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Trade, import competition and productivity growth in the food industry ☆

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ABSTRACT

Melitz and Ottaviano's (2008) firm-heterogeneity model predicts that trade liberalization induces a selection process from low to high productivity firms, which translates to an industry productivity growth. A similar firms' selection effect is induced by market size. In this paper, these predictions are tested across 25 European countries and 9 food industries, over the 1995–2008 period. Using different dynamic panel estimators we find strong support for the model predictions, namely that an increase in import penetration is systematically positively related to productivity growth. The results are robust to measurement issues in productivity, controlling for market size, country and sector heterogeneities, and for the endogeneity of import competition. Interestingly, this positive relationship is almost exclusively driven by competition in final products coming from developed (especially EU-15) countries suggesting that EU food imports are closer substitutes for domestic production than non-EU imports. These results have some potentially interesting policy implications.

Introduction

In the last decades European food market has experienced an impressive growth in import competition, coming primarily from multilateral and bilateral trade agreements, as well as from the enlargement to the Central and East European countries. The ratio of food imports to apparent consumption increased substantially, passing from 16% in 1995 to 42% in 2008. Yet, in the same period several EU countries have experienced a total factor productivity (TFP) growth close to zero, or even negative.[1] Thus the key question that arises is to what extent the huge increase in the exposure of European food firms to international trade is at the heart of this slowdown in productivity growth.

In fact, despite the negative perception of the European citizens towards globalization, there is theoretical (e.g Krugman, 1980; Melitz, 2003; Melitz and Ottaviano, 2008) and empirical evidence, at both industry (e.g. Trefler, 2004; Chen et al., 2009) and firm level (e.g. Pavcnik, 2002; Aghion et al., 2006) for a positive relationship between trade openness and industry productivity growth.[2] However, with the exception of Ruan and Gopinath (2008), who investigated the effect of trade liberalization on the across countries reallocation of production in five food industries, no paper to date have had an explicit focus on the food sector.[3] This is quite surprising, as food industry represents for several reasons an ideal case study for testing the relationship between trade openness and productivity growth. This is because, although in the last decades this sector has experienced a process of trade liberalization, it still remains one of the most protected manufacturing industry in developed countries, as an effect of both border measures, like tariffs and non-tariff barriers, and different market regulations (Olper and Raimondi, 2009). Therefore, understanding the relation between

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[1] Considering EU-15 members and the time period covered by this analysis (1995–2008), seven out of fifteen EU members displayed a negative annual TFP growth rate in the food industry. These seven countries and the respective yearly average TFP growth rate (in brackets), are the following: Germany (−1.7%), Denmark (−0.61%), Spain (−0.7%), Greece (−3.8%), Italy (−0.58%), Luxembourg (−4.6%) and Netherlands (−0.89). For an in-depth discussion about the source of the EU productivity growth slowdown in manufacturing, see O'Mahony and Timmer (2009).

[2] There exists also an important literature showing that the response of productivity to trade liberalization could be more ambiguous, especially for developing countries (see Goldberg and Pavcnik, 2007 for a review).

[3] However, there exist a large literature investigating the trade (and welfare) effect of tariff reduction using both partial and general equilibrium model, as well as the gravity equation (see, e.g., Raimondi and Olper, 2011; Philippidis et al., 2013).

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import competition and productivity is potentially rich in policy implications.

Starting from the firm heterogeneity model of Melitz and Ottaviano (2008), the present paper tests the predicted pro-competitive effect of trade liberalization on the within industry resources reallocation in the EU food sector. More specifically, the aim of the paper is to investigate the extent to which the significant growth of import penetration in the EU matters for the food industries' subsequent productivity growth, and whether this impact changes when considering different origins of imports. We work with an unbalanced panel of more than 1600 observations across 25 European countries and 9 food industries at 3 digit level. To account for the difficulty to consistently estimate the productivity growth at disaggregated industry level (see Rodrik, 2013), we rely on both real value added per person employed, and total factor productivity growth estimated from a Cobb–Douglass production function.

Import penetration is measured considering both imports from the world and the ones differentiated according to the following origins: EU-15, New Member States (NMS), OECD non-EU and the BRIC countries. The idea is to investigate whether EU imports exert a more significant competitive impact than non-EU imports, i.e. they constitute closer substitutes for domestic production. To overcome the well-known endogeneity issue between import penetration and productivity, and to take care of the growth dynamics, our econometric strategy relies on dynamic panel data approaches, using both fixed effects and the system generalized method of moments (GMM) estimator.

