,t} / \Delta S_j \right) \]  

(2)

In (2) the index \( t \) refers to the 1992–1996 period average, \( t-1 \) to the 1988–1992 period average, and \( t + (t - 1) \) to the 1988–1996 period average.

The two components represent the structural and the substitution effect, respectively: (i) the first one (first term of the right hand side of (2)) captures the reallocation of imports between different machines \( j \) (where \( j \) represents the five types of textile machines, which correspond to four digits in the trade statistics), i.e. the change in the share of machines of category \( j \) in total textile machines imported, weighted by the average skill index for each category over the entire time period; (ii) the second one captures the reallocation of imports within groups of similar machines (remember that the skill index is constructed for machines classified at the right digit level), i.e. the change in

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### Table 1

<table>
<thead>
<tr>
<th>Country</th>
<th>Average Index</th>
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<tbody>
<tr>
<td>Tunisia</td>
<td>77.79</td>
</tr>
<tr>
<td>Hungary</td>
<td>78.56</td>
</tr>
<tr>
<td>Poland</td>
<td>77.15</td>
</tr>
<tr>
<td>Czech Republic</td>
<td>82.53</td>
</tr>
<tr>
<td>Poland</td>
<td>77.15</td>
</tr>
<tr>
<td>Hungary</td>
<td>78.36</td>
</tr>
<tr>
<td>Tunisia</td>
<td>77.79</td>
</tr>
<tr>
<td>Turkey</td>
<td>66.30</td>
</tr>
<tr>
<td>Egypt</td>
<td>60.12</td>
</tr>
</tbody>
</table>

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*Note that in this case we use 4 years averages, whereas in (1) we used two years averages.*
Fig. 1. (A) CEECs imports from EU of textile and clothing machinery (HScode:8444–8452) and average skill index. Average 1988–1996. (B) SMCs imports from EU of textile and clothing machinery (HScode:8444–8452) and average skill index. Average 1988–1996.
Fig. 1. (Continued).
the average skill index of category $j$, weighted by the share of machines of category $j$ in total textile machines imported over the entire time period.

Fig. 2 shows how the actual index is decomposed for some of the countries in our sample. The difference between Turkey and the CEECs is rather striking. In the former there is not much structural change but a steadily upgrading of the existing machines. In the latter, in contrast, the substitution effect is negative and dramatically so for Czechoslovakia and Poland. The structural effect is larger than for Turkey but rather moderate. Whereas Turkey has been able to move up the technology ladder, the CEECs have downgraded the technology of the textile machines imported since the fall of the Berlin wall.

This result provides some support to the idea that the opening up of trade may induce countries to downgrade their technologies in the shorter term. In the case of the CEECs this may be the result of different factors. First, before the fall of the Berlin wall, these countries were importing most of their machines from other planned economies. Machines imported from the EU were few and probably just high tech ones, for which no substitute were available in the CEECs or in the Soviet Union. Second, even though there is evidence that trade flows of the CEECs before 1989 were partly reflecting their comparative advantage (Murrel, 1990), investment decision were not always based on the objective of maximizing profits, and thus the compatibility between skills, machines and product demand was not always regarded as an important issue. Consequently, a decline in the index in the years following liberalisation may reflect the substitution of low-medium tech European machines for equivalent Soviet machines and the shift to technologies more appropriate to the available mix of factors of production. Of course these conclusions are tentative, unless these trends are compared to pre-1989 ones.

The case of Turkey supports the case for longer term learning trends. Countries which have liberalised long ago gradually accumulate the skills necessary to move to more advanced technologies in the longer term. Note that also for Hungary, Rumania and the Czech republic the index stabilises after the first years of decline and then starts growing slowly again. Interestingly, the change in the skill index is dominated by the substitution effect in both groups of countries. Most of the upgrading and the downgrading takes place in those segments of the industry where our sample countries are already specialised. There is no drastic change towards new types of products.
Table 2
Textiles and apparel FDI inflows

<table>
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<tbody>
<tr>
<td>Czechoslovakia</td>
<td>45</td>
<td>63</td>
</tr>
<tr>
<td>Hungary</td>
<td>31</td>
<td>118.7</td>
</tr>
<tr>
<td>Bulgaria</td>
<td>39</td>
<td>70.1</td>
</tr>
<tr>
<td>Poland</td>
<td>62</td>
<td>11</td>
</tr>
<tr>
<td>Romania</td>
<td>–</td>
<td>2</td>
</tr>
</tbody>
</table>

The three Mediterranean countries reported in Fig. 2 are those which are most specialised in textiles, that is Tunisia, Morocco and Egypt. Theirs is an intermediate case. The skill index declined, although less dramatically than for the CEECs. In this case too the substitution effect is dominant. Indeed they have opened up to trade quite recently and later than Turkey.

