New Imported Inputs, New Domestic Products*

Italo Colantone†
Erasmus University Rotterdam
ERIM

Rosario Crinò‡
University of Brescia
IAE-CSIC and LdA

April 2012

Abstract

We study how new imported inputs affect the introduction of new domestic products. To this purpose, we assemble a novel data set covering 25 EU countries over 1995-2007 and containing information on domestic production and bilateral trade for the universe of products. We develop a procedure to identify new domestic goods and new imported inputs, while dealing with the complications raised by the yearly changes in the commodity classifications. Using this novel data, we first corroborate Goldberg et al.'s (2010a) finding that new imported inputs have a large positive effect on the introduction of new goods. Then, we move a step ahead and investigate the mechanisms behind this effect. To this purpose, we construct novel estimates of quality for all input varieties imported by each country. We find the effect of new imported inputs to be increasing in their quality and decreasing in their price, conditional on quality. Finally, we provide novel evidence on the characteristics of new goods. In particular, we show that new products are upgraded, as they sell at higher prices and possess higher quality than existing goods. Overall, our results suggest that new imported inputs foster the introduction of new and better products, by enabling countries to access cheaper or higher-quality intermediates from abroad.

JEL codes: F1.

Keywords: New Intermediates; New Goods; Prices; Quality; Product-Level Data.

---

*We thank Carlo Altomonte, Pablo Arocena Garro, Tibor Besedeš, Davide Castellani, Paolo Epifani, Jesús Fernández-Huertas Moraga, Rodolfo Helg, Samuele Murtinu, Paolo Naticchioni, Laura Ogliari, Enrico Pennings, Leo Sleuwaegen, Ilke Van Beveren and Maurizio Zanardi for very useful comments and discussions. We have also benefited from seminar participants at Bocconi University, the Catholic Universities of Leuven and Louvain, CEMFI, Erasmus University Rotterdam, Free University of Brussels (ULB), IAE-CSIC, Politecnico of Milan, and the Universities of Alicante, Bologna, Brescia, Milan and Nottingham, as well as from conference participants at CEI (Castellon), ETSG (Copenhagen), ITSG (Rome), JEI (Valencia), LETC (Ljubljana), SAE (Malaga), SIE (Rome), and the Zvi Griliches Research Summer Seminar (Barcelona). Rosario Crinò gratefully acknowledges financial support from the Efige project (N. 225551), funded by the European Commission under the 7th Framework Programme. The usual disclaimer applies.

†Address: Department of Applied Economics. Burgemeester Oudlaan 50, 3000 DR, Rotterdam, The Netherlands. E-mail: colantone@ese.eur.nl.

‡*Corresponding author*. Address: Department of Economics. Via S. Faustino 74/B, 25122, Brescia, Italy. E-mail: rosario.crino@eco.unibs.it.

1 Introduction

One of the key messages of the endogenous growth literature is that countries can sustain long-run growth by producing new and upgraded goods (see Aghion and Howitt, 2005, and Gancia and Zilibotti, 2005).[1] Understanding the factors behind the introduction of new and better products in a country is therefore crucial. In this paper, we emphasize the role of new imported inputs. Our focus is motivated by the following considerations. Both in developing and in developed countries, the recent upsurge of imported inputs (Feenstra, 1998, 2010; Feenstra and Hanson, 2003) has been accompanied by a sizable increase in the number of *new* intermediates sourced from abroad (see, in particular, Goldberg et al., 2009, and Broda, Greenfield and Weinstein, 2006).[2] Theoretical models predict that new imported inputs should stimulate the introduction of new goods, by reducing production costs and relaxing technological constraints.[3] Empirical research on this issue, however, is extremely scant. In particular, only one study by Goldberg et al. (2010a), based on Indian data, has so far provided compelling evidence of a positive link between new imported inputs and new domestic products.

Our aim is to take this empirical literature one step further. Focusing on the EU countries over the last two decades, we first show that new imported inputs have a positive and sizable effect on the introduction of new goods, thereby corroborating Goldberg et al.'s (2010a) findings on a large group of industrialized countries. Then we ask two new research questions. First, what are the channels through which new imported inputs operate? Second, how do new goods compare with existing products? The results of this endeavor are, in our view, quite insightful. In particular, we find the effect of new imported inputs to depend in a crucial way on their characteristics: the effect is larger the higher the quality and the lower the price of these intermediates. Moreover, we find new products to be upgraded compared to existing goods: they systematically exhibit higher prices and higher quality. Hence our results suggest that, by enabling countries to access cheaper or higher-quality intermediates from abroad, new imported inputs act as a crucial driver of the introduction of new and better products.

To perform our analysis, we assemble a novel data set covering 25 EU countries (all but Cyprus and Malta) over 1995-2007 and containing information on domestic production and bilateral trade for the universe of products, at the finest level of aggregation (8-digit). The first task we accomplish with this data is to identify new domestic products and new imported inputs. Throughout the paper, we define these objects as follows. A good is a 'new product' for a country when the first domestic firm starts producing it, and thus a positive production is recorded in our data. Similarly, a 'new imported input' is an intermediate that a country

[1] Leading contributions to this literature include Aghion and Howitt (1992), Grossman and Helpman (1991b), Romer (1987, 1990), Segerstrom, Anant and Dinopoulos (1990), and Segerstrom (1998).

[2] See Broda and Weinstein (2004, 2006), Hummels and Klenow (2005), Bernard et al. (2009), Kehoe and Ruhl (2009), and Besedeš and Prusa (2011) for additional evidence on the growth in the 'extensive margin' of trade.

[3] See, in particular, Ethier (1979, 1982), Grossman and Helpman (1990, 1991a), Rivera-Batiz and Romer (1991), and Markusen (1989).

sources from a certain trading partner for the first time.[4] Identifying new domestic products and new imported inputs is extremely complicated, due to the changes occurring every year in the commodity classifications. To address this issue, we develop a procedure that keeps track of all classification changes using correspondence tables, and thereby yields a precise indication of which products and foreign inputs are new in each year. Our data shows that the introduction of new goods and the import of new intermediates are relevant phenomena in the EU countries. In particular, 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 intermediate imports.

Having identified the new imported inputs and the new domestic products, we proceed by providing evidence of a strong positive correlation between the two. Specifically, a conservative estimate indicates that, within a country-industry pair, a 1 percentage point (p.p.) increase in the share of new imported inputs is associated with an increase of roughly 0.6 p.p. in the share of new goods. This correlation is strikingly robust, as it holds unaffected when we exclude potential outliers, address a number of issues with the construction of our variables, control for a comprehensive set of concomitant factors, and allow for heterogeneity across EU countries and in the origin of foreign inputs.

The positive correlation between new imported intermediates and new domestic products could have two explanations. On the one hand, new imported inputs could have a causal effect on the introduction of new goods. On the other hand, countries could introduce new products for reasons unrelated to the availability of foreign intermediates, and then start sourcing the necessary inputs from abroad. In order to identify the causal effect of new imported inputs, we thus need to isolate their exogenous variation. We follow two complementary approaches to this purpose. First, we run instrumental variables regressions using different sets of instruments. In particular, following Autor, Dorn and Hanson (2011), our preferred instruments are long lags of imported inputs and input tariffs in the US. Second, we exploit a series of trade shocks occurred over the period of analysis, either to our sample countries (adoption of the Euro and accession to the EU) or to their trading partners (entry of new members into the WTO). All these exercises speak in favor of a causal effect of new imported inputs on the introduction of new products, in accordance with Goldberg et al. (2010a).

At this point, the question arises as to why new imported inputs exert such a positive effect. In the second part of the paper we explore three possible channels. First, by importing new intermediates, countries could get access to essential inputs, whose previous unavailability prevented the production of some goods. Second, countries could get access to cheaper inputs, which would lower production costs and make it profitable to produce goods otherwise too

[4] Following Goldberg et al. (2009, 2010a), we work under the standard assumption that each product-partner combination ('variety') is a different input.

costly.[5] Third, countries could get access to higher-quality inputs (Kugler and Verhoogen, 2009, 2011), which would render the production of some goods technically feasible. To evaluate the empirical relevance of these three mechanisms, we need separate information on input prices and input quality. While prices are reported in our data, quality is obviously not and must therefore be estimated. To this purpose, we apply the methodology developed by Khandelwal (2010) to each of the countries in our sample. As a result, we construct an extremely detailed and widely comprehensive data set, which contains time-varying estimates of quality for all input varieties imported by each EU country. To the best of our knowledge, no such data set existed before. Using these estimates, we find robust evidence in favor of the price and quality mechanisms. In particular, we show that an increase in the share of new imported inputs has a larger effect on the share of new products: (1) the higher the quality of new imported inputs and (2) the lower their price, conditional on quality. The first mechanism, based on the possibility to access essential inputs, seems instead irrelevant for our countries.

Our last aim is to study the characteristics of new goods compared to existing products. We find that new goods exhibit a significant price premium, and that consumers perceive them as possessing higher quality. To obtain the second result, we use Khandelwal's (2010) quality estimates and compare them between new and old products exported from the EU to the US. Taken together, our results therefore suggest that new imported inputs foster the introduction of new and upgraded goods, by allowing countries to gather cheaper or qualitatively-superior intermediates from abroad.

As already mentioned, our analysis builds on the previous work of Goldberg et al. (2010a) on India. To date, that paper provides the only direct evidence of a link between new imported inputs and new domestic products. In particular, exploiting India's trade liberalization as an exogenous trade shock, the authors identify a large positive effect of new foreign intermediates on the number of goods produced by firms. Our paper differs from Goldberg et al. (2010a) in three important respects. First, we consider a large group of industrialized countries, instead of a fast-growing developing economy. By doing so we are able to show that, interestingly, the authors' results extend well beyond the developing world. Second, we focus on the introduction of new products at the economy-wide level, not at the firm level. We believe this departure to be most relevant, as products that are new for a firm need not also be new for the economy as a whole, especially in developed countries. Third, and most importantly, we shed light on the mechanisms through which new imported inputs operate and unveil important differences in the characteristics of new and old products.

