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Trade differentiation and the characteristics of new imported and exported products – international panel data analysis

Summary

This paper documents changes in both quantity and quality of goods added to countries' trade baskets as countries develop. Drawing on product level (HS0, 6 digit) data on both imports and exports for a vast panel of international economies (163 countries, 1988–2010) we calculate the number of active and new product lines, as well as compute measures of their human capital and natural resource content. We find that strong activity at the extensive margin typical for low stages of development is associated with changes in the quality content of newly traded goods. Economic growth goes in line with the rise in the number of traded products and introduction of new goods with increasing human capital content and decreasing natural resource intensity.

Keywords: import, export, trade differentiation, diversification, economic growth

1. Introduction

Product differentiation plays a central role in many influential models of international trade[2]. Following the advances in new trade theory, enriching

[1] The author gratefully acknowledges financial support from Polish Ministry of Science and Higher Education and National Science Centre (NCN, research grant 2011/01/B/HS4/04759).

[2] P. Armington, *A theory of demand of for products distinguished by place of production*, "IMF Staff Papers" 1969, vol. 16, pp. 159–178; P. Krugman, *Scale Economies, Product*

Krugman's view on products variety through the models allowing for firm heterogeneity[3] empirical literature on trade diversity expanded rapidly in the recent years[4].

According to 'love of variety' approach a greater diversity of products brings about gains in terms of welfare. Richer economies tend to have more diversified trade structures: Funke and Ruhwedel[5] found that the variety of both exports and imports are positively correlated with per capita income across 19 OECD countries; additionally export diversity can play a role as a factor of economic growth[6]. Low differentiation of trade typical for low income countries implies smaller welfare gains, but also lower resistance to idiosyncratic shocks[7]. Consequently, many recent studies focus on changes visible in the diversity of trade structures which take place in the course of economic growth process[8].

This paper documents changes in both quantity and quality of goods added to countries' trade baskets as countries develop. We mutually examine the evolution of export and import portfolios. In particular, bearing in mind the division between alternative (intensive and extensive) margins of trade[9], we focus on the

Differentiation, and the Pattern of Trade, "American Economic Review" 1980, vol. 70(5), pp. 950–959; H. Flam, E. Helpman, *Vertical Product Differentiation and North – South Trade*, "American Economic Review" 1987, vol. 77(5), pp. 810–822; G.M. Grossman, E. Helpman, *Innovation and growth in the global economy*, MIT Press, Cambridge 1991; D. Acemoglu, J. Ventura, *The World Income Distribution*, "Quarterly Journal of Economics" 2002, vol. 117, pp. 659–694.

[3] M.J. Melitz, *The Impact of Trade on Intra-industry Reallocations and Aggregate Industry Productivity*, "Econometrica" 2003, vol. 71, pp. 1695–1725.

[4] See for a detailed survey: O. Cadot, C. Carrère, V. Strauss-Kahn, *Trade diversification, income, and growth: what do we know?*, "Journal of Economic Surveys" 2012, DOI: 10.1111/j.1467–6419.2011.00719.x.

[5] M. Funke, R. Ruhwedel, *Product Variety and Economic Growth: Empirical Evidence for the OECD Countries*, "IMF Staff Papers" 2001, vol. 48(2), pp. 225–242.

[6] H. Hesse, *Economic diversification and economic growth*, in: *Breaking into new markets. Emerging lessons for export diversification*, eds R. Newfamer, W. Shaw, P. Walkenhorst, The World Bank, Washington (DC) 2009.

[7] *Breaking into new markets. Emerging lessons for export diversification*, eds R. Newfamer, W. Shaw, P. Walkenhorst, The World Bank, Washington (DC) 2009.

[8] Among others: O. Cadot, C. Carrère, V. Strauss-Kahn, *Export diversification: what's behind the hump?*, "The Review of Economics and Statistics" 2011, vol. 93(2), pp. 590–605; M.R. Agosin, R. Alvarez, C. Bravo-Ortega, *Determinants of export diversification around the world: 1962–2000*, "The World Economy" 2012, vol. 35(3), pp. 295–315; A. Parteka, M. Tamberi, *What determines export diversification in the development process? Empirical assessment*, "The World Economy" 2013, DOI: 10.1111/twec.12064.

