

Per-unit duties: friends or foes for developing exporters?

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Abstract

Protectionist instruments such as tariffs may distort the price of traded goods. In this paper, we explore the impact of specific (per-unit) duties on the patterns of agricultural trade. Specific duties are showed to encourage countries to export products with higher prices, leading to an “Alchian Allen effect” on unit values. Their restrictive effect on trade values is smaller for developed countries as compared to developing countries. It can be explained by the quality specialization of these countries, but also by the low level of quality differentiation of their exports. Our results highlight the discriminating nature of specific duties for low-income countries.

Introduction

In 2007, Japan applied a per unit (specific) duty of 2,855 USD per ton on its paddy rice imports. Converted in *ad valorem* terms (percentage), it corresponds to 905%!¹ This simple calculation immediately reveals the strategic nature of this product as such an applied duty can be prohibitive. There are many other examples, even if all of them do refer to such level of protection. Jean et al. (2006) found that the "sensitivity" of a product (i.e. potentially excluded from the negotiations when the latter allow it) is, in part, proportional to the tariff. Thus, it is not surprising that products protected by specific duties crystallize tensions among negotiators, particularly in the agricultural sector. Moreover, specific duties are often accused of discriminating exports from low-income countries, their producers being specialized in low quality segments and also in agricultural products, relatively more protected with specific tariffs than industrial goods.

Those considerations lead us to two main interrogations. Firstly, to what extent are exporters affected when their agricultural products face specific rights? Secondly, do these duties, by altering prices, preclude the development of poor countries? The aim of this paper is to explore the impact of specific duties on the patterns of agricultural trade.² To do so, we estimate the effect of per unit duties both on trade prices and trade values, paying a particular attention to developing countries as exporters.

To our knowledge, there is no existing literature that analyzes the impact of specific duties on trade patterns, and particularly trade prices. Chowdhury (2008, 2009) are among the few papers that focus on specific duties. The author studies their impact on welfare of Sub-Saharan African countries (SSA), using a General Equilibrium model. She finds that those instruments wash away more than half of the welfare benefits enjoyed by SSA countries coming from preferences granted by the European Union. Besides, our paper benefits from two other streams of literature of international trade. The first one refers to papers looking at the consequences of trade policies instruments on trade patterns, including prices. Among them, Bureau *et al* (2007) focus on MERCOSUR's exports, subject to Tariff Rate Quotas, as well as specific or composite tariffs, when entering the European beef market. The authors design a partial equilibrium model to investigate the effects of a set of policy instruments on the composition of imports. Numerical simulations show that the structure of EU protection leads, in the beef market, to a significant positive impact on prices. A second branch of

¹ Using the unit value of the product

² According to the WTO definition of agricultural products.

the literature analyzes the determinants of trade prices. We can quote all the articles that test the Alchian-Allen conjecture by looking at the consequences of transportation costs on the unit values of exported goods (Hummels and Skiba (2004) Schott (2004, 2007) and Hummels et Klenow (2005), Martin (2012)).

This paper confirms that specific duties encourage countries to export products with higher prices. Hence, we may consider that specific duties act as transport cost according to the Alchian-Allen conjecture. Moreover, we show that specific duties restrict trade, but that this effect is smaller for developed countries as compared to developing countries. The contributions of the paper are threefold. Firstly as described previously and to our knowledge, we answer to a question that has not been covered in the literature. Secondly, we use detailed data (HS6 classification) on trade and tariff, distinguishing between their per unit and ad valorem components. The time dimension of these data allows us to have a significant variance of the protection. Finally, we propose a discussion on the impact of specific duties on developing countries, using detailed indicators of export quality specialization.

This paper is organized as follows: section 1 presents the characteristics of specific duties, showing some recent evidence on the use of those duties. Looking for the Alchian-Allen effect due to specific duties, section 2 quantifies their impact on trade unit values. Section 3 goes further by empirically test the impact of specific duties on the value of trade, distinguishing between developed and developing countries. Section 4 concludes on the consequences of per unit duties on the patterns of agricultural trade.

1. Descriptive evidences

1.1. The use of per unit duties

In 2007,³ worldwide, 1.3% of the products⁴ are subject to specific duties.⁵ The agricultural sector is relatively more protected with this type of tariffs (almost 4% of its HS6 lines) than the industrial sector (less than 1%, heterogeneously distributed across sectors).

On the 163 countries available in our database, 70⁶ impose specific tariffs when importing agricultural goods⁷ (see the list in Annex 1). Countries' profiles are very heterogeneous and

³ It is MAcMap-HS6's most recent available year. See Guimbard et al. (2012) for a description of this tariffs dataset.

⁴ This ratio is computed as the number of lines (hs6) subject to specific tariffs on total number of lines (hs6) available, at the world level, considering all existing bilateral relationships.

⁵ Specific duties are also called *per unit* duties or *ad pesum* duties. We consider as specific duties the tariffs that have a positive per unit component.

disentangling similarities between them remains difficult. However, one can see that rich countries (EU27, USA, EFTA, Canada...)⁸ all use this type of duties. EFTA is a particular case with countries protecting almost exclusively their agricultural markets with such instruments. Insular countries (26) constitute another bulk of the users of per unit duties. They can be developed economies like Japan, Australia or New Zealand, but also small developing economies, like Vanuatu, Seychelles or Mauritius.

