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# Does the designation of least developed country status promote exports?

Stephan Klasen <sup>a</sup>, Inmaculada Martínez-Zarzoso <sup>a,b</sup>,  
Felicita Nowak-Lehmann<sup>a</sup> and Matthias Bruckner<sup>c</sup>

<sup>a</sup>Department of Economics, University of Goettingen, Goettingen, Germany; <sup>b</sup>Department of Economics, University Jaume I, Castellón, Spain; <sup>c</sup>Department of Economic and Social Affairs, United Nations, New York, USA

## ABSTRACT

In this paper we examine to what extent developing countries export more as a result of having the official Least Developed Country (LDC) status. We estimate a gravity model of trade over the period 1973–2013, in which identification is achieved by exploiting the particularities and asymmetries of ‘inclusion’ and ‘graduation’ criteria of LDC status. As mechanisms through which LDCs might benefit, we evaluate the effectiveness of individual trade preference schemes for LDCs of the European Union, United States, Canada, Japan, Australia, New Zealand, Norway, and Turkey and the impact of LDC status on exports. We find that first, individual trade preference regimes are not always beneficial in terms of increased export values. Export promoting effects are found for the individual schemes of some developed countries and some sectors. Second, a country’s official designation as a LDC is associated with higher aggregated exports. This is particularly the case for LDCs that export agricultural goods and light manufacturing products, including textiles and leather after 1990. Third, the positive effect of LDC status is significant and sizable even when controlling for specific trade preference schemes suggesting that there are other benefits of LDC status that play a role in promoting exports.


**KEYWORDS** Least developed countries; LDC; trade preferences; gravity model; generalized system of preferences; GSP

**JEL CLASSIFICATIONS** C33, F10, F13, F14, O19, O24

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## 1. Introduction

In 1971, the UN Committee for Development Planning (later renamed the UN Committee for Development Policy, CDP) created a list of what they called least developed countries (LDCs) to designate countries that suffered from low per-capita incomes and severe structural handicaps. The list initially included 24 countries but has changed over time as new countries have been included and others have graduated from the designation. The CDP designates which countries are listed as LDCs based on criteria that include a set of economic and social variables.<sup>1</sup> The purpose of the designation was so

**CONTACT** Inmaculada Martínez-Zarzoso  [imartin@gwdg.de](mailto:imartin@gwdg.de), [martinei@uji.es](mailto:martinei@uji.es)

that these countries would receive support from developed countries, as well as multilateral agencies, to further their economic development, including trade preferences, concessional aid, reduced UN contributions and support for participation in UN activities. The LDC category received increasing acceptance in trade discussions, especially since the late 1980s when it became the only official country grouping recognized by the WTO deserving special support.

Similarly, industrialized countries (ICs) have been granting trade preferences to developing countries since the early 1970s. These unilateral preferences, known as the Generalized System of Preferences (GSP), are upheld by international trade law and have been described in the enabling clause of the General Agreement on Tariffs and Trade (GATT) in 1979 as part of the Tokyo Round of the GATT. GSP allows ICs to apply different tariffs to different categories of trading partners (developing countries (DCs) and least developed countries (LDCs)), without violating Article I of the GATT, which requires non-discriminatory and equal (most favored nations (MFN)) treatment of trading partners. Such preferences can be part of the GSP, but they can also be granted via specific trade preference schemes, such as the EU's 'Everything by Arms' Initiative (EBA), which provides unilateral preferences to LDCs, or the 'Africa Growth Opportunity Act' (AGOA), which provides unilateral trade preferences to African countries, including all African LDCs. As the number of schemes with preferences for LDCs in recent years has increased, and as more poor countries are included in global value chains – especially in textiles, garments, other light manufacturing, and some agricultural products – the advantages of LDC status may have increased. On the other hand, multilateral trade liberalization and the end of multi-fibre agreement have led to preference erosion for LDCs, potentially lowering their export opportunities.