[9] *Intensive* margin of trade describes changes in the distribution of trade over a set of already traded goods, while *extensive* margin concerns changes in the set of products subject to trade (newly traded or disappearing goods). See for a detailed description of alternative

activity at the extensive margin reflected in the introduction of new products into the set of traded goods. Hummels and Klenow[10] find that the extensive margin (a wider variety of goods) accounts for around 60 percent of the greater exports of larger economies[11]. Several studies documented the crucial role of export survival as a factor explaining long run export performance[12], so in the analysis we draw particular attention to the ability of countries to sustain new trade relationships.

2. The data and panel composition

Empirical analysis presented in this short paper is based on product level database linking import and export statistics for 163 countries across the years 1988–2010. Statistics on the value of both trade flows (in current US$), classified according to HS0 6 digit division (theoretically including 5016 products out of which 4963 are considered in our study[13]), come from UN Comtrade retrieved through WITS[14]. This is the deepest product detail available for international comparisons – deeper disaggregation series are not harmonized and as such are not appropriate for cross-country studies. We use direct data for imports and mirrored data for exports[15].

margins' measurement: D. Hummels, P. Klenow, *The variety and quality of a nation's exports*, "American Economic Review" 2005, vol. 94(1), pp. 704–723.

[10] Ibidem.

[11] Besedes and Prusa and Helpman et al. underline the role played by the intensive margin; T. Besedeš, T.J. Prusa, *The role of extensive and intensive margins and export growth*, "Journal of Development Economics" 2011, vol. 96, pp. 371–379; E. Helpman, M. Melitz, Y. Rubinstein, *Estimating trade flows: trading partners and trading volumes*, "Quarterly Journal of Economics" 2008, vol. 123(2), pp. 441–487.

[12] T. Besedeš, T.J. Prusa, *Product differentiation and duration of U. S. import trade*, "Journal of International Economics" 2006, vol. 70(2), pp. 339–358; T. Besedeš, T.J. Prusa, *The role of extensive and intensive…*, op.cit.

[13] We had to exclude product lines which throughout the whole period of analysis were never reported by any country in the sample.

[14] WITS stands for World Integrated Trade Solutions which is a software which allows convenient upload of trade statistics from UNComtrade.

[15] See Parteka and Tamberi for a detailed description of the construction of the database employed to examine patterns of relative diversification of imported and exported products: A. Parteka, M. Tamberi, *Relative product diversification in the course of economic development: import-export analysis*, "Departmental Working Papers", vol. 2012–23, Department of Economics, Management and Quantitative Methods, Università degli Studi di Milano, Milan 2012.

In order to measure quality content of traded goods, we use Revealed Factor Intensity (RFI) Indices database from UNCTAD[16]. We consider two *RFI* indices: *rhci* – revealed human capital intensity index and *rnri* – revealed natural resource intensity index[17]. Importantly, these UNCTAD's *RFI* indices are available at the same level of disaggregation as our data (HS0 6 digit – subheadings), so we match them at the product level with our disaggregated import-export statistics[18]. It allows us to identify factor intensities of every single product which is visible in each country's trade basket and, later on, construct synthetic measures of new traded products' quality.

In the next step, on the base of product level statistics we compute synthetic measures of product diversity and quality which are obtained separately for each country and year (defined in the subsequent section). In other words, we pass from disaggregated data (with three level identification: product-reporting country-year) to the panel with country-year observations. This database is further enriched with income per capita (expressed in PPP terms, const 2005 international $) from World Bank's World Development Indicators

In Table 1 we show the composition of our final panel. It consist of 1905 observations for which it was possible to match product level import and export data with income per capita statistics. From the estimations we will drop outliers and extreme values (observations below 1st or above 99th percentile) so the actual number of countries and observations used in regressions is slightly smaller.

[16] See Shirotori et al. for a description: M. Shirotori, B. Tumurchudur, O. Cadot, *Revealed Factor Intensity Indices at the product level*, "Policy Issues in International Trade and Commodities Study Series" 2010, vol. 44. This database offers a time-series of indices approximating physical capital, human capital and natural resource intensity at the product level. The calculation of indices is based on modified Hausmann et al. (R. Hausmann, J. Hwang, D. Rodrik, *What you export matters*, "Journal of Economic Growth" 2007, vol. 12, pp. 1–25) methodology: for each good and relative factor (capital/labour, human capital and land/labour); The *RFI* indices are obtained as a weighted average of the relative factor abundance of the countries exporting that good (using a version of Balassa's Revealed Comparative Advantage indices as weights).