The frequency of use also differs between countries (see Annex 1). Thus, the share of specific lines (excluding null tariffs) can be high (100% for Switzerland, 97% for Norway) or anecdotic (Australia: 0.6% Panama: 0.01%).

Erreur ! Source du renvoi introuvable. provides information on agricultural protection (level and coverage, in terms of HS6 lines) applied by group of countries (developed and developing⁹), in 2007. The protection of specific duties is converted into *ad valorem*¹⁰ (here after *Ad Valorem* Equivalent, AVE). The pure *ad valorem* protection (ADV), tariff rate quotas¹¹ (TRQs) and free traded products (Null) are also available to complete tariff profiles. The share of HS6 lines, breakdown by the level of development of exporters and the nature of the customs duties, allows to characterize more precisely the potential issues at stake.

⁶ European Union being considered as a single entity. Considering all sectors, there are 74 countries that use specific tariffs. Those using per unit tariff exclusively in industry are Ghana, Korea, Lebanon and Uzbekistan.

⁷ In this paper, we use the WTO definition for agricultural products. Available at http://www.wto.org/english/docs_e/legal_e/14-ag_02_e.htm

⁸ EU27: European Union 27, EFTA: European Free Trade Association.

⁹ Here after developing countries or rest of the world.

¹⁰ The ad valorem equivalent is computed using the MAcMapHS6 methodology (see Bouet et al. (2008) for the description and a discussion about the choice of unit values to convert specific duty in percentage). Formally: $AVE = ad\ valorem + \frac{Specific}{unit\ value}$ where the unit value is the exporter's reference group unit value.

¹¹ A combination of an import tariff and an import quota in which imports below a specified quantity enter at a low (or zero) tariff (inside tariff) and imports above that quantity enter at a higher tariff. The latter, called outside tariff, and the former (inside) can have a *per unit* component.

Table 1. Share of type of duties and applied protection (%), in agriculture (2007)¹²

Importer	Exporter	% of HS6 lines				AVE (%) of			
		ADV	Specific	TRQs	Null	ADV	Specific	TRQs	Null
Developed Countries	All countries	27	11	6	57	19.5	14.4	43.6	0
	Developed Countries	35	12	6	47	20.8	12.9	42.1	0
	Developing Countries	24	10	6	60	17.2	16.8	46.8	0
Developing Countries	All countries	81	2	0	17	24.9	37.0	35.6	0
	Developed Countries	82	2	0	15	24.1	27.4	37.2	0
	Developing Countries	80	2	0	18	25.5	45.9	31.6	0

Source: MAcMap-HS6 2007, Authors' calculations.

Globally, developed countries use more specific duties (11% of their HS6 lines) than developing ones (2%), whatever the level of development of their partners. When exporting to developed markets, developing countries face less per unit duties (10%; developed exporters: 12%), due to the preferences granted to them.

Converting specific duties into percentage eases comparison across countries. Thus, the AVE of applied protection in developed countries (14.4%) is lower than in developing countries (37%). This might come from two effects: a lower value in US dollars of the per unit duty or a higher price of the imported goods. One might expect the second explanation may be the more important.

Moreover, developed countries' applied protection on those products appears, in average, more homogenous (12.9% and 16.8%) than developing countries' one (27.4% applied to developed exporters and 45.9% applied to similar countries). This might also come from the trade structure of the importing countries: developing countries tend to import more low-price goods than rich countries. Thus, border taxes can be a substitute to national taxes and the use of per unit duties aims more to collect tariff revenues than to protect consumer against low quality goods. On the export side, the *ad valorem* equivalent of specific tariff faced by developing exporters is higher than the one faced by developed exporters, on all markets.

Ad valorem equivalents make also possible to compare the level of protection induced by the different kinds of duties. For developed countries, the AVE of specific duties (14.4%) is lower than the average *ad valorem* duties (19.5%) and than the AVE of TRQs (43.6%) which is, by far, the most protectionist tool¹³. On the opposite, the AVE of specific duties (37%) applied by developing countries is higher than the *ad valorem* tariff (24.9%) and than the AVE of TRQs (35.6%).

¹² Applied protection is a weighted average, using the MAcMap-HS6 methodology (see Bouët et al.(2008)).

¹³ Highest AVE for TRQs are obtained when the outside rate contains a per unit component.

At the HS2 level, agricultural products concerns 31 of the 96 sectors. **Erreur ! Source du renvoi introuvable.** presents the share (in terms of HS6 lines) of per unit duties, by chapter in 2007. The AVEs (column 2) are calculated only on the agricultural lines subject to specific duties.

