



New imported inputs, new domestic products[☆]

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ABSTRACT

We study the relationship between new imported inputs and the introduction of new domestic products. To this purpose, we assemble a novel data set covering 25 European countries over 1995–2007 and containing information on domestic production and bilateral trade for the universe of goods. We develop a procedure to identify new imported inputs and new domestic products, while dealing with the complications raised by the yearly changes in the commodity classifications. We augment these data with information on prices and novel estimates of quality. We organize the empirical analysis around a version of the endogenous growth model with expanding variety, in which inputs are allowed to be heterogeneous in terms of quality. In line with this framework, we find three main results. First, new imported inputs have a strong positive effect on product creation in Europe. Second, they work through a combination of mechanisms, allowing countries to benefit from both wider and better sets of intermediate products. Finally, new imported inputs give a substantial boost to output growth in manufacturing.

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1. Introduction

A key message of the endogenous growth literature is that countries can sustain long-run growth by producing new and upgraded goods (see e.g. Aghion and Howitt, 2005; Gancia and Zilibotti, 2005). It has long been argued that international trade can stimulate the introduction of new products in a country, through the efficiency gains arising when producers get access to new input varieties from abroad (Rivera-Batiz and Romer, 1991; Backus et al., 1992). Despite the prominence of these models in the theoretical literature, empirical research on this issue is extremely limited. In an influential paper on India, Goldberg

et al. (2010a) have provided the first, and so far only, evidence of a positive link between new imported inputs and new domestic products.

In this paper, we use unique micro data for a large group of developed countries to provide novel evidence on the effects of new imported inputs on product creation, and to answer two important questions that remain open in the empirical literature. First, what are the mechanisms through which new imported inputs operate? And second, what are the implications of new imported inputs for growth? Our results confirm that new imported inputs are a crucial determinant of product creation. More importantly, our analysis shows that new imported inputs work through the interaction of different mechanisms, allowing countries to widen the set of available intermediates and to access superior varieties. Consistent with these results, we also find new imported inputs to be an important stimulus to output growth in manufacturing. Overall, our paper portrays a complete picture of the relationship between product creation and access to new foreign inputs. The main point we make is that new imported inputs have a pervasive effect on product creation across countries, work through a complex combination of mechanisms, and constitute an important engine of growth.

Our analysis relies on a novel data set covering 25 countries of the European Union (EU) over 1995–2007. For each country, we have information on domestic production and bilateral trade for the universe of products, at the highest possible level of disaggregation (8 digits). The first task we accomplish with these data is to identify new domestic goods and new imported inputs. This task is extremely challenging, as

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the commodity classifications are revised every year by the European authorities. We thus develop a new procedure that keeps track of all classification changes using correspondence tables, yielding a precise indication of which products and foreign inputs are new in each country every year. Introduction of new products and imports of new intermediates are relevant phenomena in the EU countries. According to our data, new products account for 5% of all goods produced domestically each year, and their introduction is responsible for 25% of the annual growth in manufacturing output. Similarly, new foreign inputs make 13% of all input varieties imported each year, and account for 20% of the annual growth in intermediates imports.

To guide our empirical analysis and provide the key insights for interpreting our results, we start by presenting a simple theoretical framework based on the benchmark version of the endogenous growth model with expanding variety (Rivera-Batiz and Romer, 1991). In this framework, new products are invented through research and development (R&D), according to a 'lab equipment' technology which implies that all factors, including intermediate inputs, are productive in research. In the model, new imported inputs widen the set of available intermediates and thereby generate a 'scale effect' that raises productivity in research. In equilibrium, this efficiency gain leads to greater product creation and faster output growth. We then present an extension of this model in which intermediate inputs are allowed to be heterogeneous in terms of quality, similar to Aghion and Howitt (1998). This more general framework delivers the additional prediction that differences in product characteristics may amplify the scale effect of new imported inputs. Specifically, the model predicts the efficiency gain from importing new inputs to be larger the lower is their quality-adjusted price. The intuition is that, in this extended model, new imported inputs not only widen the set of available intermediates, but may also change its composition toward varieties with more favorable price-quality ratios.