[17] Actually, UN Comtrade database on *RFI* provides three indices at the product level: *rpci* (Revealed Physical Capital Intensity), *rhci* – revealed human capital intensity index and *rnri* – revealed natural resource intensity index. However *rpci* and *rhci* result to be highly correlated, thus we use only *rhci* and *rnri*.

[18] Time series of *RFI* indices are available from 1988 to 2007 thus for the years 2008–2010 we use the values for 2007.

Table 1. Panel composition

		All countries	Countries divided by income group*	
			Developing countries	Developed countries
		(1)	(2)	(3)
Total No. of country-year obs.		1905	1120	785
Time span		1988–2010	1988–2010	1988–2010
No. of countries		163	115	48
No. of year obs. per country	Mean	11	10	16
	Min	1	1	1
	Max	23	22	23
No. of country obs. per year	Mean	82	48	34
	Min	11	2	9
	Max	130	85	45

Note: *Economies are divided according to 2010 GNI per capita, calculated using the World Bank Atlas method. Low income and middle income countries (where: low income, $1,005 or less; lower middle income, $1,006 – $3,975; upper middle income, $3,976 – $12,275) are classified by the World Bank as "developing countries". Developed countries correspond to the high income group ($12,276 or more).

Source: own elaboration.

3. Measures of product diversity and quality

In order to measure the differentiation (diversity) of products present in countries' trade portfolio, as well as their characteristics (i.e. quality) we use several product-level indicators. All of them are computed separately for export and import flows with the use of four dimensional import-export database (identification: *reporter*, *product*, *year*, *flow*). Throughout the paper we denote exports with X and imports with M so that $flow = \{X,M\}$,i refers to reporter country, k to product line and t to time period.

First of all, an *active* import (export) line is defined as product line with non-zero import (export) flow, respectively: in case of exports $active^{X}_{ikt} = 1$ if $X_{ikt} \neq 0$ and in case of imported goods: $active^{M}_{ikt} = 1$ if $M_{ikt} \neq 0$. By summing up the number of active lines (separately for every country and year) we obtain

a rough measures of traded products differentiation – N_{it}^{X} (total number of active export lines) and N_{it}^{M} (total number of active import lines)[19].

Additionally, we compute the identification of '*new* lines' (separately for import and export trade baskets) which are subsequently added to countries' trade portfolio. It has been shown[20] that trade relationships tend to be very dynamic, with many products being traded (and so appearing in trade statistics) in one year and not traded afterwards[21]. Consequently, in order to take this issue into account, we consider as *new* products only those 'successfully' (in terms of survival) added to trade basket.

First, we use the approach similar to that of Besedes and Prusa[22], where *new* product in export (import) basket of country i is defined as such if it was not exported (imported) in the prior year but is still exported (imported) in the following year. In case of exports $new(1)_{ikt}^{X} = 1$ if $(X_{ikt} \neq 0 \wedge X_{ikt-1} = 0 \wedge X_{ikt+1} \neq 0)$ and in case of imported goods: $new(1)_{ikt}^{M} = 1$ if $(M_{ikt} \neq 0 \wedge M_{ikt-1} = 0 \wedge M_{ikt+1} \neq 0)$. Consequently, the first definition of new products is based on one-year cutoff and three-year moving window to define the spell. By summing up the number of new products for a given country and year we obtain $Nnew(1)_{it}^{X}$ (total number of new export lines) and $Nnew(1)_{it}^{M}$ (total number of new import lines), both corresponding to the first definition of new lines.

Secondly, we consider relatively more stringent definition based on Cadot et al.[23] New exported products are defined as those products that were not active in country's export portfolio in the preceding two years but were exported in the subsequent two years – in this definition a moving five-year window is adop-

[19] Alternatively the literature focusing on trade diversification often employs measures based on concentration or inequality indices. See Cadot et al. (O. Cadot, C. Carrère, V. Strauss-Kahn, *Export diversification*…, op.cit.) for the analysis performed with Theil index of export concentration or Agosin et al. (M.R. Agosin, R. Alvarez, C. Bravo-Ortega, op.cit.) for evidence based on Herfindahl and Gini indices. In particular, the former study proposes a useful decomposition of the Theil index into intensive and extensive margins'components.

[20] T. Besedeš, T.J. Prusa, *Product differentiation and duration of U. S. import trade*, "Journal of International Economics" 2006, vol. 70 (2), pp. 339–358; V. Nitsch, *Die another day: duration in German import trade*, "Review of World Economics" 2009, vol. 145 (1), pp. 135–154.