Table 2. Sectoral characteristics of specific duties (2007)

HS2 Code	HS2 long Name	Share of HS6 lines (%)	AVE (%)
22	Beverages. Spirits and Vinegar	22.7	21.3
17	Sugars and Sugar Confectionery	14.8	38.7
11	Products of the Milling Industry. Malt. Starches (...)	13.3	28.8
24	Tobacco and Manufactured Tobacco Substitutes	12.8	30.7
04	Dairy Produce. Birds Eggs. Natural Honey (...)	9.4	35.3
29	Organic Chemicals	9.3	27.8
01	Live Animals	8.9	27.9
19	Preparations of Cereals. Flour Starch or Milk (...)	8.1	12.1
10	Cereals	7.5	16.2
20	Preparations of Vegetables, Fruit, Nuts (...)	7.0	12.2
16	Preparations of Meat, of Fish or of Crustaceans (...)	6.1	15.5
15	Animal or Vegetable Fats and Oils (...)	5.8	15.2
02	Meat and Edible Meat Offal	5.5	13.5
21	Miscellaneous Edible Preparations	5.5	8.3
35	Albuminoidal Substances. Modified Starches. Glues (...)	5.1	10.2
23	Residues and Waste From the Food Industries.	4.3	8.0
07	Edible Vegetables and Certain Roots and Tubers.	4.3	11.7
18	Cocoa and Cocoa Preparations	3.9	17.3
08	Edible Fruit and Nuts. Peel of Citrus Fruit or Melons.	3.7	10.6
12	Oil Seeds and Oleaginous Fruits. Miscellaneous.	3.4	8.0
38	Miscellaneous Chemical Products	3.3	9.1
52	Cotton	1.7	10.2
51	Wool Fine or Coarse Animal Hair. Horsehair (...)	1.3	1.1
09	Coffee, Tea, Maté and Spices	1.2	5.6
14	Vegetable Plaiting Materials. Vegetable Products N.E.S.	1.2	2.0
06	Live Trees and other Plants. Bulbs Roots.	1.0	2.2
33	Essential Oils and Resinoids. Perfumery Cosmetics.	0.6	2.5
05	Products of Animal Origin N.E.S.	0.5	16.4
13	Lac. Gums Resins and othr Vegetable Saps and Extracts.	0.3	3.2
53	Other Vegetable Textile Fibres	0.1	0.1
50	Silk	0.0	291.9

Source: MAcMap-HS6 2007, Authors' calculations.

Even if they remain quite marginal at the sectoral level, specific tariffs are present in each agricultural sector. Among them, their use varies widely. Indeed, the share of HS6 lines protected by such rights in each HS2 sector does not exceed 25%. Only four HS2 sectors have more than 10% of their products

covered by per unit duties. The sector exhibiting the highest share is the beverages' one (22.7%). Sugar (14.8%), the milling industry (13.3%) as well as tobacco and its manufactured substitutes (12.8%) are in the quartet head. However, tobacco and beverages are particular products, generally subject to high taxes, both internally and at the border (health issue, low demand elasticities...).

Regarding the average AVE, the silk sector is the most protected (almost 300% on average in this sector), but the potential issue is not real: it only concerns a fraction of its HS6 lines (2 products imported by Japan). The sugar sector is further distinguished with an AVE closed to 40%, followed by the milk sector (35%), the tobacco (nearly 31%) and the milling industry (29%).

1.2. The quality specialization of developing countries

Table 3 **Erreur ! Source du renvoi introuvable.** provides some descriptive statistics on the quality specialization of developing countries. For each country and product, we compute the relative price index RP_{ikt} that equals to the mean export unit value uv_{ikt} by exporter i , product k and year t , relative to the world mean export unit value uv_{kt} by product k and year t . Greater than unity, it means that the country i exports the product k at higher price than the world price average, i.e. that it exports higher quality products.¹⁴ At the opposite, an index inferior to unity corresponds to a specialization on low quality segment for the product k for country i . Table 3 **Erreur ! Source du renvoi introuvable.** reports the mean and median relative price index UV for all products and all exporters, for each group of exporting countries, classified by decile of GDP per capita.

Table 3. Export trade prices according to GDP per capita

¹⁴ For a discussion on this index and its relation with the quality of products, see Berthou and Emlinger (2010).

Decile of GDP per capita of exporting countries	$RP_{ikt} = \frac{\overline{uv}_{ikt}}{\overline{uv}_{kt}}$ relative price index		Price variation coefficient by product and year	
	Mean	Median	Mean	Median
1	0.76	0.58	54.17	47.75
2	0.79	0.62	64.95	57.65
3	0.84	0.67	62.89	54.94
4	0.82	0.69	68.97	59.63
5	0.95	0.79	68.65	59.78
6	1.04	0.92	83.11	71.43
7	1.11	0.93	83.83	73.62
8	1.27	1.10	95.33	84.23
9	1.13	1.02	100.81	89.25
10	1.23	1.07	96.53	84.74

Authors' calculation from the Trade Unit Value database, 2001, 2004, 2007

Those indicators confirm that developing countries tend to export, on average, at a lower price than the world. They also show that the top exporters, ranked by level of income, have a high quality specialization for each exported product. In the second column of the table, we present the average coefficient of variation of export unit values computed by exporter i , product k and year t . It appears that, in average, high income countries have higher coefficient of variation of export price than developing countries. These latest have consequently a weaker quality range for each product, as compared to other countries.