Even though LDC status and its associated trade preferences may seem to be advantageous for developing countries, their effectiveness is unclear. According to a survey carried out by the United Nations (DESA/CDP 2012), LDCs consider the unpredictability of non-reciprocal preferences and the administrative costs involved, as deterrents to export-oriented investment in their countries. They argue that the preferences gained from LDC status are discretionary, not contractually guaranteed, and hence could be withdrawn at any time by the importer. Given the uncertainty surrounding the preferences and costs when dealing with GSP preferences in general, it is important to assess the effectiveness of these preferences. While there is literature on the effectiveness of individual preference schemes (see below), to our knowledge, there is no literature (except for a recent simulation carried out by UNCTAD 2016)<sup>2</sup> that examines the total impact of LDC status on the exports of these countries. We study the impact of these preference schemes, and of other support that LDCs might receive to improve their exports, including aid to improve infrastructure, measures to promote foreign direct investment, and other trade-enhancing schemes.

In this paper, we analyze the impact of LDC status on promoting exports of these countries and how the impact has changed over time for different groups of LDCs. To identify a causal effect of LDC status on exports, we exploit peculiarities and asymmetries in the inclusion and graduation criteria of LDC designation. More specifically, we compare LDCs to non-LDC developing countries that have similar LDC criteria values as LDCs but are not on the list due to historical contingencies, asymmetric inclusion, and the graduation criteria.<sup>3</sup> In particular, there is a large set of non-LDCs that do not meet the inclusion criteria but are not well enough off to meet the graduation criteria if

they were on the list. In other words, if they had been placed on the list due to some historical contingency (e.g. being among the poorest countries in 1971), they would still be on it today. Hence, this comparable set of non-LDCs serves as a good control group for countries on the list. To improve the identification further, we include, in our preferred specification, trade-pair (dyadic) fixed effects as well as exporter-time and importer-time fixed effects (using a six-year window) so that identification is driven by switchers in the LDC category within the six-year window.

The current group of 48<sup>4</sup> LDCs (listed in Table 1) is largely heterogeneous, including countries that mainly export goods that are already duty free at the MFN-level, and others that could benefit from trade preferences by joining specific schemes such as GSP+. It includes landlocked countries, very small island states and countries that are heavily commodity-dependent. These characteristics and groupings are also examined in our analysis. We additionally evaluate the impact of IC trade preferences on LDC exports focusing on the effectiveness of trade preference schemes of the European Union (EU), United States (US), Canada, Japan, Australia, New Zealand, Norway, and Turkey. Finally,

**Table 1.** List of LDCs and control group list.

LDC Country	Inclusion	Graduation	LDC Country	Inclusion
<b>No switchers:</b>				
Afghanistan	1971		Malawi	1971
Benin	1971		Mali	1971
Bhutan	1971		<b>Nepal</b>	1971
Burkina Faso	1971		Niger	1971
Burundi	1971		Rwanda	1971
Chad	1971		Somalia	1971
<b>Ethiopia</b>	1971		<b>Sudan</b>	1971
Guinea	1971		<b>Uganda</b>	1971
<u>Haiti</u>	1971		<b>Tanzania</b>	1971
<b>Lao P. Dem. Rep.</b>	1971		Yemen	1971
Lesotho	1971			
<b>Switchers with trade data before and after the switch:</b>				
<u>The Maldives</u>	1971	2011	<u>Vanuatu</u>	1985
Central African R.	1975		<u>Kiribati</u>	1986
Gambia	1975		<b>Myanmar</b>	1987
Cape Verde	1977	2007	<b>Madagascar</b>	1991
Guinea-Bissau	1981		Zambia	1991
Sierra Leone	1982		<b>Senegal</b>	2000
<b>Togo</b>	1982			
<b>Switchers with no trade data either before and/or after the switch:</b>				
Botswana	1971	1994	<b>Mozambique</b>	1988
<u>Samoa</u>	1971	2014	Liberia	1990
<b>Bangladesh</b>	1975		Dem. Rep. Congo	1991
<u>Comoros</u>	1977		<u>Solomon Islands</u>	1991
Djibouti	1982		Eritrea	1994
Equatorial Guinea	1982	2017	<b>Cambodia</b>	1991
Sao Tome and Principe	1982		Angola	1994
<u>Tuvalu</u>	1986		<u>Timor-Leste</u>	2003
Mauritania	1986		South Sudan	2012
<b>Off-LDC list countries (control group):</b>				
Cameroon, Republic of Congo, Cote d'Ivoire, Ghana, Guyana, Honduras, India, Iraq, Kenya, Mongolia, Namibia, Nicaragua, Nigeria, Pakistan, Papua New Guinea, Swaziland, Vietnam, Zimbabwe				

Note: Source: UNDP. Big exporters and countries that have diversified their exports are in **bold**. Small island states are underlined.

we analyze the impact of trade preferences on total exports, exports without oil and minerals, exports of raw materials, agricultural exports and manufactured exports (further differentiating between chemical goods, machinery and transport goods, and light manufacturing products, which includes textiles and leather).