[21] Besedes and Prusa (T. Besedeš, T.J. Prusa, *Product differentiation*…, op.cit.) analyse U. S. import relationships, half of which appear to be observed for a single year only. Hess and Persson (W. Hess, W. Persson, *Exploring the duration of EU imports*, "Review of World Economics" 2011, vol. 147 (4), pp. 665–692) find that the median duration of EU imports is also 1 year, while almost 60% of all spells cease during the first year of service, and less than 10% survive the first 10 years (which is logical once globalization process and rapid technological change are taken into account).

[22] T. Besedeš, T.J. Prusa, *Product differentiation*…, op.cit.

[23] O. Cadot, C. Carrère, V. Strauss-Kahn, *Export diversification*…, op.cit.

ted. Formally, in case of exports $new(2)^{X}_{ikt} = 1$ if $(X_{ikt} \neq 0 \wedge X_{ikt-1} = 0 \wedge X_{ikt-2} = 0 \wedge X_{ikt+1} \neq 0 \wedge X_{ikt+2} \neq 0)$ and in case of imported goods: $new(2)^{M}_{ikt} = 1$ if $(M_{ikt} \neq 0 \wedge M_{ikt-1} = 0 \wedge M_{ikt-2} = 0 \wedge M_{ikt+1} \neq 0 \wedge M_{ikt+2} \neq 0$[24].

To approximate qualitative aspect of product diversification process, for each country and year we calculate weighted mean of Revealed Factor Intensities (RFI, namely *rhci* and *rnri* indices) from UNCTAD[25] across *new* imported (exported) lines, weighted by the share of each new product in the import (or export) portfolio of a country. As a result we obtain two synthetic country specific measures of factor intensity (referring to human capital and natural resources) typical for products which have been successfully added to the trade portfolio.

Formally, average human capital content of *new* exported (*X*) products is obtained as:

$$HC_{it}^{newX} = \sum_{\kappa=1}^{K} rhci_{\kappa t} s^{X}_{i\kappa t} , \tag{7a}$$

where κ refers to new product (identified according to the aforementioned definition of Besedes and Prusa[26]), *i* to country and *t* to time period, $rhci_{\kappa t}$ denotes the value of revealed human capital intensity index (distinct for each product and year) and $s^{M}_{i\kappa t}$ is the share of new exported good κ in total exports. Similarly, in case of imports average human capital content of *new* imported (*M*) products is calculated as:

$$HC_{it}^{newM} = \sum_{\kappa=1}^{K} rhci_{\kappa t} s^{M}_{i\kappa t} . \tag{7b}$$

In the same way we calculate average natural resource content of *new* imported and *new* exported products:

$$NR_{it}^{newM} = \sum_{\kappa=1}^{K} rnri_{\kappa t} s^{M}_{i\kappa t} , \tag{8a}$$

[24] When we calculate the number of new product lines, on country-year basis, we exclude from our analysis the observations corresponding to the first year in which country imports are reported in UN Comtrade database (artificially this would result in a large number of "new" products added to the country portfolio). Obviously, the adopted definitions of 'new products" (3-year or 5-year moving window) also result in the truncation of the observed period, and the total number of observations is lower than the number of all observations in the panel.

[25] M. Shirotori, B. Tumurchudur, O. Cadot, op.cit.

[26] T. Besedeš, T.J. Prusa, *Product differentiation*…, op.cit.

$$NR_{it}^{newX} = \sum_{\kappa=1}^{K} rnri_{\kappa t} s_{i\kappa t}^{X}, \tag{8b}$$

with $rnri_{\kappa t}$ denoting the value of revealed natural resource intensity index.

4. Descriptive evidence

In Table 2 we show average values of indicators concerning the number of active lines in countries' import (export) portfolio, the number of new lines (two alternative definitions defined above) and crucial characteristics concerning countries' income per capita levels, *GDPpc* and size (measured alternatively in terms of population, *POP* or aggregate production, *GDP*).