Having presented the theoretical framework we turn to the empirical analysis. As a starting point, we provide extensive evidence of a strong positive correlation between new imported inputs and new domestic products within countries and industries. Then, we move to instrumental variable (IV) regressions to address reverse causality. Indeed, unobserved shocks to specific industries and EU countries may lead to product creation for reasons unrelated to foreign intermediates; but once the decision to produce a new good has been made, firms may start sourcing the necessary new inputs from abroad. This would induce an upward bias in the OLS estimates. Thus, we construct an instrument capturing variation in new imported inputs not due to industry-specific shocks in the EU countries. In particular, the instrument captures variation due to changes in transportation costs, as induced by fluctuations in oil prices (Hummels, 2007; Hummels et al., forthcoming). The instrument turns out to be a strong predictor of new imported inputs, in the direction one would expect. At the same time, in the IV regressions, the coefficient on new imported inputs remains positive and highly significant. The size of this coefficient is roughly half the size of the baseline correlation estimated by OLS, suggesting that the instrument removes the upward bias induced by reverse causality. Overall, this first part of the analysis shows that new imported inputs are an important determinant of the introduction of new goods in the EU.

Next, we study the mechanisms through which new imported inputs operate. According to the model, new imported inputs stimulate product creation by generating efficiency gains, through two channels. First, they give rise to scale effects by expanding the range of available intermediates. Second, they may allow countries to access better varieties, i.e. varieties with lower quality-adjusted prices. To evaluate the empirical relevance of these two mechanisms, we need to measure the quality-adjusted price of each input variety imported into each EU country. While our data contain information on raw prices (the numerator of quality-adjusted prices), obviously we do not observe quality (the denominator) and must therefore estimate it. We do so using the methodology developed by Khandelwal (2010). As a result, we

construct an extremely detailed and widely comprehensive data set, containing time-varying quality estimates for all input varieties imported into each EU country; to the best of our knowledge, no such data set existed before. Using these estimates, we construct quality-adjusted prices and find robust evidence in favor of both mechanisms. In particular, we show that new imported inputs boost product creation even when they have the same quality-adjusted price as the existing intermediates, consistent with a pure scale effect. We also show, however, that the effect of new imported inputs is decreasing in their quality-adjusted price, consistent with the idea that new imported inputs also work by changing the composition of the inputs set toward superior varieties. Overall, this second part of the analysis suggests that new imported inputs stimulate product creation through a combination of mechanisms, allowing countries to benefit from both wider and better sets of intermediate products.

In the final part of the analysis, we discuss the implications of new imported inputs for growth, and provide suggestive evidence on the characteristics of new goods. In endogenous growth models with expanding variety—such as the model used in this paper—the introduction of new products constitutes technical progress and thus acts as the 'engine of growth' for the economy. Our evidence that new imported inputs stimulate product creation would therefore suggest that they should also have a positive impact on growth. Indeed, we do find robust evidence of such an effect in our data. In particular, we show that new imported inputs substantially increase the growth rate of manufacturing output per worker, even after accounting for other determinants of scale effects and growth studied in the literature (see in particular Backus et al., 1992). Finally, we close the paper by studying the characteristics of new goods. Consistent with existing extensions of the expanding variety model, we find new goods to be upgraded, i.e. characterized on average by higher quality and prices compared to old products.

The rest of the paper is organized as follows. Section 2 reviews the related literature. Section 3 presents the data and some stylized facts. Section 4 illustrates the theoretical framework underlying our empirical analysis, which is performed in Section 5. Finally, Section 6 concludes.

2. Related literature

Our paper speaks to different strands of empirical literature. In particular, as mentioned in the introduction, it is related to a recent work by Goldberg et al. (2010a). Exploiting India's trade liberalization as an exogenous trade shock, the authors identify a large positive effect of new foreign inputs on the number of goods produced within firms. However, they do not study the mechanisms through which new imported inputs operate, the characteristics of new goods, or the implications of new imported inputs for growth. These are the main contributions of our paper. Moreover, we depart from Goldberg et al. (2010a) also in other important directions. First, we focus on a large group of industrialized countries, as opposed to a fast-growing developing economy. By doing so we show, for the first time, that new imported inputs are a fundamental engine of product creation and growth not only in the developing world, but also in advanced economies that lie closer to the technological frontier. Second, we focus on the introduction of new products at the economy-wide level, not at the firm level. This departure is most relevant especially in developed countries such as the ones we study, since products that are new for a firm need not be new also for the economy as a whole.

Apart from Goldberg et al. (2010a), empirical evidence on the link between new imported inputs and new domestic products has been lacking. One of the main reasons has been the unavailability of detailed data on domestic production. In different contexts, domestic production has often been proxied using data on exported goods.² However,

² Examples include Feenstra et al. (1999), Broda et al. (2006), Bas and Strauss-Kahn (2011), Feng et al. (2012), and Aristei et al. (2013).

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