Apart from Goldberg et al. (2010a), evidence on the link between new imported inputs and new domestic products has been lacking. The main reason is the unavailability of detailed data on domestic production. To make progress, a few papers have used proxies based on export

[5] See Feenstra, Markusen and Zeile (1992) and Goldberg et al. (2010a) for an extensive discussion of these two mechanisms.

data.[6] As some of these studies acknowledge, however, those proxies do not perfectly account for the introduction of new products, as some goods may not be exported, at least initially. To the best of our knowledge, we are the first to employ data on domestic production for the universe of products, across many countries and many years.[7]

Our paper is also related to the recent studies on the characteristics of new goods, in particular to Broda and Weinstein (2010) and Xiang (2005). Using bar-code data on the purchases of US households, Broda and Weinstein (2010) show that inflation estimates based on the conventional Consumer Price Index are upward biased, as the CPI is computed on a fixed set of goods and is thus unable to accommodate the higher quality of new products. While the authors' data is extremely well suited to track new consumption patterns, our data is very well suited to identify the production of new goods within a country, which is the core of our paper. Xiang (2005) shows that new products are responsible for a large fraction of the increase in skilled-to-unskilled wage inequality in the US, as their production is more skill-intensive than that of old goods. Unlike Xiang (2005), we study the determinants, not the consequences, of the introduction of new products.[8]

Finally, our paper is related to two other strands of empirical literature. The first studies the effect of imported inputs on domestic productivity. With a few exceptions, the existing studies find this effect to be positive and economically significant.[9] In the endogenous growth literature, this positive productivity effect would be referred to as 'level effect' or 'static gain'. Instead, we are interested in the so called 'growth effect' or 'dynamic gain', which works through the introduction of new products and has been overlooked in the empirical literature. The second strand of research deals with the welfare effects of new imported varieties in general. With a few exceptions, these studies find that new foreign varieties bring about substantial welfare gains.[10] Our analysis complements these studies by documenting the positive effects of new *input* varieties on the introduction of new domestic goods.

The paper is organized as follows. Section 2 illustrates the data and reports some stylized facts. Section 3 provides evidence of a positive effect of new imported inputs on the introduction of new goods. The mechanisms behind this effect are investigated in Section 4, whereas Section 5 studies the characteristics of new products. Finally, Section 6 closes the paper by discussing the implications of our results and providing suggestions for future research.

[6] See Feenstra et al. (1999), Broda, Greenfield and Weinstein (2006), and Bas and Strauss-Kahn (2011).

[7] Recently, some papers have used the same data on domestic production to study different issues. Most notably, Bernard, Van Beveren and Vandenbussche (2010) have used this data to document some new and interesting facts on the production and export behavior of Belgian firms.

[8] To identify new goods, Xiang compares the 1972 and 1987 versions of the Standard Industrial Classification, and defines products as new if they are absent in the former but present in the latter version.

[9] See Amiti and Konings (2007), Kasahara and Rodrigue (2008), Kasahara and Lapham (2009), Sivadasan (2009), Halpern, Koren and Szeidl (2011), and Khandelwal and Topalova (2011). See Muendler (2004) for a notable exception.

[10] See Feenstra (1994), Broda and Weinstein (2004, 2006), and Broda, Greenfield and Weinstein (2006). Arkolakis et al. (2008) is a notable exception.

2 Data and Stylized Facts

2.1 Data

Data on domestic production comes from Prodcom (PC), a database administered by Eurostat. PC contains yearly information on the value and volume of sold production, for the universe of products in all EU countries.[11] The data is based on an annual survey of firms' production activities within the territory of each reporting country.[12] The survey covers the entire manufacturing sector (Section D of the NACE Rev. 1.1 classification) and, according to the EU regulation, must encompass at least 90% of the annual production of each 4-digit industry in each country. As for the level of product aggregation, the PC classification contains roughly 4,500 8-digit product codes. This classification can be directly linked to NACE, as the first four digits of the PC code identify the 4-digit NACE industry. This feature enables us to easily map products into industries. As for the time coverage, the data is available since 1995, with some differences across countries (see Table A2). However, we limit the analysis to the period 1995-2007, as the PC classification has been entirely restructured in 2008, and a complete mapping between the old and the new version cannot be produced.[13]

A crucial task for our study is to identify new products. We define a good as a 'new product' for a country when the first domestic firm starts producing it, and thus a positive production is recorded in PC. The identification of new products is dramatically complicated by the changes that occur every year in the PC classification, following the EU legislation. As standard for product classifications, these changes are of two types: (i) new products are added to the classification, with new codes; (ii) some of the existing ('old') product codes are converted into new product codes. This second type of change is problematic for our purposes, as it reflects renaming of products rather than true product entry. We identify these cases using year-to-year correspondence tables provided by Eurostat. As a result, when a new code appears in the classification, we know exactly whether it represents a new product or is just a new indicator for one or more existing products. Taking this into account, we then identify code p, produced by country c in year t, as a new good, if either: (1) code p is introduced in the classification in year t and does not have any old code corresponding to it; or (2) code p is introduced in the classification in year t and has one or more old codes corresponding to it, but none of them was produced by country c over all previous years; or (3) code p is not new to the classification, but was not produced by country c over all previous years. Importantly, this identification procedure implies that a product can be counted as new only once: if production resumes after having stopped for a while, this is not counted as entry. Hence, in our data product entry is not

[11] Data for Cyprus and Malta is confidential, so we exclude those two countries from the analysis and focus on 25 instead of 27 EU Members. Note that Belgium and Luxembourg are aggregated by Eurostat, and thus constitute a single unit of analysis.

[12] Importantly for our purposes, the survey does not cover production activities undertaken outside the national borders, e.g. in foreign subsidiaries of domestic multinationals.

[13] The restructuring has followed the shift from NACE Rev. 1.1 to NACE Rev. 2.

spuriously driven by classification changes, nor does it reflect discontinuities in production over time.

Examples of new products for some of the countries in our sample are as follows. Spain started producing 'Flat panel video monitors, LDC or plasma' (PC 32302049) in the year 2000. In previous years, that country already produced 'Color video monitors with cathode-ray tube' (PC 32302045). The Netherlands started producing 'Photocopiers incorporating an optical system' (PC 30012185) in the year 2002. In previous years, that country already produced 'Electrostatic photocopiers' (PC 30012170).

As for the trade data, we source it from Comext, another database administered by Eurostat. For all EU countries since 1988, Comext contains yearly information on the value and volume of trade (both import and export flows) for the universe of manufacturing products with all trading partners in the world (about 200 countries). The commodity classification used by Comext is the Combined Nomenclature (CN), which contains more than 10,000 8-digit codes. This classification can be linked to NACE through appropriate correspondence tables provided by Eurostat. To identify the intermediate inputs, we also map the CN classification into the Broad Economic Categories (BEC) classification. In particular, we define as inputs all CN codes belonging to the following BEC categories: Processed food and beverages, mainly for industry (BEC 121); Processed industrial supplies, nec (BEC 22); Processed fuels and lubrificants (BEC 32); Capital goods, except transport equipment (BEC 41); Parts and accessories (BEC 42); Industrial transport equipment (BEC 521); Parts and accessories of transport equipment (BEC 53).[14]

Following Goldberg et al. (2009, 2010a), we treat each variety (product p - partner n combination) as a different input. We define a variety (v) as a 'new imported input' for a country when product p is imported from trading partner n for the first time. The CN classification has also undergone several changes over the sample period. We keep track of them using the year-to-year correspondence tables provided by Eurostat. Then, we identify variety v, imported by country c in year t, as new, if either: (1) code p is introduced in the classification in year t and does not have any old code corresponding to it; or (2) code p is introduced in the classification in year t and has one or more old codes corresponding to it, but none of them was imported by country c from partner n over all previous years; or (3) code p is not new to the classification, but was not imported by country c from partner n over all previous years. Similar to domestic goods, imported varieties can be counted as new only once. Hence, this identification procedure is not affected either by changes in the CN classification or by discontinuities in bilateral trade flows over time.[15]

[14] This definition is similar to the one employed by Goldberg et al. (2009). In Section 3, we show that our results are robust to the use of a narrower definition excluding capital goods, fuel, and lubrificants.

[15] We have written two Stata programs identifying new domestic products and new imported inputs, respectively. In a nutshell, the identification of new products works as follows. Consider a code p for which we observe positive production in country c at time t, but not in previous years. The program first checks for the existence of old codes corresponding to p. If there is none, code p is directly identified as a new good. If instead some old codes

2.2 Stylized Facts

In Table 1a, we report information on the entry of domestic products and imported varieties; in the latter case, we consider two samples: varieties of intermediate inputs and, for comparison, all varieties. Figures are percentages, averaged across countries, industries and years. Note that new products account for a non-negligible share (5%) of all goods produced domestically each year. Similarly, new varieties account for a substantial fraction (13%) of the total in both samples.[16]

Next, we decompose the yearly growth rate of production (import) value into the contributions of three sets of products (varieties): new, exiting and continuing (N, E and C). In both cases, following Goldberg et al. (2010b) we use the formula

$$\frac{X_{cit} - X_{cit-1}}{X_{cit-1}} = \frac{1}{X_{cit-1}} \cdot \left\{ \sum_{z \epsilon N_{cit}} X^z_{cit} - \sum_{z \epsilon E_{cit}} X^z_{cit-1} + \sum_{z \epsilon C_{cit}} (X^z_{cit} - X^z_{cit-1}) \right\}, \tag{1}$$

where c indexes countries, i industries, and t years; depending on the specification, the superscript z denotes domestic goods or imported varieties, whereas X denotes production or import value.

In Table 1b, we present the results of these decompositions. As before, figures are percentages, averaged across countries, industries and years; numbers in italics are normalized by the growth rate. Note that new goods account for roughly one-quarter of the average yearly growth of domestic production.[17] At the same time, new imported varieties account for 17% of the average yearly growth of total imports, and for 20% of the average yearly growth of intermediate imports. All in all, these figures suggest that import of new intermediates and introduction of new products are relevant phenomena in our sample of industrialized countries.

exist, the program verifies that, for each of them, country c's production was zero over all previous years. Only in that case is code p labeled as a new good. This routine runs in approximately one day on a standard computer. The program identifying new imported inputs works similarly; however, for each code p, the procedure must be repeated across all trading partners of country c. As a consequence, the program takes on average two days for each sample country.

[16] In unreported calculations, we found that new imported *products* (i.e. goods that were never imported before from *any* trading partner) make 1% of all goods imported each year. Consistent with Broda, Greenfield and Weinstein (2006) and Goldberg et al. (2009), this suggests that in developed countries the adding of products is negligible, and the change in the extensive margin of trade is driven by variations in the set of trading partners for existing goods. For this reason, in this paper we focus on *varieties*. Note, also, that the exit rate equals 4.8% for domestic goods and 10.5% for imported varieties, implying a substantial degree of product churning in our sample, consistent with evidence on the US (Bernard et al., 2009; Bernard, Redding and Schott, 2010). (The procedures identifying exiting goods and exiting varieties are specular to those identifying new products and new imported inputs; see the previous footnote.)

[17] Goldberg et al. (2010b) and Bernard, Redding and Schott (2010) find a similar contribution, using firm-level data for India and the US, respectively.

3 New Imported Inputs and the Introduction of New Products

In this section, we study how new imported inputs affect the introduction of new domestic products. First, we present some baseline correlations, followed by a number of robustness checks and extensions. Then, we discuss identification. Finally, we perform a simple exercise to gauge the economic magnitude of the effect.

3.1 Baseline Estimates

Our baseline specification reads as follows:

$$NP_{cit} = \alpha_{ci} + \alpha_t + \beta_1 NII_{cit-1} + \varepsilon_{cit}, \tag{2}$$

where α_{ci} are country-industry effects, α_t are year effects, and ε is a random disturbance. NP is the share of new domestic products in total domestic products, whereas NII is the share of new imported inputs in total imported inputs.[18] Both the numerator and the denominator of NP and NII are computed separately for each country c, industry i, and year t, using the product-level data described before.