The main results show that a growth in import penetration is systematically positively associated with a growth in productivity. The results prove to be robust to measurement issues in productivity, after controlling for several observed and unobserved heterogeneities, and treating import penetration as endogenous to productivity. Interestingly, we show that this positive relationship is conditional to the origin of imports, and that it is exclusively driven by competition in final products coming from developed (especially EU-15) countries. Thus, EU food imports constitute closer substitutes for domestic production than non-EU imports. These result may have important practical policy implications.

Our paper is related to a large and growing literature on the relationship between industry and firm-level productivity growth and trade liberalization, a literature too large to be summarized here. Within this literature, our paper is close in the spirit to that of Chen et al. (2009), who find, among other things, a robust positive short run effect of trade openness on productivity growth in seven EU manufacturing industries. However, they do not find any significant difference in the pro-competitive effect of import coming from sources inside or outside the EU. A second important related paper is that of Trefler (2004), who investigates the economic effects of NAFTA on Canada at both industry and plant level. Notwithstanding the different context and policy shocks investigated here, it is remarkable that the magnitude of the effect of trade liberalization on productivity growth that we find at industry level is not far from his findings. Finally, our paper shares with that of Ruan and Gopinath (2008) the sector of investigation – the food industry – and the conceptual framework – a trade model with firm-heterogeneity. However, we consider different countries, and more industries observed for a long time period. More importantly, we derive predictions from a slightly different theoretical model (Melitz and Ottaviano, 2008 vs. Melitz, 2003) and, as a consequence, we use a totally different empirical approach. Yet, both studies find a remarkable support for the idea that firms' exposure to international trade matters for industry average productivity growth and, thus, contributes to the income and welfare of an economy.

The remainder of the paper is organized as follows. In the next section we theoretically motivate our empirical exercise, by relying on the predictions from international trade models with heterogeneous firms. The Section 'Econometric identification, data and measures' describes the data, the measurement issues and our identification strategy. Next the results are presented and discussed. Finally, in the 'Conclusion' we summarize the main findings and the policy implications.

Theoretical considerations and hypotheses

From a theoretical point of view, several channels might explain the existence of a positive effect of trade and trade liberalization on productivity growth (see, e.g., Altomonte et al., 2008). A growth in market competition may stimulate firms to reduce their x-inefficiencies or even lead the less productive or marginal firms to leave the market (e.g. Krugman, 1980; Melitz, 2003; Melitz and Ottaviano, 2008). Other important channels consider the increased availability of foreign intermediate inputs with lower price or higher quality (Goldberg et al., 2010; Colantone and Crinò, 2011) and their effects on technological innovation (Grossman and Helpman, 1991), as well as the effects of a greater market size due to scale economies and selection effects (Helpman and Krugman, 1985; Melitz and Ottaviano, 2008). In what follows we focus our attention on the first and the last of the above channels to motivate our empirical exercise, considering the most recent extension of the Krugman (1981) monopolistic competition trade model in presence of firms heterogeneity. More precisely, to guide our empirical analysis we sketch a simplified version of the Melitz and Ottaviano (2008) model along the line of Melitz and Trefler (2012). This is aimed at providing testable predictions for the subsequent empirical analysis and results interpretation. However, we are aware that other channels may be at the heart of a positive relationship between import competition and productivity growth. For example, the idea that competition increases efficiency and productivity, goes back at least to the Adam Smith's idea that competition works in the general interest. However, with the data in hand, we cannot properly discriminate between competitive explanations.[4]

Market size, trade and productivity in a firms heterogeneity model

On the demand side, the Melitz and Ottaviano (2008) model is based on quasi-linear preferences over a continuum of varieties indexed by i, endogenously determined. Under this setting, demand for varieties is linear in prices and, unlike the standard 'love for varieties' monopolistically competitive setup (Dixit and Stiglitz, 1977; Krugman, 1980), the price elasticity of demand depends on the number of varieties, equal to the number of firms in the sector. Variation of the number of firms (varieties) in the market is the key mechanism through which trade integration affects firm performance.

On the supply side, labor is the only factor of production.[5] In a monopolistically competitive industry, firms compete by producing different varieties of the same product, that are close substitutes. Firms differ only in their marginal costs c_i, or in their productivity $1/c_i$. Panel A of Fig. 1 represents the production quantity and the price choices for two of these firms. Every firm faces the same (residual) demand curve D, that depends on the behavior of the other firms in the market. We assume that the marginal cost (productivity) of firm 1 is lower (higher) than that of firm 2, namely $c_1 < c_2$ (or $1/$

[4] Note, moreover, that the three most cited components of TFP growth are scale economies, technical change and indeed improvements in efficiency.

[5] A model with labor as the only input factor could appear unrealistic in food processing industry, where typically raw agricultural inputs absorb an important portion of input costs. However, extending the model to considering composite factors, produces identical results (see Melitz and Redding, 2014). In the next section the implication of considering two intermediates inputs is briefly discussed.