These descriptive evidences lead us to the assumption that per unit tariffs may be a particular issue for developing countries' exports, as compared to other countries. Firstly, per unit duties are relatively important in agriculture, in which developing countries tend to specialize. Secondly, given their specialization in low quality segment and the relative narrow range of price of their exports, they might be more penalized by such barriers. The next section will empirically test this second statement.

2. The specific duties and the Alchian Allen Effect

2.1. The Alchian Allen Conjecture

The well-known Alchian-Allen conjecture (1964), also known as the "shipping the good apples out" effect, corresponds to the fact that exporters charge higher prices for remote destination. The transportation costs lead firms to export their higher priced/higher quality goods to distant partners, keeping their lower quality goods for closest or even domestic markets.

This prediction has been tested in a number of studies, some of them theoretically grounding the positive impact of distance on prices. Among those, Hummels and Skiba (2004) extend the initial model and prove that the relative strength of per unit and *ad valorem* costs matters. Baldwin and Harrigan (2011) propose a Melitz type model in which the heterogeneity of firms is not more productivity, but quality.

A variety of empirical articles looks at the consequences of transportation costs on the unit values of exported goods, through a quality upgrading effect. Schott (2004, 2007) and Hummels and Klenow (2005) examine the relationship between unit values and distance, at the country level. Martin (2012), Bastos and Silva (2010), Manova and Zhang (2009), using data on french exporting firms, find that firms charge higher F.O.B. unit values on exports to more remote countries.

The different analyses of the Alchian-Allen effect in the literature are always linked with the transportation costs, generally proxied by bilateral distance. Hummels and Skiba (2004) or Martin (2012) explore an alternative specification of transport costs by splitting them into an *ad valorem* part (iceberg cost) and an additive part (per unit cost). The latter explains the Alchian-Allen effect. Indeed, its translation into percentage lowers with the value of the good, which makes an incentive for the firms to export more expensive goods.

However, as saw the previous section, the Alchian-Allen effect may also occurs in presence of other per-unit trade costs that are the specific duties. To our knowledge, this paper is the first in the literature testing this effect for such duties. We test this hypothesis using data aggregated at the country level and use unit values as a proxy for trade prices. In the rest of the paper, we follow Schott (2008) and Fontagné et al. (2008) by considering unit values as a proxy for the quality of products. We refer to Khandelwal (2010) for a discussion on the extraction of information on quality from prices or unit values.

2.2. Empirical test of the Alchian Allen effect of the specific duties

Empirical specification

To test the Alchian-Allen effect of specific duties by importing countries, we follow Hummels and Skiba (2004) and Martin (2009). We thus estimate an equation linking bilateral prices to the exporter's and importer's income, importers' tariffs and transport costs. Unlike Hummels and Skiba (2004), we do not have data on freight cost. The latter are approximated by the bilateral distance as

it is usually done in the empirical literature. One of the main differences from the quoted papers is that we consider the specific part of the tariffs, defined at the bilateral and product level.¹⁵

$$\ln p_{ijkt} = \alpha \ln \frac{GDP}{cap}_{it} + \beta \ln \frac{GDP}{cap}_{it} + \gamma \ln dist_{ij} + \delta \ln Tspe_{ijkt} + \lambda_i + \lambda_j + \lambda_k + \lambda_t + \epsilon_{ijkt} \quad (1)$$

Bilateral prices p_{ijkt} of imports of product k by country j from country i at time t are proxied by CIF import unit values, defined at the HS6 level, coming from the worldwide Trade Unit Value Database¹⁶ of the CEPII. We use the GDP per capita of exporting and importing countries from the World Development Indicators of the World Bank, and bilateral distances from the CEPII. Specific duties come from the MAcMap-HS6 dataset.¹⁷ Products, exporters, importers and time fixed effects are included.

Equation (1) is estimated on years 2001, 2004, 2007, for which data on tariffs are available. Since unit values data are little noisy, we exclude extreme unit values, i.e. above 50 times the world median unit value for the product k and below 1/50 times the same median.

Estimation of equation (1) is performed by using ordinary least square estimator. Bilateral unit values uv_{ijkt} and specific duties spe_{ijkt} are determined by a number of common observed and non-observed factors. To handle these simultaneity and endogeneity biases, we use the Instrumental Variables approach. Two instruments are used for the specific duty. We first consider a variable equal to the mean export unit value of the importer j , by product k , that we cross with a dummy equal to 1 if the country j exports the product k , 0 otherwise. This export unit value is supposed to be a proxy of the price of the domestic products within the country. We assume that a country which products are expensive tends to implement higher specific duties than other countries, to protect its production from the competition of low price products. We use as second instrument a variable indicating whether the importing country is a net exporter of product k or not. Net exporters would tend more to use the specific duties instrument than net importers, which have less interest to protect their market from low quality products.

Results

¹⁵ We also test an alternative specification, considering both the *ad valorem* and the specific part of the tariffs. Adding the *ad valorem* component of the tariff does not change the coefficient of the other variables. However, it raises problem when we instrument the specific duties because of multicollinearity of the two components of the tariffs.