The results are in Table 2. Columns 1-3 estimate eq. (2) by OLS, at three different levels of industry aggregation: 4-digit NACE (column 1), 3-digit NACE (column 2) and 2-digit NACE (column 3); standard errors are corrected for clustering within country-industry pairs. Note that all coefficients are positive and highly significant, with t-statistics close to 10. Interestingly, the point estimate roughly doubles each time the level of industry aggregation is increased. This pattern is consistent with industries sourcing inputs not just from themselves, but also from other industries in the same aggregate group.

To fully accommodate backward linkages across industries, we now exploit the country-specific Input-Output Accounts provided by Eurostat (available only at the 2-digit industry level). In particular, we use the Import Matrices to compute the share of each industry j in the total import of intermediates by industry i. We calculate these figures for all available years (see Table A2) and then take their average over time. Using the resulting values (ω_{cij}), we construct an *overall* indicator of new imported inputs as follows:

$$NIIov_{cit} = \sum_{j=1}^{I} \omega_{cij} \cdot NII_{cjt}. \tag{3}$$

In column 4, we estimate eq. (2) using $NIIov$ instead of NII. The coefficient β_1 is positive and highly significant, and the point estimate is larger than in previous columns. In particular, it implies that a 1 p.p. increase in the share of new imported inputs is associated with an increase of roughly 0.6 p.p. in the share of new domestic products. This further suggests that

[18] We use 'imported inputs', instead of 'imported input varieties', for brevity.

backward linkages across industries are relevant, and that β_1 may be downward biased if these linkages are not accounted for. We thus view column 4 as our preferred specification.

3.2 Robustness and Extensions

In this section, we check the robustness of the above positive correlation along several dimensions. To begin with, we consider alternative ways of constructing the variables and alternative estimation methods. The results are in Table 3. In panel a), we trim the distributions of NP and $NIIov$ at 1^{st} and 99^{th} percentile: β_1 slightly increases, suggesting that our results are not driven by outliers.[19] In the following three panels, we use alternative definitions of the explanatory variable. In particular, in panels b) and c) we reconstruct $NIIov$ using average or yearly weights from the Use Matrices. The latter are available for many more years compared to the Import Matrices (see Table A2), but capture cross-industry linkages in terms of domestic (as opposed to foreign) purchases of intermediates. These differences notwithstanding, the results are virtually unchanged. In panel d), we instead redefine intermediate inputs by excluding capital goods, fuel and lubrificants. Using this narrower definition yields similar estimates.

Next, we address two possible concerns with our dependent variable. The first is related to the fact that the PC classification may not immediately adjust to the invention of new products. Until these goods are assigned their own codes, firms would thus report their production under existing codes (Pierce and Schott, 2011). As a consequence, we would count these products as new only with a delay. To address this issue, in panel e) we reconstruct NP using only the 3,098 codes that are present in the PC classification along the entire sample period. Reassuringly, the results are largely unchanged. The second concern is related to our procedure for identifying new products. Since we do not observe production prior to 1995, the procedure may overestimate the number of new goods in the initial years of the sample.[20] However, the procedure becomes more reliable as time passes, since we can track production back for a longer period. In panel f), we thus reestimate eq. (2) after excluding the first three years of observations for each country. While β_1 slightly falls, our main evidence remains unaffected.[21]

So far, we have used the number of domestic goods and foreign inputs to construct our

[19] Other approaches to deal with outliers yield similar results. In particular, we have: (i) replaced the extreme observations with the values of the 1^{st} and 99^{th} percentile; (ii) excluded industries with extreme values of NP and $NIIov$ (Tobacco, NACE 16; Footwear, NACE 19; Coke and Petroleum, NACE 23); (iii) excluded countries with extreme values of both variables (Germany, UK, Latvia and Lithuania); (iv) estimated eq. (2) with an outlier-robust procedure, implemented in Stata using the `rreg` command. We found the coefficient (standard error) on $NIIov$ to equal 0.584 (0.065) in the first case, 0.659 (0.075) in the second, 0.553 (0.075) in the third, and 0.518 (0.044) in the fourth.

[20] To illustrate this issue, take a generic country, and consider a good with positive production in 1996, but not in 1995. Our procedure classifies this good as new for that country in 1996. However, we cannot exclude that the good was already produced by the country prior to the beginning of our sample (i.e. in 1994 or earlier).

[21] Excluding the first four or five years of observations would yield similar results (available upon request). However, in that case a few countries would drop out of the sample. Note that the same issue arises with the identification of new imported inputs, but is less serious, as our trade data usually starts well before the estimation sample (see Table A2). In any case, this robustness check takes care also of the issue with imports.

variables. By doing so, we have attached equal weight to all products and intermediates. In panel g), we show that β_1 would have been even larger had we defined NP and $NIIov$ in terms of values, thereby giving higher weight to products with larger sales and to inputs with larger import flows.[22] Next, we use alternative estimation methods. In particular, in panel h) we estimate eq. (2) by pooled Tobit, to accommodate left-censoring in NP (1,454 observations are zero in our sample). If anything, the Tobit marginal effect is larger than the OLS estimate of β_1. In panel i), we instead use variables in levels (i.e. counts of new products and new imported inputs) and estimate the resulting specification by fixed-effect Poisson, with standard errors corrected for clustering at the country-industry level. The coefficient is still positive and highly significant, and implies that an additional new input is associated with an increase of 0.1% in the number of new products.

In Table 4, we check that the positive correlation between NP and $NIIov$ is not spuriously driven by omitted variables at the industry or country level. To this purpose, in column 1 we add to eq. (2) a number of proxies for industry characteristics: size (number of employees), capital and material intensity (respectively, capital and material expenditure per worker), labor productivity (value added per employee), import penetration (imports over the sum of output and imports), and investment in advanced technologies (share of high-tech capital in total capital investment).[23] In column 2, we instead replace the time dummies with industry-year effects, which absorb industry-specific shocks hitting all countries simultaneously. In column 3, we control for country characteristics: level and growth of per capita GDP, population size, real exchange rate, and the ratios of merchandise trade and gross fixed capital formation to GDP (all sourced from the World Development Indicators). Finally, in column 4 we replace the time dummies with country-year effects, which absorb country-specific shocks common to all industries. Note that β_1 is positive and precisely estimated across the board.

In Table 5, we consider other concomitant factors. To begin with, we show that NP is largely uncorrelated with the shares of *total* imported inputs in overall import value and number of varieties (columns 1 and 2, respectively). This suggests that our results do not simply reflect the expansion of trade in intermediates over the recent decades. In column 3, we show that the introduction of new products is positively correlated with the share of new over total *domestic* inputs; interestingly, though, this correlation is much weaker (by an order of magnitude) than that with the share of new imported intermediates.[24] In column 4, we show that NP is uncorre-

[22] Panel g) uses fewer observations than previous specifications, because the value of production is sometimes not reported in PC for confidentiality reasons. When this happens, we only know that production has occurred; hence, we can use those observations only when working with numbers. Note that the higher value of β_1 is not due to this change in sample size. Indeed, if we estimate eq. (2) on the subsample used in panel g), but with variables in numbers, we obtain a coefficient (standard error) on $NIIov$ equal to 0.598 (0.085), i.e. very close to our baseline estimate.

[23] These controls vary across countries, industries and years. They are sourced from the EUKLEMS database, except for import penetration, which is constructed using trade and turnover data from Eurostat.

[24] For completeness, we note that the share of new domestic inputs equals 7% on average, against 13% for $NIIov$.

lated with the share of new over total imported *final* goods. This suggests that the introduction of new products is not related to the import of new goods in general but, specifically, to the import of new intermediate inputs. Next, we show that NP is uncorrelated with the share of *exiting products* in total domestic goods (column 5)[25] and with the shares of *exiting inputs* in domestic and imported intermediates (column 6). Finally, we show that the results change very little if we include all these controls in the same specification (column 7). Importantly, the correlation between NP and $NIIov$ stays strong and positive across all columns.

In Table 6, we allow the correlation to differ across EU countries and across origins of foreign inputs. In particular, in column 1 we add to eq. (2) an interaction term between $NIIov$ and a dummy for the ten new members of the EU.[26] The correlation between NP and $NIIov$ is significantly positive both for the old and for the new EU members, but it is somewhat stronger for the latter group of countries. In column 2, we instead split $NIIov$ into two separate regressors, constructed using imports from OECD and non-OECD countries, respectively. The introduction of new products is positively correlated with new imported inputs from both areas, but more so with those from OECD countries.

3.3 Identification

The positive correlation between new imported inputs and new domestic products is compatible with two explanations. First, new imported inputs could have a causal effect on the introduction of new goods (we postpone a discussion of the mechanisms to Section 4). Second, countries could introduce new products for reasons unrelated to the availability of foreign intermediates, and then start sourcing the necessary inputs from abroad. To identify the causal effect of new imported inputs, we thus need to isolate the variation of $NIIov$ that occurs exogenously, i.e. independent of the decisions to produce new goods within each country-industry pair.

According to the literature, this exogenous variation could have two origins. The first is represented by technological shocks occurring abroad: by enabling third countries to produce and export new intermediates, these shocks would exogenously expand the range of foreign inputs available to our countries.[27] The second source of exogenous variation is represented by reductions in trade barriers: by lowering import costs, a fall in trade barriers would make it profitable to buy foreign inputs otherwise too costly.[28] We capture either one or both sources

[25] Consistently, we obtain similar results if we use net entry (new minus exiting products, as a share of total domestic goods) as the dependent variable; in this case, the coefficient (standard error) on $NIIov$ would equal 0.411 (0.083).

[26] These are the Eastern European countries that joined the EU in 2004 or 2007. This dummy is set equal to 1 for these countries in all sample periods; hence, its linear term is subsumed into the country-industry effects.

[27] Broda and Weinstein (2006) show that technological progress in third countries accounts for a large fraction of the threefold increase in the number of varieties imported by the US over the last three decades. See Debaere and Mostashari (2010) for additional evidence on a larger set of economies.

[28] Goldberg et al. (2010a) show that trade liberalization has triggered an upsurge in the number of new intermediate inputs imported by Indian firms over the 1990s. See Broda and Weinstein (2006), Kehoe and Ruhl (2009), and Debaere and Mostashari (2010) for additional evidence on how lower trade barriers have boosted the

of variation by means of two complementary approaches. First, we run instrumental variables (IV) regressions using different sets of instruments. Second, we exploit a number of trade shocks occurred over the sample period.