Foreign investments are also an important source of technological inflow. As reported in Table 2, FDI to the CEECs in constant US dollars in textiles and clothing grew substantially in the first half of the Nineties. FDI flows to Turkey were not as large. Unfortunately, we have no sector specific data for the other SMCs.

But data on FDI capture only a small part of the involvement of European enterprises in neighbouring developing countries. A large share of the redeployment of production takes place through subcontracting or other production agreements that do not figure as FDI. An indirect way to capture these links is to look at OPT data. OPT is a custom regime under the multilayer arrangement, according to which enterprises can import processed commodities free of duty and within quota which are granted on top of the standard MFA bilateral quota. OPT are expected to capture flows of temporary trade between subcontractors and between parent companies and subsidiaries. Thus OPT, even if they are trade data, they capture trade flows resulting from production agreements between firms in the EU and in sample countries. We do not know whether these agreements imply a simple arm-length transaction or whether they are carried out between a parent-subsidiary transaction. They are an all-encompassing measure, capturing both FDI and subcontracting. There is some debate on the difference between FDI and subcontracting arrangements as vehicles for technology transfer. The main difference is that locals are directly involved in managing local production, so their opportunity and their incentive to learn is larger. But this is right for wholly owned subsidiaries. If we consider joint ventures, which are also captured by FDI data, it can be shown that they are as efficient in transferring technology as any other looser inter-firm agreement like subcontracting.

Table 3 shows the share of OPT on total trade for our three groups of countries. It compares the 1988–1992 and the 1992–1996 average shares. For all three groups of countries OPT is rather stable in the two periods and mostly concentrated in clothing, the most labour intensive stage of production. OPT is overwhelmingly important for the CEECs (more than 50% in clothing) and much less so for the other two regions.

3.4. Stylised facts on exports

As textiles are a major export industry for all the countries analysed, we would expect to observe a close link between the evolution of the structure of imported inputs and the evolution of the structure of exports of textile products. Table 4 shows that the export composition of textile products in 1988 and 1995 for the CEECs, Turkey and the SMCs, is virtually unchanged.
Table 4
Export composition of textile and clothing products (%)

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<tbody>
<tr>
<td>Spinning</td>
<td>18</td>
<td>13</td>
<td>21</td>
<td>15</td>
<td>21</td>
</tr>
<tr>
<td>Weaving</td>
<td>3</td>
<td>1</td>
<td>4</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Knitting</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Clothing</td>
<td>78</td>
<td>86</td>
<td>75</td>
<td>81</td>
<td>75</td>
</tr>
</tbody>
</table>

Table 5
Changes in specialization (simple correlation coefficients between RCAs in 1988 and 1995)

<table>
<thead>
<tr>
<th>Spinning</th>
<th>Weaving</th>
<th>Clothing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Malta</td>
<td>0.12542</td>
<td>Syria</td>
</tr>
<tr>
<td>Tunisia</td>
<td>0.14165</td>
<td>Cyprus</td>
</tr>
<tr>
<td>Hungary</td>
<td>0.18742</td>
<td>Bulgaria</td>
</tr>
<tr>
<td>Bulgaria</td>
<td>0.23552</td>
<td>Hungary</td>
</tr>
<tr>
<td>Poland</td>
<td>0.26738</td>
<td>Turkey</td>
</tr>
<tr>
<td>Czechoslovakia</td>
<td>0.32692</td>
<td>Morocco</td>
</tr>
<tr>
<td>Israel</td>
<td>0.35760</td>
<td>Poland</td>
</tr>
<tr>
<td>Morocco</td>
<td>0.44964</td>
<td>Czechoslovakia</td>
</tr>
<tr>
<td>Cyprus</td>
<td>0.48364</td>
<td>Egypt</td>
</tr>
<tr>
<td>Turkey</td>
<td>0.52062</td>
<td>Israel</td>
</tr>
<tr>
<td>Egypt</td>
<td>0.53144</td>
<td>Slovenia</td>
</tr>
<tr>
<td>Slovenia (1992–1995)</td>
<td>0.77352</td>
<td>Tunisia</td>
</tr>
<tr>
<td>Syria</td>
<td>0.90848</td>
<td>Croatia</td>
</tr>
<tr>
<td>Croatia (1992–1995)</td>
<td>0.95996</td>
<td>Malta</td>
</tr>
</tbody>
</table>

...growth rate of exports of textile products between 1988 and 1995 is 26% for the CEECs and 12% for Turkey and the SMCs, the composition of exports is and remains (even increasingly so) biased in favour of clothing products.