¹⁶ See Berthou and Emlinger (2012) for a description of the dataset.

¹⁷ See Guimbard, Jean, Mimouni and Pichot (2012) for a description of the dataset.

Table 4 reports the estimations of equation (1). The first two columns correspond to estimations on the full sample of observations. The two last columns report estimations on the sub-sample of observations that are not in free trade. We find a significant and positive impact of specific duties on import unit values in all estimations, confirming the Alchian-Allen effect. Exporters tend to export at a higher price when they face specific duties, *ceteris paribus*. The coefficient is higher when accounting for endogeneity with an instrumental variable estimator. The Sargan and Cragg Donald statistic confirms that our instrumental variables are adequate.

Table 4. Estimation on bilateral prices

	(1)	(2)	(3)	(4)
Distance	0.15*** (0.00)	0.13*** (0.00)	0.14*** (0.00)	0.15*** (0.00)
GDP/cap importer	0.20*** (0.01)	0.21*** (0.01)	0.18*** (0.01)	0.21*** (0.01)
GDP/cap exporter	0.14*** (0.01)	0.11*** (0.01)	0.14*** (0.01)	0.12*** (0.01)
Specific duties	0.01*** (0.00)	0.23*** (0.02)	0.01*** (0.00)	0.24*** (0.02)
number obs.	773 462	773 462	448 128	448 128
R2	0.603	0.555	0.585	0.514
IV	no	yes	no	yes
sargan p-value		0.421		0.445
Cragg Donald statistic		525.85		579.38

Standard errors in parentheses, * p<0.10, ** p<0.05, *** p<0.01

All the variables are in log. Exporter, importer, product and time fixed effects included

The other coefficients have the expected signs. We find the classic Alchian-Allen effect linked to transport cost through the positive coefficient of the distance. Countries tend to export their most expensive product to distant partners. Both GDPs per capita have significant and positive impact. As shown in Schott (2001), prices increase with the exporter's income. They also positively vary with the importer's income.

In a second specification, we distinguish the impact of specific duties on unit values by level of income of the exporter. We expect a higher impact for developed countries, as they have more possibilities to upgrade their quality when facing specific duties than poorest countries whose range of quality by product is limited. The results are reported in Table 5. In the first column, we use a

dummy “developing countries” equal to one if the exporting country belong to this group,¹⁸ zero otherwise. The negative coefficient on the cross variable, in column (1), confirms the smaller impact (but still positive) of specific duties on trade unit values for developing countries. This result is supported when we estimate the effect of specific duties on unit value, by deciles of GDP per capita of exporters: the higher the GDP per capita of the exporter, the higher is the coefficient. The Alchian-Allen effect of the specific duties depends on the level of income of the exporting countries. The impact of specific duties implementation on developing countries exports will be further discussed in the next section of the paper.

¹⁸ The developing countries’ group combines all the countries that are not high income countries according to the World Bank. EU27 is considered as developed.

Table 5. Estimation on bilateral prices according to exporter's level of development

	(1)	(2)
Distance	0.14*** (0.00)	0.15*** (0.00)
GDP/cap importer	0.20*** (0.01)	0.20*** (-0.01)
GDP/cap exporter	0.12*** (0.01)	0.11*** (-0.01)
Specific duties	0.26*** (0.02)	0.07** -0.03
Specific duties*D(developing exporter)	-0.15*** (0.02)	
Specific duties*first decile of exporter GDP/cap		0.07** (0.03)
Specific duties*second decile of exporter GDP/cap		0.06*** (0.02)
Specific duties*third decile of exporter GDP/cap		0.05*** (0.02)
Specific duties*fourth decile of exporter GDP/cap		0.10*** (0.02)
Specific duties*fifth decile of exporter GDP/cap		0.15*** (0.02)
Specific duties*sixth decile of exporter GDP/cap		0.18*** (0.02)
Specific duties*seventh decile of exporter GDP/cap		0.22*** (0.02)
Specific duties*eighth decile of exporter GDP/cap		0.24*** (0.02)
Specific duties*ninth decile of exporter GDP/cap		0.29*** (0.03)
Specific duties*tenth decile of exporter GDP/cap		0.35*** (0.03)
number obs.	773 462	773 462
R2	0.562	0.567
IV	yes	yes

Standard errors in parentheses, * p<0.10, ** p<0.05, *** p<0.01

All the variables are in log. Exporter, importer, product and time fixed effects included

Robustness checks

Equation (1) is estimated using exporter, importer, product and time fixed effects. As robustness checks, we use two alternatives specifications following Hummels and Skiba (2004). We first calculate the means of the variables relative to product k and express all variables relative to this mean.

$$\ln uv_{ijkt} - \overline{\ln uv_k} = \alpha (\ln GDP_{it} - \overline{\ln GDP_k}) + \beta (\ln GDP_{it} - \overline{\ln GDP_k}) + \gamma (\ln dist_{ij} - \overline{\ln dist_k}) + \delta \ln Tspe_{ijkt} - \ln Tspe_k + (\epsilon_{ijkt} - \epsilon_k) \quad (2)$$