IV Regressions Our preferred instruments are long lags of imported inputs and input tariffs in the US. The first variable is inspired by Autor, Dorn and Hanson (2011) and can be motivated as follows: technological shocks in third countries create new import opportunities not only in the EU but worldwide, including other advanced countries like the US. Changes in US imports should thus reflect these shocks. As for the second variable, changes in US tariffs are arguably correlated with changes in EU tariffs. However, given our focus on the EU, they are less exposed to endogeneity concerns based on political economy arguments. We construct both variables using data on US bilateral trade at the product level, available from Feenstra, Romalis and Schott (2002) over 1989-2006. We aggregate this data at the 2-digit industry level. In particular, for each industry, we compute total imported inputs and average input tariffs across all products and trading partners of the US.[29] In aggregating the data we exclude the EU country to which the instruments refer. Hence, the instruments vary across countries, industries and years. We weight both variables by Import Matrix coefficients as in eq. (3) and use their 6^{th} (and longest possible) lag in all the regressions.

For robustness, we also use the shift-share instrument proposed by Card (2001), and recently applied to imported inputs by Ottaviano, Peri and Wright (2010). This instrument isolates the exogenous variation in the share of new imported inputs due to shocks to trading partners. It is constructed in a number of steps. First, for each country, industry and year, we compute the ratio of new imported inputs from partner n over total imported inputs. We call this variable NII_{cint}, and note that $\sum_n NII_{cint} = NII_{cit}$. Second, we regress NII_{cint} on industry-time and partner-time effects, separately for each country in our sample. Third, we cumulatively add the estimated partner-time effects to the initial value of NII_{cint}, i.e. the value observed in the first year for which trade data are available (as shown in Table A2, this is usually well before the beginning of the estimation sample). Fourth, we aggregate the resulting variable ($\widehat{NII}_{cint}$) over all trading partners, thereby obtaining $\widehat{NII}_{cit} \equiv \sum_n \widehat{NII}_{cint}$. Finally, we weight $\widehat{NII}_{cit}$ by Import Matrix coefficients as in eq. (3).[30]

extensive margin of trade over recent decades.

[29] The US data covers all exchanges of 10-digit products (defined according to the Harmonized System classification) with all trading partners in the world. Most notably, for each import flow the data includes the quantity, the value and the corresponding tariff. We first identify intermediate inputs by mapping the HS classification into the BEC classification. Then, we aggregate imported inputs and input tariffs at the 5-digit level of the Standard International Trade Classification. Finally, we convert the data at the 2-digit level of the International Standard Industrial Classification, which is equivalent to the 2-digit level of NACE.

[30] To illustrate the intuition behind the instrument, consider two industries (i and j) in country c. Suppose that, in the initial period, both industries have the same (overall) share of new imported inputs. Also assume, however, that partner n accounts for a larger share of new imported inputs in industry i than in industry j. If n experiences a shock that raises its exports to country c, the instrument will impute a larger exogenous increase in the supply of new foreign inputs to industry i than to industry j.

Table 7a estimates eq. (2) by Two-Stage Least Squares (2SLS). In column 1, we instrument $NIIov$ using the 6^{th} lag of imported inputs and input tariffs in the US. The Hansen test cannot reject the validity of the overidentifying restriction; moreover, the F-statistic for excluded instruments is well above 10, the rule-of-thumb threshold suggested by Staiger and Stock (1997) to check for weak instruments. Importantly, the coefficient on $NIIov$ is positive, highly significant, and similar in size to our baseline OLS estimate. In columns 2 and 3, we use input tariffs and imported inputs individually, to check that our results are not driven by the poor performance of any of the two instruments. Reassuringly, the F-statistics are very high in both cases, and our coefficient of interest is largely unchanged.

In the presence of demand shocks correlated across countries, using imports in the US as an instrument may be problematic. These shocks may in fact trigger the introduction of new products in the EU and, at the same time, boost imports of intermediates both in the EU and in the US. In that case, the instrument would not be valid. This concern might not be particularly serious in our setting, as we are using a very long lag of the instrument in the regressions. Nevertheless, we now follow Autor, Dorn and Hanson (2011) and reestimate eq. (2) after dropping industries in which correlated demand shocks may be more relevant. In particular, in column 4 we exclude industries producing construction material, i.e. metal and non-metal products (NACE 26, 27 and 28); in column 5 we drop computers (NACE 30); in column 6, we exclude some industries producing consumption goods, such as textile, apparel and footwear (NACE 17, 18 and 19); and in column 7, we drop all these industries at the same time.[31] Reassuringly, our results do not show any noteworthy change.

Another potential concern is that the decline in tariffs over the sample period may not have been large enough to provide scope for identification. To address this issue, we now restrict the analysis to the inputs that have witnessed the largest drops in tariffs. In particular, we define them as the intermediates for which the tariff reduction over 1989-2006 was greater than the median reduction across all inputs.[32] In column 8, we use this subset of inputs to reconstruct $NIIov$, and instrument the new regressor using the 6^{th} lag of US imported inputs (always restricting to intermediates with large tariff cuts). Note that the results are very similar.[33] Finally, in column 9 we use the shift-share instrument. The F-statistic is very high also in this case. Moreover, the coefficient on $NIIov$ remains positive, highly significant, and similar in size to our baseline estimate.

Trade Shocks As a companion to the IV regressions, we now exploit three trade shocks occurred over the sample period: (1) entry of new members into the WTO; (2) adoption of the

[31] Autor, Dorn and Hanson (2011) exclude the same industries in their robustness checks.

[32] To identify these intermediates, we use data on US tariffs. In particular, we compute the average yearly tariff change for each input, defined at the 6-digit level of the HS classification (equivalent to the 6-digit level of CN). Then, we keep only the 1,348 inputs with tariff cuts above the sample median (0.3 p.p. per year).

[33] In this specification, we exclude input tariffs from the set of instruments, as we have used the information on tariffs to construct the regressor.

Euro by a group of countries in our sample; (3) accession to the EU by another group of sample countries. Arguably, all of these shocks have gone in the direction of reducing trade barriers and facilitating the exchange of goods among countries.

Table 7b reports the results. In column 10 we exploit the first shock. To this purpose, we reconstruct $NIIov$ using only the inputs sourced from the 35 countries that joined the WTO since 1996. We instrument the new regressor using the 6^{th} lag of US imported inputs and input tariffs, themselves restricted to the 35 new members of the WTO (clearly, these instruments do not vary across the EU countries but only across industries and years). Note that the results are similar to those obtained before focusing on the universe of trading partners. In column 11, we repeat this exercise while restricting to China, the largest of the new WTO members. The main evidence holds unaffected.

Next, we exploit the other shocks. To this purpose, we first construct two (mutually exclusive) groups of countries: the first is composed of the 12 economies that adopted the Euro in 1999 or 2000; the second consists of the ten countries that entered the EU in 2004 or 2007. Then, we estimate the following specification on each subsample:

$$NP_{cit} = \alpha_{ci} + \alpha_t + (\beta_1 + \beta_2 \mathbf{I}\{t \geq \bar{t}_c\}) \cdot NIIov_{cit-1} + \varepsilon_{cit}, \tag{4}$$

where $\mathbf{I}\{\cdot\}$ is the indicator function, equal to 1 for country c both in the year of the shock ($\bar{t}_c$) and in subsequent periods. We expect new imported inputs to have a stronger effect after the shocks, i.e. $\beta_2 > 0$. Indeed, as shown in columns 12 and 13, β_2 is positive, large, and very precisely estimated in both cases. Instead, NP and $NIIov$ are uncorrelated before the shocks.

3.4 Economic Magnitude

Finally, we discuss the economic significance of the effect of new imported inputs. From Table 1b we know that, on average, 25% of the yearly growth in output is accounted for by the introduction of new goods. How much of this figure, in turn, is accounted for by new imported inputs, via their effect on the introduction of new products? To answer this question, we regress the contribution of new goods to output growth (the first term on the right-hand-side of eq. (1)) on $NIIov$, controlling for country-industry and year effects. We get a coefficient (standard error) of 0.509 (0.112). Multiplying this coefficient by the average annual share of new imported inputs (13% according to Table 1a) yields 0.07. Hence, roughly one-fourth (0.07/0.25) of the contribution of new products to output growth can be attributed to new imported inputs.

4 Channels

The previous section has shown that new imported inputs stimulate the introduction of new domestic products. In this section, we discuss the channels through which this effect occurs.

In particular, building on the existing literature, we consider three possible mechanisms. First, by importing new intermediates, countries could get access to essential inputs, in the absence of which some goods could not be produced. Second, countries could get access to cheaper inputs, which would lower production costs and make it profitable to produce goods otherwise too costly. Finally, countries could get access to higher-quality inputs, which would render the production of some goods technically feasible.

We evaluate the empirical relevance of these three mechanisms by estimating the following specification:

$$\begin{aligned} NP_{cit} \quad &= \quad \alpha_{ci} + \alpha_t + (\beta_1 + \beta_2 PNew_{cit-1} + \beta_3 QNew_{cit-1}) \cdot NIIov_{cit-1} + \\ &\quad + \beta_4 PNew_{cit-1} + \beta_5 QNew_{cit-1} + \varepsilon_{cit}, \end{aligned} \tag{5}$$

where $PNew$ and $QNew$ are the average price and quality of new imported inputs, relative to existing intermediates (details below). The effect of new imported inputs is then given by:

$$\frac{\partial NP}{\partial NIIov} = \beta_1 + \beta_2 PNew + \beta_3 QNew. \tag{6}$$

Note that $\beta_3 > 0$ would provide evidence in favor of the third mechanism, as it would imply that the effect of new imported inputs is stronger the higher their relative quality. Similarly, $\beta_2 < 0$ would provide evidence in favor of the second mechanism, as it would imply that the effect of new imported inputs is stronger the lower their relative price. Finally, $\beta_1 > 0$ would provide evidence in favor of the first mechanism, as it would imply that new imported inputs have an effect even independent of their price and quality.

To construct $PNew$, we use the prices (c.i.f. unit values) of all imported varieties of intermediate inputs. As a first step, we rescale the individual prices between zero and one, and divide each of them by the average price across *all* varieties (both new and existing ones); we perform these operations separately within each country, 4-digit industry and year.[34] Then, we average these ratios across the *new* varieties, thereby obtaining a proxy for the relative price of new imported inputs. Finally, we take the weighted average of this proxy at the 2-digit industry level.[35] The resulting variable can be zero or positive; a larger number indicates a higher relative price of new imported inputs. For estimation, we weight this variable by Import Matrix coefficients as in eq. (3).

We follow the same steps to construct $QNew$. However, unlike prices, quality is not observed and must be estimated. We estimate the quality of all input varieties imported by each country using the approach developed by Khandelwal (2010). Here we summarize the salient aspects

[34] This should make prices comparable across countries and industries. Below, in a robustness check, we will regress the individual prices on product fixed effects, so as to further remove systematic differences in product and industry characteristics.