But if we take into account other, less aggregated indicators we can see that within the four product categories considered there has been a lot of change. A simple indicator is the correlation between the Balassa index of revealed comparative advantage (RCA) in 1988 and 1995: the closer the correlation ratio to 1, the smaller the change in export specialisation. Table 5 computes this indicator at the four-digit level for three of our four subsectors composing the textile industry. As we can see, for many of the countries in the sample the change has been quite considerable, particularly in the upstream subsectors, spinning and weaving.

Change is lower in the clothing sector which has traditionally been the major export subsector.

...growth rate of exports of textile products between 1988 and 1995 is 26% for the CEECs and 12% for Turkey and the SMCs, the composition of exports is and remains (even increasingly so) biased in favour of clothing products.

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Change is lower in the clothing sector which has traditionally been the major export subsector.

Thus, although we observe a relatively static composition of exports in the industry at the two-digit level, if we move to the four digit levels (looking at what happens within the subsector), we note a much less stable picture. This result is consistent with the finding, reported in the previous section, that, for many of the sample countries, the substitution effect seems to dominate the structural effect in explaining the change in the aggregate average skill index.

A final important indicator is the change in unit value of exports. Unit values can be interpreted as a proxy for product quality. An increase in unit value shows whether exporters are able to move towards products which are more sophisticated and have a high value added. It is therefore a measure of performance related to the process of technological learning. There are some methodological problems in using unit values as measures of product quality. First, as discussed by Aw and Roberts (1986), changes in unit values for...
Table 6  
Average unit value index of export to the EU

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Spinning</td>
<td>0.71</td>
<td>0.96</td>
<td>1.23</td>
<td>1.19</td>
<td>0.92</td>
<td>1.05</td>
</tr>
<tr>
<td>Weaving</td>
<td>0.68</td>
<td>0.69</td>
<td>0.58</td>
<td>0.69</td>
<td>1.50</td>
<td>1.27</td>
</tr>
<tr>
<td>Knitting</td>
<td>0.66</td>
<td>0.99</td>
<td>0.70</td>
<td>1.07</td>
<td>0.63</td>
<td>0.77</td>
</tr>
<tr>
<td>Clothing</td>
<td>1.02</td>
<td>1.19</td>
<td>1.22</td>
<td>1.22</td>
<td>1.22</td>
<td>1.07</td>
</tr>
</tbody>
</table>

a given product category may reflect both changes in quality and changes in the product bundle. The problem is more serious the more aggregate the product categories. To overcome composition effects we compute Tornqvist price indices. We compute unit values at a very disaggregated level (eight digits) and aggregate them at the two digits level using fixed weights (the average period share of the eight digit categories over the two digits categories) for every year in our sample. Second, unit values may capture price changes which have little to do with product quality. This problem is of particular concern during trade liberalisation. Import prices are expected to drop because of the rise in the supply of imports. Indeed, unit values of European imports of textile and clothing products dropped since 1992. To control for the trade liberalisation effect, we therefore compute the ratio between the unit values of EU imports of product \( j \) from country \( c \) and of total EU imports of product \( j \). This works as far as we assume that the trade policy shock on prices is symmetric for all exporting countries. In this case the ratio purely reflects country specific factors. Moreover, these indices are useful if we want to make cross product comparisons. The unit value index of product \( j \) (two digit categories) exported by country \( c \) at time \( t \) is therefore given by:

\[
UVA_{c,j,t} = \frac{\sum_i (X_{c,i,t}/T_{c,i,t}) X_{c,i,AV}/X_{c,j,AV}}{\sum_i (X_{w,i,t}/T_{w,i,t}) X_{w,i,AV}/X_{w,j,AV}}
\]

(3)

where \( X \) refers to values and \( T \) to quantities (tonnes), suffix \( i \) stands for eight digit product categories, \( w \) for total EU imports and \( AV \) for period average values. Table 6 reports \( UVA_{c,j,t} \) for exports from our three groups of countries to the EU. Note that the ratios are on average higher for simpler products like clothing, that there is a generalised increase for all countries and all products between the 1988 and 1992 average and the 1992 and 1996 average, and that the CEECs have been able to catch up from initial levels which were quite lower than for the other two groups. These trends, therefore, show an upgrading of the quality of the products exported from our sample countries to Europe.