This specification allows to remove commodity-specific variations in price that can be unrelated to Alchian-Allen Effect. In a second alternative specification, we differentiate all the variables with respect to their mean by importer j and product k .

$$\ln uv_{ijkt} - \overline{\ln(uv_{jk})} = \alpha (\ln GDP_{it} - \overline{\ln GDP_{jk}}) + \beta (\ln GDP_{it} - \overline{\ln GDP_{jk}}) + \gamma (\ln dist_{ij} - \overline{\ln dist_{jk}}) + \delta \ln Tspe_{ijkt} - \ln Tspe_{jk} + (\epsilon_{ijkt} - \epsilon_{jk}) \quad (3)$$

This alternative specification, using mean differentiated variables, gives identical results to equation (1) (see Annex 2).

3. The effect of specific duties on value of trade

In the previous section, we examined the impact of specific duties on unit values, highlighting the well-known Alchian-Allen effect of these policy instruments on trade prices. However, as a protectionist tool, specific duties may reduce the imported quantities. In this section, we would like to know whether the positive impact of specific duties on trade prices compensates their restrictive effect on traded quantities (i.e. a positive impact on trade values).

Empirical specification

We estimate a classical gravity equation that explains bilateral trade, at the product level, by importer's and exporter's incomes, tariffs and bilateral variables as proxies of transport costs (distance, colony,¹⁹ border²⁰ and language²¹). Country and product fixed effects are added to account for the multilateral resistance terms (Anderson and van Wincoop (2004)).

$$\ln v_{ijkt} = \alpha \ln GDP_{it} + \beta \ln GDP_{it} + \gamma \ln dist_{ij} + \delta \ln Tspe_{ijkt} + \mu \ln Tadv_{ijkt} + colony_{ij} + border_{ij} + language_{ij} + \lambda_i + \lambda_j + \lambda_k + \lambda_t + \epsilon_{ijkt} \quad (4)$$

¹⁹ The dummy equals to one if the two trading partners have a colonial history in common, zero otherwise.

²⁰ The dummy equals to one if the two countries share a border, zero otherwise.

²¹ The dummy equals to one if the two countries have a common official language, zero otherwise.

Trade data come from the BACI database²² and are defined at the HS 6-digits commodity level. Tariffs,²³ GDP and distance data are the same datasets previously used. Bilateral dummies (colony, border and language) come from the CEPII's geodist²⁴ dataset.

We estimate the effect of the explanatory variables both on extensive and intensive margin of trade.

Acknowledging the importance of zero trade flows, we first run a probit model to evaluate the effect of our explanatory variables on the extensive margin of trade. Second, we estimate the equation (4) on positive values of trade using OLS estimators, allowing to assess the impact of specific tariffs on the intensive margin of trade.

Results

Table 6 reports the regression results of equation (4). The first column provides the results of the probit estimation while the second reports the results of the OLS estimation. The negative impact of the specific duties on trade values is clearly confirmed in both estimations. Despite their positive impact on trade unit values, specific duties still act as a trade barriers. They negatively affect the probability of exporting (extensive margin) and the value of trade (intensive margin).

Other variables of the equation (4) have significant coefficients, with the expected sign. Distance and *ad valorem* duties negatively impact trade. Sharing a border or a language, having a colonial links, marginally offset this effect. Trade increases with exporter's and importer's GDP.

²² See Gaulier and Zignago (2011).

²³ We use the power of the *ad valorem* part of the tariff, i.e. $\log(1+ad\ valorem)$ in equation (4).

²⁴ See Mayer and Zignago (2011).

Table 6. Estimations on trade values

	(1)	(2)
Importer GDP	0.13*** (0.00)	0.27*** (0.01)
Exporter GDP	0.06*** (0.00)	0.17*** (0.01)
Distance	-0.53*** (0.00)	-0.38*** (0.00)
Common Border	0.34*** (0.00)	0.52*** (0.01)
Common Official Language	0.32*** (0.00)	0.12*** (0.01)
Colonial History	0.37*** (0.00)	0.04*** (0.01)
Ad valorem duties	-0.76*** (0.01)	-1.13*** (0.02)
Specific duties	-0.05*** (0.00)	-0.07*** (0.00)
number obs.	21 209 026	1 546 527
r2		0.236

Standard errors in parentheses, * p<0.10, ** p<0.05, *** p<0.01

All the variables are in log, exporter, importer, product and time fixed effects included

We are now investigating whether the impact of per unit duties on trade values differs with the level of development of the countries. To do so, we follow the same strategy as in the previous section and use cross variables with specific duties (see Table 7).²⁵ Specific duties exhibit a higher impact on trade values for developing countries than for the others (cross variables are negative and significant). Moreover, this impact decreases with the GDP per capita of the exporter. For lowest income countries, the coefficients of the cross variable are negative or not significant, while they are positive for countries whose GDP per capita is under the world median income, meaning that the negative effect of specific duties on trade is lower for high income countries. This result is in line with those concerning unit values. As exporters, developed countries are less constrained than developing countries by the use of specific duties by their trade partners.