[35] As weights, we use the share of each 4-digit industry in the number of new imported inputs in the corresponding 2-digit industry.

of this methodology, while relegating technical details and estimation results to the Appendix. Briefly, in this intuitive and tractable approach, quality is the vertical component of a nested logit demand model, which is also devised to accommodate differences in horizontal characteristics across products. The demand for each variety is modeled as follows: the market share of the variety in the corresponding industry is a function of the variety's price and some controls for horizontal differentiation. These demand functions are estimated industry by industry, and the quality estimates are obtained by summing the variety fixed effects, the time fixed effects, and the residuals from the regressions. Intuitively, these estimates assign higher quality to varieties with greater market share, conditional on prices and other controls. Importantly, the quality estimates are both variety-specific and time-varying.

Using our data on bilateral imports at the product level, we estimate separate demand functions for each 4-digit industry in each country.[36] We consider different models, estimated either by 2SLS (our preferred choice) or by OLS, using either the subsample of imported inputs (our preferred choice) or the whole sample of imported varieties. Depending on the model, we run 3,268 to 4,205 separate regressions, using a total of 10 to 15 million observations. As a result of this effort, we construct an extremely detailed and widely comprehensive data set, which contains quality estimates for all imported varieties - at the finest level of product aggregation - in each EU country. To the best of our knowledge, no such data set existed before. We use these quality estimates to construct $QNew$ exactly as we used prices to construct $PNew$.

In Table 8, we estimate different versions of eq. (5). To begin with, in column 1 we consider a benchmark specification including only $NIIov$, $PNew$ and their interaction; standard errors are corrected for clustering within country-industry pairs. The coefficient on the interaction term (β_2) is positive and weakly significant, implying that the effect of new imported inputs is stronger the higher their relative price. The empirical trade literature suggests that prices are correlated with quality. In particular, Kugler and Verhoogen (2009, 2011) provide compelling evidence that higher input prices are associated with higher input quality.[37] Accordingly, β_2 may be mixing up the price and quality channels discussed above. Unlike previous studies, we have separate information on input prices and input quality, and we can thus disentangle the two mechanisms by estimating the complete version of eq. (5).

The results are in column 2. Given that $QNew$ is a generated regressor, we accompany the analytical standard errors with bootstrapped standard errors based on 100 replications. We highlight three main findings. First, the coefficient β_3 is positive and highly significant, implying that the effect of new imported inputs is stronger the higher their relative quality.

[36] As a consequence, the quality estimates are not comparable across countries and industries (Amiti and Khandelwal, 2010). For this reason, when constructing $QNew$ we normalize the individual estimates by country-industry-year means, as we did for prices. Later on, in a robustness check, we will regress the quality estimates on product fixed effects, so as to further improve comparability.

[37] Quality and prices are positively correlated also in our data, consistent with Kugler and Verhoogen (2009, 2011). Specifically, a regression of $PNew$ on $QNew$, controlling for country-industry and year effects, yields a coefficient (standard error) of 0.806 (0.035).

Second, the coefficient β_2 switches sign (from positive to negative) and is now highly significant: *conditional on quality*, the effect of new imported inputs is stronger the lower their relative price. Third, the coefficient β_1 drops to zero and is imprecisely estimated, which speaks against the first mechanism. In light of the evidence in Goldberg et al. (2010a), these findings have an interesting implication: they suggest that the mechanisms through which new imported inputs operate may not be the same in developed countries as in developing economies. In particular, the possibility to gather essential inputs may be relevant in a developing country like India (as the authors allude to), but less so in the industrialized world, where countries have already access to most essential inputs.[38] In developed countries, new imported inputs are instead more likely to work by enabling the adjustment of the input mix along the price and quality dimensions.

In the bottom part of column 2, we use eq. (6) to measure the effect of new imported inputs at different values of $PNew$ and $QNew$. In particular, we first average both variables over time, within each country-industry pair. Then, we evaluate eq. (6) at each observation of the resulting sample. To compute the standard errors, we use the bootstrapped standard errors of the parameters. Note that the effect of $NIIov$ is on average positive, highly significant, and very close to the estimate in Table 2. More interestingly, the effect is positive and precisely estimated along the entire distribution; indeed, a 1 p.p. increase in $NIIov$ raises NP by 0.4 p.p. at the 10^{th} percentile, and by 0.9 p.p. at the 90^{th}. For completeness, we also report the average partial derivatives of eq. (5) with respect to $QNew$ and $PNew$; as expected, they are positive and negative, respectively.

Finally, we perform a number of robustness checks using different variants of the quality estimates (see the Appendix for details). In particular, in column 3 we exclude the residuals from the definition of quality. In column 4, we use quality estimates obtained by OLS instead of 2SLS. In column 5, we use quality estimates obtained on the whole sample of imported varieties, instead of the subsample of imported inputs. Finally, in column 6 we regress quality and prices on product fixed effects, so as to further clean up these variables from product and industry characteristics; we then use the residuals from these regressions to reconstruct $QNew$ and $PNew$. Reassuringly, our main results are robust across all specifications.

5 Characteristics of New Products

In this final section, we study how new products compare with existing goods, in terms of important characteristics such as volumes, prices and quality. In columns 1 and 2 of Table 9, we use the whole sample of 8-digit products and regress log volumes and prices on a dummy for new goods (New), controlling for product and country-year effects. The product fixed effects absorb systematic differences in product and industry characteristics, whereas the country-year effects limit the comparison of new and existing goods within the same country and year. As standard in

[38] Recall that developed countries import already most products, as shown by Broda, Greenfield and Weinstein (2006) and discussed in footnote 16 for our sample.

the empirical literature, we exclude extreme observations with unit values in the top and bottom deciles of the price distribution. Standard errors are corrected for clustering within country-product pairs. Note that, not surprisingly, new products sell in lower quantities compared to existing goods, and that, more interestingly, they exhibit a significant price premium, equal on average to 4% ($(e^{0.041} - 1) \times 100 = 4.2$).[39]

Next, we ask how consumers perceive the quality of new goods. Since we cannot directly use Khandelwal's (2010) methodology to estimate quality for domestic products, we use his quality estimates for US imports. These estimates encompass all differentiated (10-digit HS) products imported by the US from all trading partners in the world.[40] We first match Khandelwal's estimates with our data on exports from the EU to the US.[41] Then, we identify the new goods exported from each sample country to the US market, through the same procedure applied to imports in Section 2. Using the resulting data set, we compare the quality of new and existing products exported from the EU to the US.

Before commenting the results of this exercise, we find it helpful to pause and discuss our use of exports to the US. First, we note that there is a positive correlation between new imported inputs and new exported varieties in general, similar to what we have documented for new domestic products. In particular, in a regression like (2) for the share of new exported varieties, the coefficient (standard error) on $NIIov$ equals 0.488 (0.180). Second, we recall that the US is the main market for EU exports, accounting for the largest share (21%) of extra-EU trade in 2007 (source: Eurostat). Third we find that, in terms of volumes and prices, new exports to the US behave similarly to new domestic products. In particular, if we regress log volumes of EU exports to the US on a dummy for new exported products, we obtain a coefficient (standard error) of -0.794 (0.036), while in a similar regression for log prices the coefficient equals 0.033 (0.019). These numbers are very close to those reported in columns 1 and 2 of Table 9.

Going back to our main question, in column 3 we regress the quality estimates on a dummy for new exports from the EU to the US, controlling for product and year effects. Since the quality estimates only have an ordinal meaning, we standardize the dependent variable to have zero mean and unitary variance. Moreover, since quality is estimated in a first stage, we report bootstrapped standard errors based on 100 replications. The results show that the quality of new products is significantly higher than that of existing goods. To provide additional evidence, we now use information on the 'ladder length' of each product, defined as the difference between the maximum and minimum quality of all its varieties. As argued by Khandelwal (2010), products with a longer ladder feature greater scope for quality differentiation. Accordingly, we

[39] If we exclude exiting products, the coefficients (standard errors) on New equal -0.697 (0.043) for quantities and 0.039 (0.016) for prices. If instead we focus on differentiated products (Rauch, 1999) to mimic the estimation sample used in the subsequent analysis on quality, the coefficients (standard errors) on New equal -0.766 (0.066) and 0.051 (0.028), respectively.

[40] Differentiated products are identified by Khandelwal using Rauch's (1999) classification.

[41] To this purpose, we work at the 6-digit level of product aggregation, at which the CN and HS classifications coincide. To aggregate the quality estimates at that level, we take medians within partners, years and 6-digit product codes. We limit the analysis to products with unique measurement unit.

expect the previous results to hold stronger for long-ladder products. To test this conjecture, we reestimate our specification separately on two subsets of goods, characterized by long and short quality ladders, respectively. In particular, we define the former (latter) subset as containing all products with ladder length above (below) the median.[42] The results are in columns 4 and 5. Strikingly, the estimated coefficient is positive, large, and highly significant for long-ladder products, whereas it is very small and imprecise for short-ladder goods. Overall, the results of this section suggest that new products are upgraded, as they exhibit higher prices and higher quality compared to existing goods.

6 Conclusion

We studied how new imported inputs affect the introduction of new domestic products. To this purpose, we constructed a novel data set covering 25 EU countries over 1995-2007 and containing information on domestic production and bilateral trade for the universe of products. We developed a procedure for identifying new domestic goods and new imported inputs, while accommodating the yearly changes in the commodity classifications. We showed that new imported inputs foster the introduction of new domestic products. To investigate the mechanisms behind this effect, we constructed novel estimates of quality for all input varieties imported by each country. We found the effect of new imported inputs to be stronger the higher their quality and the lower their price (conditional on quality). Finally, we documented that new products sell at higher prices compared to existing goods, and possess higher quality.

These results may bear some interesting policy implications. In particular, they are at odds with the widespread concern that ever increasing imports can only harm the manufacturing sector of industrialized countries. On the contrary, our results suggest that favoring trade in intermediates may be an effective strategy to stimulate the introduction of new goods and thus boost output growth. Moreover, our findings suggest that new imported inputs may facilitate the shift of manufacturing toward the production of vertically-superior goods, thereby reducing the exposure of domestic industries to the competitive pressure of low-wage countries.

In closing, we suggest a number of directions for future research. First, the use of firm-level data can provide further insight into how new imported inputs affect the economic performance of individual firms. Second, a rigorous welfare analysis (which is beyond the scope of this paper) can improve our understanding of the overall gains from new imported inputs. Finally, the paucity of suitable data has so far hampered empirical research on several issues related to this paper, such as the effects of new products on income inequality and the role of vertical differentiation for the pattern of trade. We hope that our novel data will stimulate research on these and other important topics.

[42] Data on quality ladders is sourced from Khandelwal (2010).