The most important difference relative to previous studies is that we specifically include LDC status in our analysis while studying the link between trade preferences and bilateral trade by differentiating by product groups and sectors and focus therefore on the specifics of a particular preference scheme.<sup>5</sup> We also account for time-varying and time-invariant country characteristics, country-pair heterogeneity and take into account other bilateral time-variant factors that affect exports, such as free trade agreements (FTAs), currency unions (CUs) and common WTO membership, following more recent studies (Herz and Wagner 2011; Gradeva and Martínez-Zarzoso 2016).

The main results show that official LDC status is associated with an increase in exports, in terms of total exports and agricultural exports. When exploring heterogeneity across sectors and different individual GSP schemes, we find positive effects for only some goods and the GSP schemes of particular importers. We also find that LDC status leads to higher exports when controlling for specific trade preference schemes suggesting that the benefits of that status extend beyond a specific trade preference scheme. These positive effects are only visible after 1990, a period where we find some evidence that LDC status also led to higher exports in light manufacturing products, including textiles and leather.

The rest of the paper is structured as follows: Section 2 presents a review of the closely related literature and Section 3 outlines the empirical strategy, the model specification, and describes the data and its sources. The main results are presented in Section 4 and Section 5 concludes.

## 2. Trade preferences, LDC status and developing countries' exports

Trade preferences under the GSP program are granted not only by the so-called QUAD countries – EU, US, Japan, and Canada – but also by Australia, New Zealand, and Norway, among others.<sup>6</sup> A common feature of all preference systems is that GSP preferences can be withdrawn, suspended, or limited vis-à-vis countries and products.

There are several studies evaluating the effect of GSPs granted by single ICs to DCs. We focus on the results of studies for the US, Japan, and EU. Frazer and Van Biesebroeck (2010) examine the AGOA scheme – the US trade preference scheme for African countries – using data for the period 1998–2006 from 207 countries and 5120 products (6-digit). They find a large, positive, and statistically significant impact of AGOA on US imports from AGOA countries. Receiving AGOA treatment increases US imports, on average, by 13%. Imports of apparel, agricultural goods, minerals, petroleum and manufacturing products increase by 42%, 8%, 16.6%, 73.5% and 14.6% respectively.

Ito (2013) evaluates the impact on LDCs of duty-free quota free (DFQF) access granted by Japan. Japan began granting LDCs DFQF access in 2000 and accelerated the policy after 2005. Ito (2013) finds that LDCs did not benefit from DFQF access to the Japanese market in general. The tariff lines, which were granted zero tariffs and substantial preference margins over non-LDC countries, cover products not imported by Japan, although total imports from LDCs to Japan increased. Ito interprets these

negative results as suggestive evidence that tariff barriers are small obstacles for trade relative to the challenges posed by infrastructure, non-tariff barriers, distance, and cultural differences.<sup>7</sup>

Thelle et al. (2015) analyze EU trade preference scheme using import data from 176 countries (133 DCs and 43 OECD or high-income oil-exporting countries) and 3408 products over a period of 18 years (1995–2012). They use three different trade preference measures: (i) tariff margins ( $t^{MFN} - t^{TP}$ ),<sup>8</sup> (ii) preference ratios ( $1 - t^{TP}/t^{MFN}$ ), and (iii) existence of trade preferences, i.e. a dummy variable that takes the value of one if a trade preference scheme exists. This latter measure has the advantage to capture not only the impact of tariffs but that of quotas, non-tariff trade barriers, and rules of origins as well, which may be important aspects of trade preferences not captured by tariffs. In line with the results by Gil-Pareja, Llorca-Vivero, and Martínez-Serrano (2014), Thelle et al. (2015) find that, on average, trade preferences granted by EU countries significantly increase DC exports in nominal terms. In particular, they find that enjoying trade preferences boosts DC exports by about 6% (impact of the preference dummy), that a 100% elimination of tariffs (the preferential tariff becomes zero) would also increase exports of all products by 6%, on average, and that a 1% increase in the tariff margin increases DC exports by about 0.3% over a period of 18 years.<sup>9</sup>

Econometric evidence on the role of trade preferences for DC exports is mixed. In many cases, studies examining the impact of trade preference schemes on DC aggregate exports use trade preference indicators (GSPs), that is, dummies that indicate whether a trade preference system is at work or not. A number of empirical studies in the 1980s and 1990s show that GSPs underperformed, with only a modest increase in the exports of beneficiary countries, some of which could be attributed to trade diversion (Brown 1989; Sapir and Lundberg 1984; Whalley 1990). More recent studies by Herz and Wagner (2011) and Gil-Pareja, Llorca-Vivero, and Martínez-Serrano (2014) examine a number of trade preference schemes and also find mixed results.