²⁵ In the rest of the paper, we estimate equation (4) only on positive values of trade, using OLS estimator.

Table 7. Estimations on trade values by level of exporter's income

	(1)	(2)
Importer GDP	0.27*** (0.01)	0.27*** (0.01)
Exporter GDP	0.17*** (0.01)	0.16*** (0.01)
Distance	-0.38*** (0.00)	-0.38*** (0.00)
Common Border	0.52*** (0.01)	0.52*** (0.01)
Common Official Language	0.11*** (0.01)	0.12*** (0.01)
Colonial History	0.04*** (0.01)	0.04*** (0.01)
Ad valorem duties	-1.12*** (0.02)	-1.12*** (0.02)
Specific duties	-0.05*** (0.00)	-0.12*** (0.01)
Specific duties*developing exporter	-0.04*** (0.00)	
Specific duties*first decile of exporter GDP/cap		0.01 (0.02)
Specific duties*second decile of exporter GDP/cap		0.00 (0.00)
Specific duties*third decile of exporter GDP/cap		-0.02* (0.01)
Specific duties*fourth decile of exporter GDP/cap		-0.01 (0.01)
Specific duties*fifth decile of exporter GDP/cap		0.06*** (0.01)
Specific duties*sixth decile of exporter GDP/cap		0.05*** (0.01)
Specific duties*seventh decile of exporter GDP/cap		0.06*** (0.01)
Specific duties*eighth decile of exporter GDP/cap		0.06*** (0.01)
Specific duties*ninth decile of exporter GDP/cap		0.08*** (0.01)
Specific duties*tenth decile of exporter GDP/cap		0.07*** (0.01)
number obs.	1 546 527	1 546 527
r2	0.236	0.236

Standard errors in parentheses, * p<0.10, ** p<0.05, *** p<0.01

All the variables are in log, exporter, importer, product and time fixed effects included

The strengthened effect of specific duties on developing countries' exports price may be explained by two factors: firstly, for each product these countries may have a relatively narrow range of prices, and consequently less possibility to do pricing-to-market. Secondly, developing countries usually export products at low prices; they are consequently more sensitive to specific duties than developed countries' exports. In order to see whether the quality specialization can explain the larger impact of specific duties on the exports of developing countries, we estimate the effect of those duties on trade values using the two indicators defined in Table 3. In the first column, we estimate the effect of specific duties according to the relative price index RP_{ikt} of the exporting country. The positive coefficient shows that having a higher relative price index reduces the effect of specific duties on trade. Furthermore, as expected, a higher relative price index induces a higher level of trade for exporting countries. Thus, the quality specialization of the exporter affects the sensitivity of exports to specific duties. Being specialized in a higher segment of quality minimizes the effect of specific duties on trade.

In the second column of Table 8, we estimate the effect of specific duties on trade with respect to the coefficient of variation of the exporting price, computed by product. It appears that having a larger range of price reduce the effect of specific duties on trade. Quality differentiation within the same product category allows exporting countries to avoid the restrictive impact of specific duties on trade. At the opposite, countries that do not have a large range of quality suffer more from the implementation of specific duties by destination countries. They have difficulties to do pricing-to-market by exporting quality products to countries with specific duties and/or high transport costs and lower quality product to more accessible markets. In other words, they cannot select "good" or "bad" apple according to their export destination, as they usually produce only one kind of apple.

Table 8. Estimations on trade values according to quality specialization indicators

	(1)	(2)
Importer GDP	0.26*** (0.01)	0.27*** (0.01)
Exporter GDP	0.15*** (0.01)	0.17*** (0.01)
Distance	-0.38*** (0.00)	-0.38*** (0.00)
Common Border	0.52*** (0.01)	0.52*** (0.01)
Common Official Language	0.11*** (0.01)	0.11*** (0.01)
Colonial History	0.04*** (0.01)	0.04*** (0.01)
Ad valorem duties	-1.13*** (0.02)	-1.12*** (0.02)
Specific duties	-0.09*** (0.00)	-0.10*** (0.00)
Specific duties* RP_{ikt}	0.01*** (0.00)	
RP_{ikt}	0.12*** (0.02)	
Specific duties*Variation coefficient of price		0.05*** (0.00)
Variation coefficient of price		0.13*** (0.05)
number obs.	1 546 524	1 546 527
r2	0.236	0.236

Standard errors in parentheses, * p<0.10, ** p<0.05, *** p<0.01

All the variables are in log, exporter, importer, product and time fixed effects included

4. Conclusion

Tariffs usually have two effects on trade patterns. Firstly, they restrict import demand in quantity. However, in the same time, to preserve their revenues from trade, exporters may reduce their export prices (Kreinin, 1961). The specific nature of per unit duties leads to another behavior: as the border protection decreases with the price of the goods, exporters tend to price-to-market and, consequently, ship more expensive products. We showed that this rise in price does not compensate the reduction in trade quantities. Specific duties still reduce trade values.