Focusing first on the differences between imports and exports, it is clear that export baskets are less heterogeneous in terms of product variety than import baskets ($N_{it}^{M} > N_{it}^{X}$, such a tendency holds also within subgroups of countries divided according to the development level and listed in columns 2 and 3 of Table 2). Product heterogeneity of imports is much higher than that of exports: also in case of low income countries. Consequently, there is room for activity at the extensive margin of exports and the process of adding new lines to the export portfolio is more pronounced than in case of imports: depending on the definition of new products used (clearly, bigger numbers are obtained with the measure based on one-year cutoff: $Nnew(1)_{it}^{M} > Nnew(2)_{it}^{M}$; $Nnew(1)_{it}^{X} > Nnew(2)_{it}^{X}$). On average countries from our sample (column 1) are characterized by 182 (or 68) new exported products added annually, compared to only 89 (or 35) in case of imports portfolio.

Turning back to the number of new products, clearly developing countries expand their import and export portfolio by adding new lines. Sticking to less stringent definition of new lines in line with Besedes and Prusa[27], $Nnew(1)_{it}^{M}$ and $Nnew(1)_{it}^{X}$, developing countries (column 2 of Table 2) add on average 114 new import lines and 205 new export lines annually. For developed countries (column 3 of Table 2) these values are, respectively, equal to 60 and 150. So, developed countries continue to expand the set of traded goods but the diversification process is much less pronounced than in case of countries at lower stage of economic development.

[27] Ibidem.

Table 2. Number of imported/exported products and new import/export lines – average values (overall and by income group)

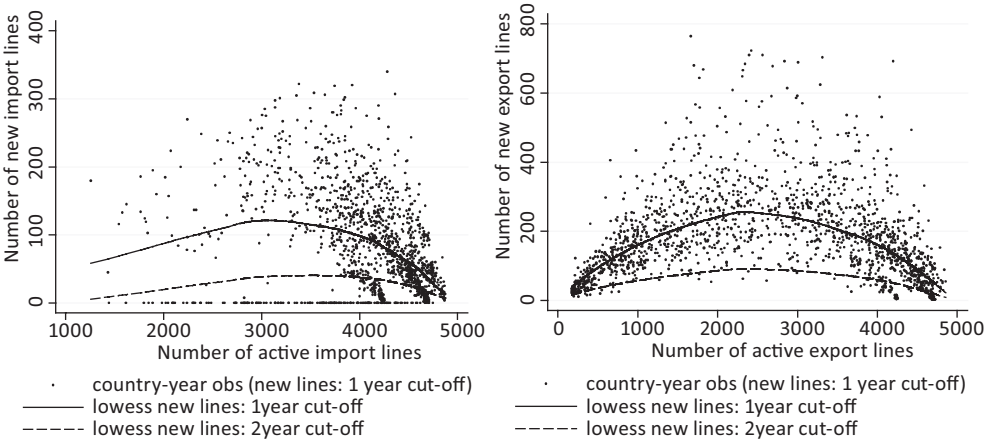
	All countries	Countries divided by income group*	
		Developing	Developed
	(1)	(2)	(3)
GDPpc [PPP, const.2005 int.USD]	14291	5474	26871
POP [mln]	48,401	64,344	25,716
GDP [mld, PPP, const.2005 int.USD]	4.7	2.6	7.7
Imports:			
N_{it}^{M}	3917	3658	4288
$Nnew(1)_{it}^{M}$	89	114	60
$Nnew(2)_{it}^{M}$	35	43	26
Exports:			
N_{it}^{X}	2686	2030	3623
$Nnew(1)_{it}^{X}$	182	205	150
$Nnew(2)_{it}^{X}$	68	75	58

Note: average values across country-year observations; *country division as in Table 1.

Source: own elaboration based on trade data from UN Comtrade, *GDPpc*, *POP* and *GDP* from World Bank's WDI.

Figure 1 and Figure 2 add another observation on the comparison between the expansion of the sets of imported and exported products. We plot the relationship between the number of *active* import (export) lines and *new* import (export) lines added annually to the trade portfolio (lines correspond to lowess[28] approximations based on country-year data points, obtained with the two alternative measures of new products). After having covered approx. half of the potential set of traded goods (4963 lines), the number of new product lines added to both import and export baskets starts to decrease. It holds for both flows. However, given that imports are typically more diversified than exports (Table 2), we can observe that the prevalent mass of country-year data points is located on the decreasing part of inverted U-shape import curve (Figure 1, left plot) while the process of adding new lines to export portfolio is much more symmetric and there are also many countries with very strong activity at the extensive margin of trade (Figure 1, right plot).