A Quality Estimation

To construct the variable $QNew$ used in Section 4, we need time-varying estimates of quality for all input varieties imported by each country. We obtain these estimates using the methodology proposed by Khandelwal (2010). In this section, we heavily build on his work to explain this approach. In period t, the demand for variety v has the following expression:[43]

$$\ln(s_{vt}) - \ln(s_{0t}) = \lambda_v + \lambda_t + \alpha \ln p_{vt} + \sigma \ln(ns_{vt}) + \gamma \ln pop_{nt} + \lambda_{vt}. \tag{7}$$

s_{vt} is variety v's market share in the corresponding industry and is defined as q_{vt}/MKT_t, where q_{vt} is the quantity of v and $MKT_t \equiv \sum_v q_{vt}/(1 - s_{0t})$. s_{0t} is the market share of an outside variety (domestic product), which is set to 1 minus import penetration in the industry.[44] p_{vt} is the price (c.i.f. unit value) of variety v. $ns_{vt} \equiv q_{vt}/\sum_{v \in p} q_{vt}$ is variety v's share in the corresponding 8-digit product (the nest share); this variable prevents the quality estimates from being influenced by the higher substitutability of varieties within products than across products. pop_{nt} is partner n's population, which controls for hidden varieties.[45] Quality is given by $\widetilde{\lambda}_{vt} \equiv \lambda_v + \lambda_t + \lambda_{vt}$, where the variety fixed effect (λ_v) captures the time-invariant valuation of v, the year fixed effect (λ_t) captures the secular time trend common to all varieties, and the residual (λ_{vt}) captures shocks to the valuation of v occurring in year t.

We estimate three different versions of eq. (7), separately on each 4-digit industry in each country. The first, and preferred, version is estimated by 2SLS, using the subsample of imported inputs. The second version is estimated by OLS using the same subsample. The third version is estimated by 2SLS, using the whole sample of imported varieties (i.e. including also final products). 2SLS estimation accounts for possible correlation of p_{vt} and ns_{vt} with λ_{vt}. Similar to Khandelwal (2010), we use the following instruments: number of varieties within product p; number of varieties exported by partner n; and interactions of distance from n with both oil prices (Brent) and product-specific transportation costs.[46] For estimation, we exclude varieties with extreme unit values (below the 5^{th} or above the 95^{th} percentile of the distribution within each industry, as in Khandelwal, 2010); moreover, we restrict to industries in which there are at

[43] This expression is derived under the nested logit framework introduced by Berry (1994). We omit country and industry subscripts, as the specification refers to each 4-digit industry in each country.

[44] Import penetration is defined as imports over the sum of imports plus output. We calculate import penetration in each country, 4-digit industry and year, using import and turnover data from Eurostat.

[45] Partner n could export different subproducts of p, classified under more detailed categories (e.g. colors) than available in the trade data. These 'hidden varieties' would increase the market share of v, even if all subproducts had the same quality as the exports of p from other partners. Population size controls for hidden varieties; together with the nest share, it thus accommodates differences in horizontal characteristics across products. We draw population data from the World Development Indicators.

[46] For any pair of countries, distance is the population-weighted number of kilometers between their largest cities (source: CEPII). To compute product-level transportation costs, we start from variety-specific, unit transportation costs for the US (sourced from Feenstra, Romalis and Schott, 2002). We regress these costs on partner fixed effects, to remove the influence of distance from the US. Then, we take the average of the residuals within 6-digit products, across all trading partners of the US.

least 20 varieties with two or more observations.

Table A1 summarizes the results. Each column refers to a different version of eq. (7), as indicated at the bottom of the table. We perform 3,268 separate regressions when working on the subsample of intermediate inputs (columns 1 and 2), and 4,205 when working on the whole sample of products (column 3). Overall, we use 10 million observations in the first case and 15 million in the second. The median numbers of observations per estimation are 1,651 and 1,959, respectively, whereas the median numbers of varieties per estimation are 460 and 552. The median coefficient on ns_{vt} is always positive, the median price elasticity always negative. Interestingly, the price elasticity is substantially lower when estimated by 2SLS than by OLS (see columns 1 and 2), suggesting that the instruments move the coefficient on p_{vt} in the expected direction. This pattern of results closely matches that of Khandelwal (2010). More importantly, our estimates are also similar in size to those obtained by the author; indeed, Khandelwal reports a median 2SLS estimate of -0.58 for the price elasticity and of 0.46 for the coefficient on the nest share.

Using the estimated parameters, we compute five different measures of quality. Our preferred measure is based on the estimates in column 1. The first alternative is also based on column 1, but excludes the residuals from the expression of $\widetilde{\lambda}_{vt}$. The second alternative uses the original expression for $\widetilde{\lambda}_{vt}$ combined with the OLS estimates in column 2. The third alternative is instead based on the estimates in column 3. Finally, the last alternative is obtained as the residual from a regression of our preferred measure on product fixed effects. Using these estimates of $\widetilde{\lambda}_{vt}$, we construct the variable $QNew$ as explained in the main text.

References

[1] Aghion, P. and Howitt, P., 1992, "A Model of Growth through Creative Destruction," *Econometrica*, 60, pp. 323-351

[2] Aghion, P. and Howitt, P., 2005, "Growth with Quality-Improving Innovations: An Integrated Framework," in P. Aghion and S. Durlauf (eds.), *Handbook of Economic Growth*, pp. 67-110, Elsevier

[3] Amiti, M. and Khandelwal, A.K., 2010, "Import Competition and Quality Upgrading," *NBER Working Paper 15503*

[4] Amiti, M. and Konings, J., 2007, "Trade Liberalization, Intermediate Inputs, and Productivity: Evidence from Indonesia," *American Economic Review*, 97, pp. 1611-1638

[5] Arkolakis, C., Demidova, S., Klenow, P.J. and Rodriguez-Clare, A., 2008, "Endogenous Variety and the Gains from Trade," *American Economic Review: Papers and Proceedings*, 98, pp. 444-450

[6] Autor, D.H., Dorn, D. and Hanson, G.H., 2011, "The China Syndrome: Local Labor Market Effects of Import Competition in the United States," *Mimeo*, University of California San Diego

[7] Bas, M. and Strauss-Kahn, V., 2011, "Does Importing more Inputs Raise Exports? Firm Level Evidence from France," *CEPII Working Paper 2011-15*

[8] Bernard, A.B., Jensen, J.B., Redding, S.J. and Schott, P.K., 2009, "The Margins of US Trade," *American Economic Review: Papers and Proceedings*, 99, pp. 487-493

[9] Bernard, A.B., Redding, S.J. and Schott, P.K., 2010, "Multiple-Product Firms and Product Switching," *American Economic Review*, 100, pp. 70-97

[10] Bernard, A.B., Van Beveren, I. and Vandenbussche, H., 2010, "Multi-Product Exporters, Carry-Along Trade and the Margins of Trade," *National Bank of Belgium Working Paper 203*

[11] Berry, S., 1994, "Estimating Discrete-Choice Models of Product Differentiation," *RAND Journal of Economics*, 25, pp. 242-262

[12] Besedeš, T. and Prusa, T.J., 2011, "The Role of Extensive and Intensive Margins and Export Growth," *Journal of Development Economics*, 96, pp. 371-379

[13] Broda, C., Greenfield, J. and Weinstein, D., 2006, "Globalization and the Gains from Variety," *NBER Working Paper 12512*

[14] Broda, C., and Weinstein, D., 2004, "Variety Growth and World Welfare," *American Economic Review: Papers and Proceedings*, 94, pp. 139-144

[15] Broda, C., and Weinstein, D., 2006, "Globalization and the Gains from Variety," *Quarterly Journal of Economics*, 121, pp. 541-585

[16] Broda, C., and Weinstein, D., 2010, "Product Creation and Destruction: Evidence and Price Implications," *American Economic Review*, 100, pp. 691-723

[17] Card, D., 2001, "Immigrant Inflows, Native Outflows and the Local Labor Market Impacts of Higher Immigration," *Journal of Labor Economics*, 19, pp. 22-61

[18] Debaere, P. and Mostashari, S., 2010, "Do Tariffs Matter for the Extensive Margin of International Trade? An Empirical Analysis," *Journal of International Economics*, 81, pp. 163-169

[19] Ethier, W., 1979, "Internationally Decreasing Costs and World Trade," *Journal of International Economics*, 9, pp. 1-24

[20] Ethier, W., 1982, "National and International Returns to Scale in the Modern Theory of International Trade," *American Economic Review*, 72, pp. 389-405

[21] Feenstra, R.C., 1994, "New Product Varieties and the Measurement of International Prices," *American Economic Review*, 84, pp. 157-177

[22] Feenstra, R.C., 1998, "Integration of Trade and Disintegration of Production in the Global Economy," *Journal of Economic Perspectives*, 12, pp. 31-50

[23] Feenstra, R.C., 2010, *Offshoring in the Global Economy: Microeconomic Structure and Macroeconomic Implications (Ohlin Lectures)*, MIT Press, Cambridge, MA and London

[24] Feenstra, R.C. and Hanson, G.H., 2003, "Global Production Sharing and Rising Inequality: A Survey of Trade and Wages," in K. Choi and J. Harrigan (eds.) *Handbook of International Economics*, pp. 146-185, Basil Blackwell

[25] Feenstra, R.C., Madani, D., Yang, T. and Liang, C., 1999, "Testing Endogenous Growth in South Korea and Taiwan," *Journal of Development Economics*, 60, pp. 317-341

[26] Feenstra, R.C., Markusen, J.R. and Zeile, W., 1992, "Accounting for Growth with New Inputs: Theory and Evidence," *American Economic Review: Papers and Proceedings*, 82, pp. 415-421

[27] Feenstra, R.C., Romalis, J. and Schott, P.K., 2002, "U.S. Imports, Exports and Tariff Data," *NBER Working Paper 9387*

[28] Gancia, G. and Zilibotti, F., 2005, "Horizontal Innovation in the Theory of Growth and Development," in P. Aghion and S. Durlauf (eds.), *Handbook of Economic Growth*, pp. 111-170, Elsevier

[29] Goldberg, P.K., Khandelwal, A.K., Pavcnik, N. and Topalova, P., 2009, "Trade Liberalization and New Imported Inputs," *American Economic Review: Papers and Proceedings*, 99, pp. 494-500

[30] Goldberg, P.K., Khandelwal, A.K., Pavcnik, N. and Topalova, P., 2010a, "Imported Intermediate Inputs and Domestic Product Growth: Evidence from India," *Quarterly Journal of Economics*, 125, pp. 1727-1767

[31] Goldberg, P.K., Khandelwal, A.K., Pavcnik, N. and Topalova, P., 2010b, "Multiproduct Firms and Product Turnover in the Developing World: Evidence from India," *Review of Economics and Statistics*, 92, pp. 1042-1049

[32] Grossman, G. and Helpman, E., 1990, "Trade, Innovation and Growth," *American Economic Review*, 80, pp. 86-91

[33] Grossman, G. and Helpman, E., 1991a, *Innovation and Growth in the Global Economy*, MIT Press, Cambridge, MA and London

[34] Grossman, G. and Helpman, E., 1991b, "Quality Ladders in the Theory of Growth," *Review of Economic Studies*, 58, pp. 43-61

[35] Halpern, L., Koren, M. and Szeidl, A., 2011, "Imported Inputs and Productivity," *Mimeo*, University of California Berkeley