4. Empirical analysis: linking import of machines to export performance

We now relate the unit value of exports to technological inflows in order to uncover the relevance and impact of the latter upon the former. To this end we carry out a panel analysis involving 14 countries, 7 years of data (1989–1996) and four product categories (clothes, knitted products, woven fabric and yarn). We postulate the following simple linear model with fixed effects:

\[
UVA_{c,j,t} = \alpha_0 + \alpha_{c} D_c + \alpha_{j} D_j + \alpha_{t} D_t + \alpha_{1} \text{SKILL}_{c,j,t} + \alpha_{2} \text{SPE}_{c,j,t} + \alpha_{3} \text{SKILL}_{c,j,t} \cdot \text{SPE}_{c,j,t} + \alpha_{4} \text{OPT}_{c,j,t} + \varepsilon_{c,j,t}
\]

(4)

Variables subscripts refer to the characteristics of sector \( j \) whose products are produced by using machines of category \( j \) (yarns with spinning machines, knitted products with knitting machines, woven products with textile and finishing machines and clothing products with clothing machines), to country \( c \) and to year \( t \). The model relates the unit value of exports of a product \( UVA \) to the average skill index of machines used

\footnotesize{Note that we have five categories of textile machines and four categories of textile products. This is so because finishing is a further stage of the textile process (after weaving), but we cannot distinguish the finishing stage at the product level, i.e. the same product (woven textile) is produced by both textile and finishing stages.}
for that product (SKILL), to exports under OPT and to a measure of relative comparative advantage of the country in product j (SPE). The SKILL and the SPE variables enter the model both individually and interacted with each other. Table 7 illustrates the definition of these variables in details.

In (4) we specify two measures of technological inflows: the complexity of the machines imported and the share of outward processing trade exports over total exports of product j from country c at time t (source COMEXT and our index).

\[ \text{OPT}_{c,j,t} = \text{XOPT}_{c,j,t}/\text{X}_{c,j,t} \]

\[ \text{SPE}_{c,j} = (\text{X}_{c,j}/\text{X}_{c})/\text{V} \]

\[ \text{SKILL}_{c,j} = \Sigma \text{V}_{c,i,j,t} \]

Table 7 illustrates the definition of these variables in details.

<table>
<thead>
<tr>
<th>Definitions and sources of variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \text{UV}<em>{c,j,t} = \text{X}</em>{c,j,t}/\text{X}_{c,j,t} ) is the unit value of exports of product j from country c to the EU at time t over unit value of world exports of product j to the EU. Unit values of product categories j are constructed as weighted averages of unit values of the eight digits product categories i contained in j at time t, with period average (AV) fixed product weights (source COMEXT)</td>
</tr>
<tr>
<td>( \text{SKILL}<em>{c,j} = \Sigma \text{V}</em>{c,i,j,t} ) is the average skill index of machines used for the production of j imported by country c at time t (source COMEXT and our index)</td>
</tr>
<tr>
<td>( \text{SPE}<em>{c,j} = (\text{X}</em>{c,j}/\text{X}_{c})/\text{V} ) is the Balassa index of revealed comparative advantage for country c in product j, average 1988–1996 (source COMEXT)</td>
</tr>
<tr>
<td>( \text{OPT}<em>{c,j,t} = \text{XOPT}</em>{c,j,t}/\text{X}_{c,j,t} ) is the share of exports under outward processing trade over total exports of product j from country c at time t (source COMEXT)</td>
</tr>
<tr>
<td>( D_t ) is a country dummy equal to 1 for country c and 0 otherwise</td>
</tr>
<tr>
<td>( D_j ) is a sector dummy equal to 1 for sector j and 0 otherwise</td>
</tr>
<tr>
<td>( D_{i,t} ) is a time dummy equal to 1 for time t and 0 otherwise</td>
</tr>
<tr>
<td>( \epsilon_{c,j,t} ) is a disturbance error term</td>
</tr>
</tbody>
</table>

We allow for three sources of heterogeneity in our model, related to different sectors, countries and time periods. We control for their effect on the dependent variable by including in the specification appropriate dummy variables, respectively, denoted by \( D_j \), \( D_c \), and \( D_t \).