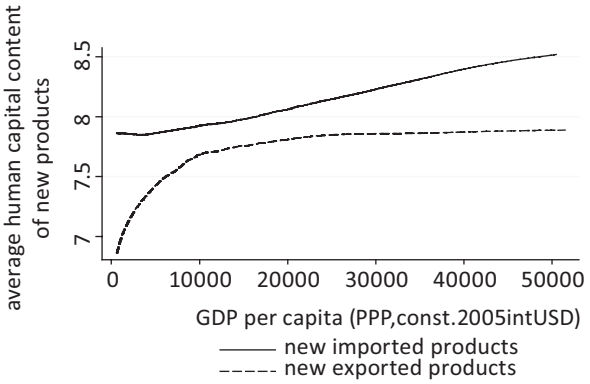
[28] Lowess stands for 'locally weighted scatterplot smoother'.



Note: lowess – span = 0.8, sample without outliers defined as observations below 1st or above 99th percentile (number of obs. = 1828). Theoretical max of active lines: 4963.

Figure 1. The number of new products with respect to the number of active lines in trade portfolio (left plot: imports, right plot: exports)

Source: own elaboration with trade data from UN Comtrade (HS0, 6 digit) and income per capita from World Bank's WDI.



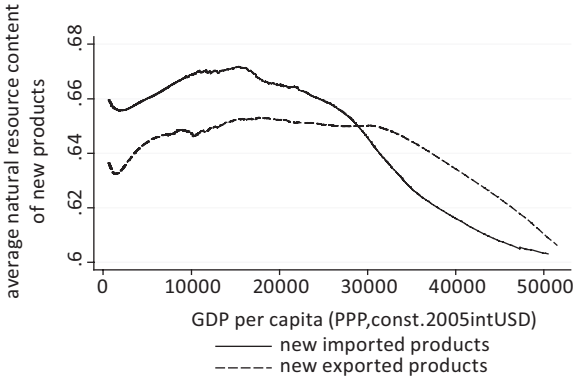
Note: lines correspond to lowess approximation (outliers and extreme values excluded). New products: $new(1)_{it}^{X}$ and $new(1)_{it}^{M}$; yaxis: HR_{it}^{newX} and HR_{it}^{newM}.

Figure 2. Average human capital content of *new* imported and *new* exported products versus countries' income per capita levels (163 countries, 1988–2010)

Source: own elaboration with trade data from UN Comtrade (HS0,6 digit), income per capita from World Bank's WDI and *rhci* from UNCTAD.

Finally, in Figure 2 and Figure 3 we plot the relationship between income per capita levels and average quality of goods added to the set of traded products (measured as in eq. 7a,7b, 8a and 8b). As countries diversify, they add to their import and export baskets goods with increasing human capital content (Figure 2).

As expected – richer countries are able to export more advanced products and, similarly, societies in richer countries demand imported goods of superior quality than low income economies. Moreover, at all stages of economic development human capital content of new imported products is higher than that of new exported goods. In terms of the dependence on natural resources, only initial phase of economic development is associated with trade diversification based on natural resources (Figure 3).



Note: lines correspond to lowess approximation (outliers and extreme values excluded). New products: $new(1)_{it}^{X}$ and $new(1)_{it}^{M}$; yaxis: HR_{it}^{newX} and HR_{it}^{newM}.

Figure 3. Average natural resource content of new imported and new exported products versus countries' income per capita levels (163 countries, 1988–2010)

Source: own elaboration with trade data from UN Comtrade (HS0,6 digit), income per capita from World Bank's WDI and *rnri* from UNCTAD.

5. Econometric analysis

In order to assess formally the relationship between the differentiation of traded products and stages of development, in Table 3 and Table 4 we report parametric estimates of the regression model, introducing income per capita in the quadratic form[29]:

[29] Quadratic form is used in line with the findings of Cadot et al. (O. Cadot, C. Carrère, V. Strauss-Kahn, *Export diversification*..., op.cit.) who reveal the U-shaped path of product concentration using the data at the same level of disaggregation as we do. As a robustness, we have also considered a cubic form of the equation. Results obtainable upon request.