Our results confirm that developing exporters suffers more than developed ones from specific duties. Indeed, having a specialization in high quality products allow developed exporter to avoid the restrictive impact of specific duties on trade. Furthermore, a large range of quality permits to these exporters to choose their destination market according to the encountered protection.

Thus, the conversion of specific duties into *ad valorem*, as discussed under the Doha proposal, would possibly enhance trade of developing countries, but its magnitude will depend on the modalities of conversion into percentage (regarding the choices of official unit values, for example). The sinking of multilateral proposals and, thus, the *statu quo* on the use of specific duties can also obligate such countries to increase the quality of their products. Unfortunately, the path to development is dotted with obstacles. If the presence of specific duties may be positive for exporters, forcing them to improve the quality of their products, it can also, by reducing their current trade (and thus their income and investment), locking them in a specialization in low quality which is far away from welfare creation and development.

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6. Annexes

Annex 1. Share (%) of HS6 lines, for various types of duties, in agriculture2007.²⁶

Importer	Adv	Specific	TRQ	Null	Importer	Adv	Specific	TRQ	Null
Armenia	28	0	0	72	Maldives	100	0	0	0
Australia	41	0	0	59	Mauritius	15	3	0	82
Azerbaijan	96	1	0	3	Mexico	79	1	0	20
Bahamas	94	0	0	6	Moldova rep.of	50	0	0	49
Bangladesh	94	0	0	6	Montenegro	91	1	0	8
Barbados	90	0	0	9	Namibia	43	1	0	56
Belarus	98	1	0	1	Nepal	100	0	0	0
Belize	87	1	0	13	New zealand	32	0	0	67
Bermuda	95	0	0	5	Norway	3	6	1	90
Bosnia and herzegovina	69	3	0	28	Pakistan	99	1	0	0
Botswana	42	1	0	56	Palestinian territory	41	3	0	56
Brunei darussalam	22	1	0	77	Panama	69	0	1	30
Canada	33	0	2	65	Papua new guinea	22	1	0	77
China	94	1	0	6	Puerto rico	30	6	0	64
Comoros	99	0	0	1	Russian federation	83	1	0	15
Cook islands	1	1	0	98	Saint kitts and nevis	73	0	0	27
Croatia	43	2	1	55	Saint vincent and the gr	88	0	0	12
Egypt	86	0	0	14	Seychelles	12	1	0	87
European Union	12	2	2	84	Singapore	0	0	0	100
Fiji	89	1	0	10	Solomon islands	99	1	0	0
Georgia	8	0	0	91	South africa	41	1	0	57
Ghana	87	0	0	13	Sri lanka	86	1	0	13
Haiti	33	0	0	67	Swaziland	42	1	0	56
Iceland	17	2	1	80	Switzerland	0	37	2	61
India	97	0	0	3	Taiwan	74	0	1	25
Indonesia	79	0	0	21	Tajikistan	75	0	0	25
Israel	42	3	0	56	Thailand	95	2	0	4
Japan	27	1	1	70	The former yugoslav rep.	63	1	0	36
Jordan	53	0	0	47	Tonga	90	1	0	9
Kazakstan	82	1	0	17	Trinidad and tobago	35	0	0	65
Kiribati	60	1	0	38	Turkey	33	0	0	67
Korea	83	0	0	17	Turkmenistan	15	0	0	84
Kyrgyzstan	53	0	0	47	Ukraine	67	3	0	29
Lebanon	59	0	0	40	USA	30	5	1	64
Lesotho	42	1	0	56	Uzbekistan	94	0	0	6
Liechtenstein	0	39	0	61	Vanuatu	81	1	0	18
Malaysia	45	1	0	54	Zimbabwe	84	7	0	10

Source: MAcMap-HS6 2007, Authors' calculations.

²⁶ This table contains all countries that use specific duties for at least one product. Thus, when their share is equal to 0, it is not absolute zero. It means that the share is inferior to unity, that is very closed to zero (for example, for Panama this share is 0.006%).

Annex 2. Robustness checks estimation on bilateral prices.

2.1 Estimation on bilateral prices, using commodity differenced variables

	(1)	(2)
Distance	0.11*** (0.00)	0.11*** (0.00)
GDP/cap importer	0.15*** (0.00)	0.14*** (0.01)
GDP/cap exporter	0.16*** (0.00)	0.16*** (0.00)
Specific duties	0.02*** (0.00)	0.09*** (0.02)
number obs.	773 462	773 462
R2	0.137	0.127
IV	no	yes

All the variables are commodity differenced

Standard errors in parentheses, * p<0.10, ** p<0.05, *** p<0.01

2.2 Estimation on bilateral prices, using exporter commodity differenced variables

	(1)	(2)
Distance	0.13*** (0.00)	0.13*** (0.00)
GDP/cap importer	0.14*** (0.00)	0.14*** (0.01)
GDP/cap exporter	0.25*** (0.01)	0.25*** (0.01)
Specific duties	0.02*** (0.00)	0.03* (0.02)
number obs.	773 462	773 462
R2	0.091	0.091
IV	no	yes

All the variables are exporter commodity differenced

Standard errors in parentheses, * p<0.10, ** p<0.05, *** p<0.01