[36] Hummels, D. and Klenow, P.J., 2005, "The Variety and Quality of a Nation's Exports," *American Economic Review*, 95, pp. 704-723

[37] Kasahara, H. and Lapham, B., 2009, "Productivity and the Decision to Import and Export: Theory and Evidence," *Mimeo*, Queen's Economics Department

[38] Kasahara, H. and Rodrigue, J., 2008, "Does the Use of Imported Intermediates Increase Productivity? Plant-Level Evidence," *Journal of Development Economics*, 87, pp. 106-118

[39] Kehoe, T.J. and Ruhl, K.J., 2009, "How Important is the New Goods Margin in International Trade?" *Mimeo*, University of Minnesota

[40] Khandelwal, A.K., 2010, "The Long and Short (of) Quality Ladders," *Review of Economic Studies*, 77, pp. 1450-1476

[41] Khandelwal, A.K. and Topalova, P., 2011, "Trade Liberalization and Firm Productivity: The Case of India," *Review of Economics and Statistics*, 93, pp. 995-1009

[42] Kugler, M. and Verhoogen, E., 2009, "Plants and Imported Inputs: New Facts and an Interpretation," *American Economic Review: Papers and Proceedings*, 99, pp. 501-507

[43] Kugler, M. and Verhoogen, E., 2011, "Prices, Plant Size, and Product Quality," *Review of Economic Studies*, forthcoming

[44] Markusen, J.R., 1989, "Trade in Producer Services and in Other Specialized Intermediate Inputs," *American Economic Review*, 77, pp. 85-95

[45] Muendler, M.A., 2004, "Trade, Technology and Productivity: A Study of Brazilian Manufacturers 1986-1998," *CESifo Working Paper 1148*

[46] Ottaviano, G.I.P., Peri, G. and Wright, G.C., 2010, "Immigration, Offshoring and American Jobs," *NBER Working Paper 16439*

[47] Pierce, J.R. and Schott, P.K., 2011, "Concording U.S. Harmonized System Categories Over Time," *Journal of Official Statistics*, forthcoming

[48] Rauch, J.E., 1999, "Networks versus Markets in International Trade," *Journal of International Economics*, 48, pp. 7-35

[49] Rivera-Batiz, L.A. and Romer, P.M., 1991, "Economic Integration and Endogenous Growth," *Quarterly Journal of Economics*, 106, pp. 531-555

[50] Romer, P.M., 1987, "Growth Based on Increasing Returns due to Specialization," *American Economic Review*, 77, pp. 56-62

[51] Romer, P.M., 1990, "Endogenous Technological Change," *Journal of Political Economy*, 95, pp. S71-S102

[52] Segerstrom, P.S., 1998, "Endogenous Growth without Scale Effects," *American Economic Review*, 88, pp. 1290-1310

[53] Segerstrom, P.S., Anant, C.A. and Dinopoulos, E., 1990, "A Schumpeterian Model of the Product Life Cycle," *American Economic Review*, 80, pp. 1077-1091

[54] Sivadasan, J., 2009, "Barriers to Competition and Productivity: Evidence from India," *B.E. Journal of Economic Analysis & Policy*, 9, Advances, article 42

[55] Staiger, D. and Stock, J.H., 1997, "Instrumental Variables Regression with Weak Instruments," *Econometrica*, 65, 557-586

[56] Xiang, C., 2005, "New Goods and the Relative Demand for Skilled Labor," *Review of Economics and Statistics*, 87, pp. 285-298

Table 1 - Stylized Facts

a) Entry and Exit Rates

Entry	Exit
Domestic products	
5.0	4.8
All imported varieties	
13.2	10.5
Imported varieties of intermediate inputs	
13.1	10.6

b) Decomposition of the Growth Rates of Production and Import Value

Growth Rate	New	Exiting	Continuing
	Domestic production		
9.4	2.3	-1.6	8.6
100.0	*24.8*	*-16.5*	*91.7*
	Overall imports		
11.7	*2.0*	*-1.3*	*11.0*
100.0	*17.1*	*-10.7*	*93.5*
	Imports of intermediate inputs		
11.6	*2.3*	*-1.5*	*10.8*
100.0	*20.0*	*-12.7*	*92.7*

In panel a), *entry* is the ratio of new over total products (domestic goods or imported varieties, depending on the row); *exit* is defined accordingly. In panel b), the yearly growth rate of production (import) value is decomposed into the contributions of three sets of products (varieties): new, exiting and continuing. All figures are percentages, averaged across countries, industries and years. Intermediate inputs are defined in footnote 14. Source: Prodcom and Comext.

Table 2 - New Imported Inputs and the Introduction of New Products

Dependent variable: share of new domestic products in total domestic products, *NP*

	(1)	(2)	(3)	(4)
NII_{t-1}	0.122***	0.245***	0.404***	
	[0.018]	[0.028]	[0.050]	
$NIIov_{t-1}$				0.574***
				[0.065]
Obs.	33586	18256	4475	4619
R2	0.07	0.07	0.11	0.11
Industry aggregation	NACE 4	NACE 3	NACE 2	NACE 2

NII is the ratio of new over total imported inputs within each industry. *NIIov* is the ratio of new over total imported inputs from all industries; it is constructed as the weighted average of *NII* using country-specific Import Matrix coefficients (see eq. (3)). All specifications are estimated by OLS and control for country-industry and year effects. Standard errors are corrected for clustering within country-industry pairs. ***, **, * = indicate significance at the 1, 5 and 10% level, respectively.

Table 3 - Alternative Variable Definitions and Estimation Methods

Dependent variable: share of new domestic products in total domestic products, *NP* (unless otherwise indicated)

	Coeff.	Std. Err.	Obs.	R2
a) Trimming	0.623***	[0.080]	3079	0.13
b) Using average weights from Use matrices	0.578***	[0.067]	4682	0.11
c) Using yearly weights from Use matrices	0.586***	[0.066]	4043	0.12
d) Excluding capital goods, fuel and lubrificants	0.513***	[0.063]	4619	0.11
e) Considering only codes that are always present in the PC classification	0.510***	[0.065]	4576	0.15
f) Excluding the first three years of observations for each country	0.307***	[0.072]	3311	0.09
g) Constructing variables using values	1.148***	[0.427]	2683	0.09
h) Pooled Tobit	0.906***	[0.072]	4619	-
i) Fixed-effect Poisson *(dep. var.: count of new products; expl. var.: lagged count of new imported inputs)*	0.001***	[0.000]	4526	-

Unless otherwise indicated, the explanatory variable is $NIIov_{t-1}$. Panel a) excludes the extreme tails (1%) of the distributions of *NP* and *NIIov*. Panels b) and c) reconstruct *NIIov* using average and yearly weights from the Use Matrices. Panel d) uses a narrower definition of intermediate inputs, which excludes capital goods, fuel and lubrificants. In panel e), *NP* is reconstructed using only the 3,098 codes that are present in the PC classification along the entire sample period. In panel g), the variables are the shares of new domestic products and new imported inputs in the value of domestic production and intermediate imports, respectively. All specifications control for country-industry and year effects, except for panel h), which only includes year dummies. Standard errors are always corrected for clustering within country-industry pairs. The level of industry aggregation is always NACE2. ***, **, * = indicate significance at the 1, 5 and 10% level, respectively. See also notes to previous tables.

Table 4 - Controls for Industry and Country Characteristics

Dependent variable: share of new domestic products in total domestic products, *NP*

Industry-Level Controls	(1)	(2)	Country-Level Controls	(3)	(4)
$NIIov_{t-1}$	0.391***	0.622***	$NIIov_{t-1}$	0.411***	0.174**
	[0.069]	[0.071]		[0.068]	[0.087]
ln $Size_{t-1}$	0.006		ln Per capita GDP_{t-1}	-0.281***	
	[0.021]			[0.052]	
ln Capital $intensity_{t-1}$	0.022*		Per capita GDP $growth_{t-1}$	1.151***	
	[0.011]			[0.230]	
ln Material $intensity_{t-1}$	0.029		ln $Population_{t-1}$	2.016***	
	[0.025]			[0.275]	
ln Labor $productivity_{t-1}$	-0.023		ln Real exchange $rate_{t-1}$	0.169***	
	[0.030]			[0.043]	
ln Import $penetration_{t-1}$	0.025*		Trade-GDP $ratio_{t-1}$	0.075***	
	[0.014]			[0.027]	
High-tech capital $share_{t-1}$	0.050		Gross fixed capital	-0.668***	
	[0.067]		formation over GDP_{t-1}	[0.172]	
Country-industry effects	yes	yes	Country-industry effects	yes	yes
Year effects	yes	no	Year effects	yes	no
Industry-year effects	no	yes	Country-year effects	no	yes
Obs.	3266	4619	Obs.	4098	4619
R2	0.11	0.31	R2	0.15	0.53

Size is the number of employees. *Capital intensity* is capital expenditure per worker. *Material intensity* is material expenditure per worker. *Labor productivity* is value added per employee. *Import penetration* is the ratio of imports over the sum of output and imports. *High-tech capital share* is the share of high-tech capital in total capital investment. Standard errors are corrected for clustering within country-industry pairs. ***, **, * = indicate significance at the 1, 5 and 10% level, respectively. See also notes to previous tables.

Table 5 - Other Concomitant Factors

Dependent variable: share of new domestic products in total domestic products, *NP*

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$NIIov_{t-1}$	0.556***	0.574***	0.661***	0.521***	0.570***	0.666***	0.586***
	[0.066]	[0.068]	[0.085]	[0.085]	[0.064]	[0.088]	[0.095]
Total imported inputs $(value)_{t-1}$	-0.134*						-0.048
	[0.079]						[0.078]
Total imported inputs $(varieties)_{t-1}$		0.009					-0.013
		[0.243]					[0.230]
New domestic $inputs_{t-1}$			0.076***				0.069***
			[0.020]				[0.020]
New imported final $goods_{t-1}$				0.067			0.062
				[0.083]			[0.081]
Exiting $products_{t-1}$					-0.036		-0.060**
					[0.025]		[0.028]
Exiting inputs $(domestic)_{t-1}$						-0.083	-0.087
						[0.070]	[0.071]
Exiting inputs $(imported)_{t-1}$						0.080	0.077
						[0.094]	[0.090]
Obs.	4619	4619	4148	4619	4584	4152	4114
R2	0.11	0.11	0.11	0.11	0.12	0.10	0.11

Control variables are defined as follows (same order as in the table): share of total imported inputs in overall import value (weighted by Import Matrix coefficients); share of total imported inputs in overall number of imported varieties (weighted by Import Matrix coefficients); share of new domestic inputs in total domestic inputs (weighted by Use Matrix coefficients); share of new over total imported final goods (weighted by Import Matrix coefficients); share of exiting products in total domestic products; shares of exiting inputs in total domestic inputs or imported intermediates (weighted by Use and Import Matrix coefficients, respectively). All specifications control for country-industry and year effects. Standard errors are corrected for clustering within country-industry pairs. ***, **, * = indicate significance at the 1, 5 and 10% level, respectively. See also notes to previous tables.