We also recognize the likely endogeneity of our measures of technological inflows. The choice of a given technology depends on the expected performance such technology will generate. In the context of our paper firms choose high tech machines if they know that they can use such machines to produce high quality products. This problem is common to all studies which look at the link between imports of technology and economic performance. In order to correct for the correlation between those explanatory variables and the disturbance term, which may also be induced by measurement errors, we instrument out our regressors using a constant, the dummy variables, and the first lag of the model regressors.\(^9\)

Given the specific sectoral context of our empirical investigation and the countries involved, finding exogenous, rather than predetermined, instruments is extremely difficult if not impossible. After instrumenting we use a standard least squares dummy variable estimation method.

\(^9\) Results are also robust when we use the second lag of the model regressor as instruments.
In Table 8 we report results for three different regressions. In the first column results are presented for all the countries in the sample. The effects of unmeasured country specific factors ought to be captured by country dummies. However, the same factors in principle may also affect the slope of the coefficients. Therefore we also divide the sample in groups, on the basis of their pattern of trade liberalisation, and distinguish between SMCs—excluding Turkey—(column 2), and CEECs (column 4). As discussed in Section 2, the case of Turkey stands in isolation if compared to the other two country groupings. However, if we run a pseudo-F-test (not reported) to check for the possibility of pooling Turkey with the other SMCs we find that the two samples can be pooled together without loss of information. We therefore also run a pooled regression whose results are reported in column 3. We include country dummies also in the regressions for the country subsamples. This would have not been necessary had the division in groups been sufficient to eliminate the effect of country specific factors on the intercept. A pseudo-$F$-test (not reported) on the joint significance of country dummies enables us to reject the hypothesis for SMCs, but not for the CEECs. A similar $F$-test designed to ascertain the impact of sector specific effects on unit values not captured by the explanatory variables rejects the hypothesis of no impact in all cases.