$$N^{flow}_{it} = \alpha + \beta_1(GDPpc_{it}) + \beta_2(GDPpc_{it})^2 + \lambda_t + \nu_{it} \;\forall\; flow = \{X,M\}, \qquad (9)$$

where *i* refers to country and *t* to time period, *GDPpc* is real income per capita, N^{flow} stands for our basic measure of trade differentiation (Number of active product lines) and $flow = \{X,M\}$ denotes trade flow (exports or imports, respectively). In order to account for general shocks and business cycle effects, we introduce a set of time dummies (which should also capture changes in the HS scheme common to all countries). Quadratic formulation is statistically significant. However, we perform the formal assessment of its meaning within the observed data[30]. The turning point (*TP*) occurs very late in the development process (PPP$ 33660 for exports and PPP$ 27673 for imports). Even though alternative confidence intervals of *TP* estimates lay within the observed range of *GDPpc*, the prevalent mass of observations and countries is located on the increasing part of the inverted U curve – the process of progressing differentiation of imported and exported products dominates in the economic growth process.

Table 3. The number of traded products and development level – estimation results

Dep.variable:	N^X_{it}	N^M_{it}
	(1)	(2)
$(GDPpc)^2$	–2.393e-06***	–1.461e-06***
	[–11.38]	[–10.85]
GDPpc [PPP, const.2005 int.USD]	1.611e-01***	8.087e-02***
	[19.37]	[16.60]
No. of obs.	1831	1828
R2	0.38	0.33
Time dummies	yes	yes
Estimated Turning Point (*TP*) [PPP, const. 2005 int.USD]	33660	27673
Range of *GDPpc* [PPP, const. 2005 int.USD]	(604,51969)	(604,51969)
Standard error of *TP* [PPP, const. 2005 int.USD]	1362	1024
95% confidence intervals for *TP*		
Lower bound (N), Upper bound (N)	(30988, 36333)	(25663, 29683)
Lower bound (P), Upper bound (P)	(31498, 36614)	(26034, 30055)
Lower bound (BC), Upper bound (BC)	(31509, 36769)	(26053, 30104)

[30] J. Weesie, *Analysis of the turning point of a quadratic specification*, "Stata Technical Bulletin" 2001, vol. 60, pp. 18–20.

Percentage of country-year obs. below *TP*	93%	83%
No. of countries below *TP*	153	150
Total number of countries	157	157
Time period	1988–2010	1988–2010

Note. *, ** and *** denote significance at 10%, 5% and 1% level, respectively. LS estimates, extreme values excluded (obs. below 1st or above 99th percentile). Robust t-statistics in parenthesis under coefficients. Standard error and confidence intervals obtained through parametric bootstrap (1000 replications), assuming alternative distributions: N – normal, P – percentile, BC – bias corrected.

Source: own elaboration based on trade data from UN Comtrade (HS0, 6digit); income per capita from World Bank's WDI.

Finally, in Table 4 we report the results of estimations linking new products' qualitative characteristics and countries' income per capita levels. As expected, human capital content of new imported and exported products is positively linked with *GDPpc*, while the reverse holds true for the natural resource content[31].

Table 4. New products quality and development level – estimation results

	Avg. human capital content of new producs		Avg. natural resource content of new producs	
	HC_{it}^{newX}	HC_{it}^{newM}	NR_{it}^{newX}	NR_{it}^{newM}
	(1)	(2)	(3)	(4)
GDPpc [PPP, const.2005 int.USD]	5.871e-05***	1.294e-05***	–8.11E-08	–1.393e-06***
	[26.99]	[24.13]	[–0.26]	[–15.46]
No. of obs.	1866	1866	1866	1866
R2	0.47	0.6	0.12	0.68
Time dummies	yes	yes	yes	yes
Total number of countries	157	157	157	157
Time period	1988–2010	1988–2010	1988–2010	1988–2010

Note. *, ** and *** denote significance at 10%, 5% and 1% level, respectively. LS estimates, sample without extreme values (observations below 1st or above 99th percentile). Robust t-statistics in parenthesis under coefficients.

Source: own elaboration with trade data from UNComtrade (HS0,6 digit), income per capita from World Bank's WDI and *RFI* from UNCTAD.

[31] Quadratic formulation of the model results to be insignificant.

6. Summary of the findings

Drawing on o large panel of international economies we have shown how the set of imported and exported products evolves in economic growth process. Strong activity at the extensive margin, manifested through the rise in the number of active export and import lines, is typical for early stages of development. Trade diversification tendency, typical for a predominant mass of observations in our panel, is associated with changes in the quality content of newly traded goods. Economic growth goes in line with the rise in the number of traded products and introduction of new goods with increasing human capital content and decreasing natural resource intensity.

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