

# TRADE, FDI AND SKILL-BIASED TECHNOLOGICAL CHANGE: THE CASE OF TURKEY

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## Extended abstract:

This paper examines the relationship between trade openness, technology adoption and the relative demand for skilled labour in the Turkish manufacturing sector.

The motivation of this work originates from the observation of a significant increase of the relative demand for skilled labour during a period of rapid and thorough trade liberalization.

From the theoretical point of view, the increasing firms' international exposure may lead to different outcomes in terms of labour demand. On the one hand, from the traditional trade theory - expressed in the Heckscher-Ohlin's model and the Stolper-Samuelson theorem (HOSS) - we may expect a relative decrease in the demand for skilled labour. In fact, according to this main building-block of the theory of international trade, openness should benefit a country's relatively abundant factor, since trade specialisation will favour sectors intensive in the abundant factor. Taking into account that Turkey— when compared with the world economy – is relatively abundant in unskilled labour and so have a comparative advantage in this production factor, openness should increase the demand of unskilled workers and raise their relative wages. On the other hand, if the HOSS assumption of homogeneous production functions<sup>1</sup> among countries is relaxed, then international openness may facilitate technology diffusion from developed and more advanced countries. Imports, exports and foreign direct investments (FDI) may in fact act as a channel of technological upgrading and shift the production towards more skill-intensive technologies. In other words, trade and FDI may induce and foster the skill-biased technological change (SBTC) at the firm level.

This paper contributes to this debate presenting new empirical evidence on the Turkish manufacturing sector, making use of a detailed firm-level database (*Annual*

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<sup>1</sup> That is, the same technology and absence of scale economies.

*Manufacturing Industry Statistic*) which covers more than 90 percent of all manufacturing firms over the 1980-2001 period.

Our data show a contemporaneous increase in both relative employment and relative wages, suggesting that in the aftermath of the rapid and thorough liberalization process, the relative demand for skilled labour did in fact increase. We decompose the aggregate demand shift into the within- and between-sectors components (disaggregated at four-digit level) and we find that that the aggregate shift was mainly due to within-sector skill upgrading, which provides a preliminary evidence of the relevance of the SBTC hypothesis. Technological change is in fact supposed to cause a shift within each industry as opposed to other structural changes – like trade-induced specialization or consumption demand shifts – which should cause a reallocation of demand between industries. Interestingly, the within-industry shift appear to be larger during the periods of more rapid trade liberalization, which opens the way to the hypothesis that trade openness may interact with technological upgrading, causing the adoption of more skill intensive technologies at both sectoral and firm level. This hypothesis is in line with the growing literature that has stressed the key role of trade openness in the international technology diffusion.

We then test more properly this idea through an econometric analysis at both sector and firm level. Indeed, we estimated a cost share equation – derived from a *translog* cost function – whereby changes in the wage bill share of skilled workers in a given sector/plant are related to observable measures of international exposure and technology adoption.

In the sector level analysis we aggregate firm-level data at four-digit ISIC industry level and match them with data on international trade, in order to evaluate the impact of both import and export flows in shaping the relative demand for skills within each industry. We adopt a dynamic approach and estimate the equation with a GMM System estimator. The results show that the sectors that most raised their imports have also experienced a higher increase in the labour cost share of skilled workers. This finding is consistent with the idea that imports imply a transfer of new technologies that are more skill-intensive than those previously in use in domestic markets, thus leading to a higher demand for skilled labour. This idea is reinforced by the finding that only imports from industrialised countries - where the potential for innovation diffusion comes from - enter the regression significantly. Instead, sectoral export orientation is negatively correlated

with demand for skills, which is consistent with the HOSS predictions, given Turkey's comparative advantages in the production of unskilled-labour-intensive goods. Indeed, export-oriented policies seem to have caused a within-industry shift towards less skill-intensive firms who gained higher market shares. To sum up, the sectoral results are consistent with both the HOSS indications and the technology-based explanations. On the one hand, trade openness – expressed as export intensification – tends to shift the production toward less skill-intensive firms. On the other hand, import penetration facilitates the adoption of new technologies embodied in capital and intermediate goods, thus shifting the production toward more skill-intensive technologies.

Finally, we analyse the determinants of relative demand for skilled labour at the firm-level. Using the same methodology based on the estimation of a labour cost share equation, we test the impact of a set of variables that are potential sources of skill-biased effect. From the regression results it emerged that technology related variables (R&D expenditures and technological transfer - proxied by a dummy variable indicating if a firm got the right to use a foreign technology by a license agreement and paying a royalty) are positive and significantly related to skill upgrading at firm level. This result supports the SBTC argument also in the case of a middle income country. This is an interesting result in itself because most papers on SBTC focus on developed countries and the evidence for developing countries is scant. Moreover, we test the impact of variables reflecting firms' international engagement (a dummy variable for exporter firms and a dummy variable for firms with a share of foreign ownership). Both turned out to be positive and significant, emphasizing the importance of firms' international exposure in the process of technology adoption and upgrading with the related consequences in terms of demand for skills.

All these results are robust to different econometric specifications and suggest that the interplays between trade openness and technology adoption have played a key role in shifting the demand for labour towards more skilled workers within each industry and firm.