<table>
<thead>
<tr>
<th>Explanatory variables</th>
<th>All sample</th>
<th>SMCs</th>
<th>SMCs + Turkey</th>
<th>CEECs</th>
</tr>
</thead>
<tbody>
<tr>
<td>SKILLc,j,t</td>
<td>0.131 (2.02)**</td>
<td>0.027 (5.597)***</td>
<td>0.06 (2.66)**</td>
<td>0.29 (1.09)</td>
</tr>
<tr>
<td>SPEc,j,t</td>
<td>0.314 (1.544)</td>
<td>0.947 (3.067)***</td>
<td>0.472 (1.8)*</td>
<td>0.695 (0.798)</td>
</tr>
<tr>
<td>SKILLc,j,t SPEc,j,t</td>
<td>-0.159 (-1.721)*</td>
<td>-0.45 (-3.546)***</td>
<td>-0.232 (-1.97)**</td>
<td>-0.293 (-0.718)</td>
</tr>
<tr>
<td>OPc,t</td>
<td>0.352 (2.53)***</td>
<td>-1.256 (-0.926)</td>
<td>-1.12 (-0.986)</td>
<td>0.719 (2.047)**</td>
</tr>
<tr>
<td>Spinning</td>
<td>0.258 (4.9)**</td>
<td>0.475 (3.867)***</td>
<td>0.394 (4.798)***</td>
<td>0.1 (1.3)</td>
</tr>
<tr>
<td>Weaving</td>
<td>-0.066 (-1.336)</td>
<td>-0.069 (-0.877)</td>
<td>0.012 (0.17)</td>
<td>-0.093 (-0.906)</td>
</tr>
<tr>
<td>Clothing</td>
<td>0.329 (5.37)***</td>
<td>0.583 (8.741)***</td>
<td>0.5 (0.87)***</td>
<td>-0.133 (-0.792)</td>
</tr>
<tr>
<td>BUL</td>
<td>-0.68 (-10.2)**</td>
<td>-0.537 (-3.478)***</td>
<td>-0.53 (-4.06)***</td>
<td>-0.156 (-1.573)</td>
</tr>
<tr>
<td>CYP</td>
<td>-0.412 (-5.58)***</td>
<td>-0.819 (-4.517)***</td>
<td>0.08 (-0.91)</td>
<td>0.695 (1.09)</td>
</tr>
<tr>
<td>CZECH</td>
<td>-0.634 (-2.73)***</td>
<td>-0.167 (-1.957)***</td>
<td>0.695 (1.09)</td>
<td>-0.156 (-1.573)</td>
</tr>
<tr>
<td>EGY</td>
<td>-0.655 (-7.37)***</td>
<td>-0.819 (-4.517)***</td>
<td>0.08 (-0.91)</td>
<td>0.695 (1.09)</td>
</tr>
<tr>
<td>HUN</td>
<td>-0.511 (-3.85)</td>
<td>-0.328 (1.75)*</td>
<td>-0.308 (-1.99)**</td>
<td>0.695 (1.09)</td>
</tr>
<tr>
<td>ISR</td>
<td>-0.168 (-2.019)**</td>
<td>-0.117 (-1.087)</td>
<td>-0.123 (-1.255)</td>
<td>0.695 (1.09)</td>
</tr>
<tr>
<td>MOR</td>
<td>-0.102 (-1.533)</td>
<td>-0.117 (-1.087)</td>
<td>-0.123 (-1.255)</td>
<td>0.695 (1.09)</td>
</tr>
<tr>
<td>POL</td>
<td>-0.546 (-7.03)***</td>
<td>-1.201 (2.29)</td>
<td>-1.201 (2.29)</td>
<td>0.695 (1.09)</td>
</tr>
<tr>
<td>ROM</td>
<td>-0.425 (-4.954)***</td>
<td>-0.819 (-4.517)***</td>
<td>0.08 (-0.91)</td>
<td>0.695 (1.09)</td>
</tr>
<tr>
<td>SYR</td>
<td>-0.862 (-11.41)***</td>
<td>-1.13 (-6.159)***</td>
<td>-1.051 (-6.742)***</td>
<td>0.695 (1.09)</td>
</tr>
<tr>
<td>TUN</td>
<td>0.661 (0.814)</td>
<td>-0.039 (-0.346)</td>
<td>-0.536 (-0.557)</td>
<td>0.695 (1.09)</td>
</tr>
<tr>
<td>TUR</td>
<td>-0.112 (-1.214)</td>
<td>-0.222 (-1.269)</td>
<td>-0.222 (-1.269)</td>
<td>0.695 (1.09)</td>
</tr>
<tr>
<td>1990</td>
<td>0.057 (0.666)</td>
<td>-0.04 (-0.44)</td>
<td>0.06 (0.658)</td>
<td>0.065 (0.817)</td>
</tr>
<tr>
<td>1991</td>
<td>0.136 (0.021)</td>
<td>-0.07 (-0.782)</td>
<td>-0.471 (-0.547)</td>
<td>0.042 (0.55)</td>
</tr>
<tr>
<td>1992</td>
<td>0.055 (0.004)</td>
<td>-0.02 (-0.259)</td>
<td>0.219 (0.027)</td>
<td>0.082 (0.86)</td>
</tr>
<tr>
<td>1993</td>
<td>0.131 (0.202)***</td>
<td>0.066 (0.735)</td>
<td>0.084 (0.029)</td>
<td>0.141 (1.473)</td>
</tr>
<tr>
<td>1994</td>
<td>0.066 (1.13)**</td>
<td>0.149 (0.17)</td>
<td>0.465 (0.06)</td>
<td>0.105 (1.281)</td>
</tr>
<tr>
<td>1995</td>
<td>0.17 (0.64)**</td>
<td>0.144 (1.51)</td>
<td>0.128 (1.59)</td>
<td>0.209 (2.567)**</td>
</tr>
<tr>
<td>1996</td>
<td>0.176 (2.98)**</td>
<td>0.127 (1.43)</td>
<td>0.115 (1.374)</td>
<td>0.215 (2.2)**</td>
</tr>
<tr>
<td>Intercept</td>
<td>0.498 (1.64)</td>
<td>-0.734 (-1.4)</td>
<td>-0.06 (-0.13)</td>
<td>0.018 (0.031)</td>
</tr>
<tr>
<td>No. of observations</td>
<td>574</td>
<td>190</td>
<td>222</td>
<td>152</td>
</tr>
<tr>
<td>Adjusted $R^2$</td>
<td>0.5</td>
<td>0.623</td>
<td>0.5</td>
<td>0.442</td>
</tr>
</tbody>
</table>

Notes: (i) $t$-statistics in brackets computed from heteroskedastic robust standard errors. (ii) One, two, and three asterisks denote 90, 95, and 99% significance, respectively. (iii) The instrument list includes a constant, industry, country and time dummies, and the first lag of the regressors. 