Table 6 - Heterogeneity

Dependent variable: share of new domestic products in total domestic products, *NP*

	EU15 vs. New EU Members	Imports from OECD vs. Non-OECD Countries
	(1)	(2)
$NIIov_{t-1}$	0.264***	
	[0.062]	
$NIIov_{t-1}$ * Indic for New EU Members	0.488***	
	[0.109]	
$NIIov_{t-1}$		0.636***
(Imports from OECD countries)		[0.115]
$NIIov_{t-1}$		0.417**
(Imports from non-OECD countries)		[0.178]
Obs.	4619	4619
R2	0.12	0.11

In column 1, *NIIov* is interacted with a dummy for the ten countries that joined the EU after 1995. In column 2, *NIIov* is divided into two separate regressors, constructed using imports from OECD and non-OECD countries, respectively. Both specifications control for country-industry and year effects. Standard errors are corrected for clustering within country-industry pairs. ***, **, * = indicate significance at the 1, 5 and 10% level, respectively. See also notes to previous tables.

Table 7 - Identification

Dependent variable: share of new domestic products in total domestic products, *NP*

	a) IV Regressions									b) Trade Shocks			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
$NIIov_{t-1}$	0.973***	1.067***	0.835***	0.922***	0.753***	0.809***	0.799***	0.967***	0.726***	0.897***	1.052***	0.109	-0.417
	[0.099]	[0.124]	[0.133]	[0.146]	[0.133]	[0.148]	[0.169]	[0.203]	[0.111]	[0.097]	[0.130]	[0.083]	[0.412]
$NIIov_{t-1}$ * Indic for Euro adoption												0.461***	
												[0.095]	
$NIIov_{t-1}$ * Indic for EU accession													0.807***
													[0.143]
Obs.	4613	4613	4613	3956	4396	3958	3084	4613	4613	4613	4613	2726	1156
R2	0.10	0.09	0.11	0.10	0.11	0.10	0.11	0.05	0.11	0.004	0.04	0.12	0.24
IV Statistics													
F-statistic for excluded instruments	326.7	908.9	653.5	507.6	623.4	667.5	480.4	180.0	762.3	37.6	16.0	-	-
Hansen test, *p*-value	0.15	-	-	-	-	-	-	-	-	0.22	0.55	-	-
Specification, Instruments and Estimator													
Specification	Baseline	Baseline	Baseline	Excl. NACE 26-28	Excl. NACE 30	Excl. NACE 17-19	Excl. NACE 17-19, 26-28, 30	Inputs with large tariff cuts	Baseline	Inputs from new WTO members	Inputs from China	Euro area countries	New EU members
Instruments	US imp. inputs and input tariffs	US input tariffs	US imp. inputs	US imp. inputs	US imp. inputs	US imp. inputs	US imp. inputs	US imp. inputs (with large tariff cuts)	Shift-share	US imp. inputs and input tariffs (from new WTO members)	US imp. inputs and input tariffs (from China)		
Estimator	2SLS	2SLS	2SLS	2SLS	2SLS	2SLS	2SLS	2SLS	2SLS	2SLS	2SLS	OLS	OLS

The indicators for Euro adoption and EU accession are equal to 1 in each country both in the year of the shock and in subsequent periods. All specifications control for country-industry and year effects. Standard errors are corrected for clustering within country-industry pairs. ***, **, * = indicate significance at the 1, 5 and 10% level, respectively. See also notes to previous tables.

Table 8 - Channels

Dependent variable: share of new domestic products in total domestic products, *NP*

	(1)	(2)	(3)	(4)	(5)	(6)
$NIIov_{t-1}$	0.385**	0.010	0.013	0.095	0.010	0.021
	[0.150]	[0.181]	[0.182]	[0.189]	[0.180]	[0.182]
		[0.208]	[0.208]	[0.210]	[0.201]	[0.205]
$NIIov_{t-1}$ * $PNew_{t-1}$	0.312*	-1.207***	-1.168***	-0.806***	-1.059***	-1.068**
	[0.181]	[0.346]	[0.341]	[0.303]	[0.289]	[0.538]
		[0.330]	[0.324]	[0.312]	[0.283]	[0.477]
$PNew_{t-1}$	-0.037	0.120***	0.117***	0.080**	0.107***	-0.195***
	[0.026]	[0.038]	[0.038]	[0.034]	[0.034]	[0.074]
		[0.038]	[0.037]	[0.036]	[0.034]	[0.077]
$NIIov_{t-1}$ * $QNew_{t-1}$		2.015***	1.966***	1.501***	1.857***	1.877***
		[0.468]	[0.461]	[0.413]	[0.402]	[0.620]
		[0.496]	[0.488]	[0.465]	[0.437]	[0.599]
$QNew_{t-1}$		-0.213***	-0.210***	-0.165***	-0.202***	0.099
		[0.057]	[0.056]	[0.054]	[0.052]	[0.062]
		[0.064]	[0.063]	[0.061]	[0.057]	[0.057]
Obs.	4262	4262	4262	4262	4262	4262
R2	0.12	0.13	0.13	0.12	0.13	0.12
Estimated quality	-	2SLS; sample: imp. inputs	2SLS; sample: imp. inputs. No residuals	OLS; sample: imp. inputs	2SLS; sample: all imp. varieties	2SLS; sample: imp. inputs. No prod. effects
Partial derivatives with respect to						
$NIIov_{t-1}$						
Average		0.650***	0.647***	0.673***	0.650***	0.649***
		[0.067]	[0.068]	[0.074]	[0.064]	[0.066]
10^{th} pctl		0.403***	0.403***	0.507***	0.434***	0.487***
		[0.087]	[0.075]	[0.072]	[0.064]	[0.105]
Median		0.674***	0.668***	0.690***	0.666***	0.666***
		[0.070]	[0.066]	[0.073]	[0.070]	[0.065]
90^{th} pctl		0.857***	0.849***	0.807***	0.840***	0.785***
		[0.098]	[0.097]	[0.092]	[0.092]	[0.084]
$Qnew_{t-1}$						
Average		0.067***	0.063***	0.043**	0.055***	0.065***
		[0.020]	[0.020]	[0.021]	[0.018]	[0.022]
$Pnew_{t-1}$						
Average		-0.048***	-0.045**	-0.031*	-0.040**	-0.049*
		[0.018]	[0.018]	[0.017]	[0.017]	[0.026]

PNew and *QNew* are the relative price and relative quality of new imported inputs. The quality estimates used to construct *QNew* are obtained by estimating eq. (7) separately on each country and 4-digit industry, and then summing the variety fixed effects, the time fixed effects, and the residuals from those regressions (except in column 3, where the residuals are excluded). All specifications in this table control for country-industry and year effects. The first standard error is analytical and corrected for clustering within country-industry pairs; the second standard error is bootstrapped (100 replications). The standard errors of the derivatives are computed using the bootstrapped standard errors of the parameters. ***, **, * = indicate significance at the 1, 5 and 10% level, respectively. See also notes to previous tables.

Table 9 - Characteristics of New Products

Dependent variables indicated in columns' headings

	Log Volume (1)	Log Price (2)	Quality (3)	Quality (4)	Quality (5)
New_t	-0.742***	0.041**	0.038***	0.073***	-0.004
	[0.041]	[0.016]	[0.014]	[0.020]	[0.005]
Obs.	180887	180887	91701	48218	43483
R2	0.74	0.87	0.16	0.14	0.41
Estimation sample	All domestic products	All domestic products	Exports from EU to US: all products	Exports from EU to US: long-ladder products	Exports from EU to US: short-ladder products

Columns 1 and 2: *New* is a dummy for new domestic products; the observations in the top and bottom deciles of the price distribution are excluded; the specifications control for product and country-year effects, and standard errors are corrected for clustering within country-product pairs. Columns 3-5: *New* is a dummy for new exported products from each of the 25 EU countries to the US; the dependent variable is normalized with zero mean and unitary variance; long-ladder products are goods with ladder length above the median, short-ladder products are defined accordingly; the specifications control for product and year effects, and standard errors are bootstrapped (100 replications); only products with unique measurement unit are used. ***, **, * = indicate significance at the 1, 5 and 10% level, respectively. See also notes to previous tables.

Table A1 - Summary Statistics on Quality Estimates

	(1)	(2)	(3)
Coefficient on price (median)	-0.805	-0.192	-0.774
Coefficient on nest share (median)	0.441	0.868	0.489
Observations per estimation (median)	1651	1651	1959
Varieties per estimation (median)	460	460	552
Total number of estimations	3268	3268	4205
Total observations across all estimations	10235679	10235679	15137129
Sargan test, *p*-value (median)	0.15	-	0.10
Estimator and estimation sample	2SLS; sample: imp. inputs	OLS; sample: imp. inputs	2SLS; sample: all imp. varieties

Table A2 - Data Availability

	Production Data	Trade Data	Import Matrices	Use Matrices
Austria	1995-2007	1995-2007	1995, 2000, 2005	1995, 1997, 1999-2006
Belgium-Luxemburg	1995-2007	1988-2007	1995, 2000, 2005	1995, 1997, 1999-2005
Bulgaria	2001-2007	1999-2007	-	2000-2004
Czech Republic	2001-2007	1999-2007	2005	1995-2007
Denmark	1995-2007	1988-2007	1995, 2000-2006	1995-2006
Estonia	2000-2007	1999-2007	1997, 2000, 2005	1997, 2000-2006
Finland	1995-2007	1995-2007	1995-2007	1995-2007
Germany	1995-2007	1988-2007	1995, 2000-2006	1995, 1997-2006
France	1995-2007	1988-2007	1995, 1997, 1999-2006	1995, 1997-2006
Greece	1995-2007	1988-2007	2000, 2005	2000-2008
Hungary	2001-2007	1999-2007	1998, 2000, 2005	1998-2006
Ireland	1995-2007	1988-2007	1998, 2000, 2005	1998, 2000-2006
Italy	1995-2007	1988-2007	1995, 2000, 2005	1995-2006
Latvia	2001-2007	1999-2007	1996, 1998	1996, 1998, 2004
Lithuania	2000-2007	1999-2007	2000, 2005	2000-2006
Netherlands	1995-2007	1988-2007	1995-2002, 2004-2006	1995-2006
Poland	2002-2007	1999-2007	2000, 2005	2000-2005
Portugal	1995-2007	1988-2007	1995, 1999, 2005	1995-2006
Romania	2000-2007	1999-2007	2000, 2003-2006	2000, 2003-2006
Slovakia	1998-2007	1999-2007	2000, 2005	1995-2006
Slovenia	2001-2007	1999-2007	1996, 2000, 2001, 2005	1996, 2000-2006
Spain	1995-2007	1988-2007	1995, 2000, 2005	1995-2006
Sweden	1995-2007	1995-2007	1995, 2000, 2005	1995-2006
United Kingdom	1995-2007	1988-2007	1995	1995-2003