Dependent variable: UA. **
The overall performance of the model is satisfactory if judged by the $R^2$ and by the significance of individual regressors. Note that the implied standard errors are robust to heteroskedasticity. In addition, instruments appear to be relevant if judged on the basis of first stage $R^2$. Finally, we checked for but failed to detect any sign of (first-order) serial correlation. On these premises we proceed to consider more closely the empirical role of the explanatory variables.

Consider, first, the case with all the countries in column 1. Here both the indicators of technological inflows (SKILL and OPT) positively and significantly affect unit values of export. $SPE$ has a positive sign but it is not significant. Yet, the interacted variable has a negative and statistically significant impact. Remember that the interacted variable captures the impact of imported machinery on unit values for the specialised countries (i.e. countries with a comparative advantage in product $j$).

If we postulate that specialised countries buy on average more sophisticated machines, the negative sign could reflect decreasing returns in the relationship between the sophistication of the imported machines and product quality. Outward processing trade positively influences unit values. Thus, when export flows are driven by foreign firms, product quality is higher. The whole sample, however, combines completely different patterns emerging in specific country groups. This is quite clear if we look at the results reported in columns 2–4. In the case of CEECs the only variable which has a statistically discernible role in our model is OPT. Thus inflows of machines do not seem to have an impact on product quality per se, independently from the role of foreign investors. In contrast, in SMCs, product upgrading appears to be driven essentially by inflows of machinery. This result is not too surprising, given the role of foreign firms in formerly planned economies. Indeed, there is now solid evidence that the CEECs have been playing the most important role among Europe’s neighbouring cheap labour countries as the off-shore basis of many European producers. Moreover, the sudden and dramatic shift in markets and products in Eastern Europe could probably have not taken place without a heavy involvement of foreign producers. The case for the SMCs is different. Indigenous learning through imported machines appears to have played a more important role in this case. OPT is never significant. This sample includes traditional producers of textile products, like Egypt, Tunisia and Morocco. Changes in unit values reflect a longer term pattern of product upgrading, where foreign producers play a minor role. Note that when we pool Turkey together with the other SMCs the variance explained by our model, the significance and the size of the coefficients of the explanatory variables all decline. Turkey is indeed the champion of our Southern Mediterranean sample, and probably relies less on imported technologies for product upgrading than the other countries sampled in our analysis.

5. Conclusions

In this paper we have examined the link between imported technologies and export performance. The analysis has been set in the background of the process of regional integration between the EU and its neighbouring developing countries and has focused on the textile industry. The underlying question to which we attempted to answer is whether trade integration fosters or dampens learning and technological upgrading.

Since the turn of the decade trade between the EU, the Central and Eastern European Countries (CEECs), Turkey and most of the Southern Mediterranean Countries (SMCs) was substantially liberalised. We find that unit values of exports from these countries to the EU rose steadily between 1988 and 1996, relative to the unit values of world exports to Europe. If increased unit values satisfactorily proxy increases in product quality, trade integration fostered product upgrading and technological learning in the sample countries. In this paper we have investigated whether imported technologies and other sources of knowledge have some bearing on this pattern.

Technological inflows are captured by the degree of involvement of European companies in trade (outward processing trade) and by the skill content of the machines imported. These variables appear to have a statistically discernible and positive role on product.
quality for all the countries analysed. Imported ma-
chines are the most important determinant of product
upgrading in the SMCs, while foreign firms play a
dominant role in the CEECs.

The pattern of trade liberalisation and specialisa-
tion of the two groups of countries has been quite
different. In the CEECs liberalisation has been sud-
den and drastic. Trade patterns changed considerably,
both in terms of products and market destination. For-
eign companies have therefore played a crucial role in
this path of transition. In the SMCs things have been
much smoother. Trade is being liberalised more grad-
ually and many of them have a strong specialisation
in textiles. Although based on imported technologies,
upgrading and learning appears to be rooted in the
local production structure.

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