Herz and Wagner (2011) analyze 184 countries over the period 1953–2006 using annual trade data. They use Pseudo Poisson Maximum Likelihood (PPML) estimation<sup>10</sup> to estimate a gravity model of trade that includes year and country-pair fixed effects. The overall results point to an export hampering effect of trade preferences. More specifically, the authors show that trade preferences (GSP scheme) are associated with 4% lower exports for DCs on average. However, the impact of trade preferences on DC exports is positive and statistically significant if the scheme existed for less than 10 years but turns negative and statistically significant for trade relations lasting between one and two decades (medium to long run). Herz and Wagner (2011) argue that preference-granting countries benefit in the short-run since GSP-receiving countries import intermediate inputs mainly from GSP-granting countries, supposedly due to the recipient country's goodwill or improved relations. They also emphasize that trade preferences seem to have distortive effects in DCs in the long run when strict or complicated rules of origin lead DCs to export under most favored nation (MFN) tariffs rather than under GSP preferences.

In contrast to these findings, Gil-Pareja, Llorca-Vivero, and Martínez-Serrano (2014) provide evidence of an export promoting effect of trade preferences for DCs. They use a panel data set of 177 countries over the period 1960–2008 to estimate a gravity model of trade in levels and in first differences, including controls for unobserved heterogeneity and multilateral resistance.<sup>11</sup> A Heckman 2-stage model and a PPML model are also estimated. Their results show positive and statistically significant average effects of

trade preferences, ranging from a cumulative impact of 26% after 4 years to 88% after 8 years. They find an impact of 91%<sup>12</sup> when the model is estimated using first differences. Using other estimation techniques, namely a Heckman approach and PPML, the impact is reduced to 39%, and 27%, respectively. A simulation study by UNCTAD (2016) finds that the removal of LDC-specific preferential treatment by G20 countries would cause a loss that is, on average, equivalent to a 3%–4% reduction in merchandise export revenues.

Whereas general GSP preferences are open to most developing countries, preference providers typically offer more generous schemes exclusively to LDCs. These LDC schemes were introduced in the early 2000s as a response to the call for developed countries to provide duty- and quota-free access to LDCs. In addition to general GSP preferences and LDC preferences, many ICs also provide preferences to other groups of DCs or regions, either within the GSP or as separate schemes.

Among the specific schemes, the EU offers the EBA initiative with ‘zero’ tariffs for LDCs covering all products except for arms and ammunition and also the slightly less preferential GSP+ tariff for vulnerable countries, which respect human rights and other international conventions. The US system of preferences for LDCs also works through different schemes in addition to the general GSP scheme, including the AGOA and the Caribbean Basin Trade Partnership Act (CBTPA), which include almost all LDCs in the region (but are not limited to them). Duty-free access is excluded for oil, certain textiles and apparel and some leather products under US-GSP. Under AGOA, footwear, luggage, handbags, watches, and flatware can be exported duty-free to the US since December 2000, subject to specific certification on the rules of origin. Textiles can be exported duty-free but not quota-free to the US. Apart from the Generalized Preferential Tariff (GPT), Canada offers two further non-reciprocal regimes: the Commonwealth Caribbean Countries Tariff (CCCT) and the Least Developed Country Tariff (LDCT). The Japanese GSP system is comprised of a list of agricultural items that are eligible for GSP, and a list of industrial goods that are ineligible. The Japanese system provides duty-free, as well as reduced-duty access under GSP to developing countries. All the textile and clothing products from LDCs are DFQF since 2001 in Japan. It is worth noting that Japan has adopted a special graduation policy, whereby a particular country can lose its GSP benefits for a specific product when the beneficiary is considered to be internationally competitive and Japan has also in fact withdrawn benefits as countries have graduated from LDC status.<sup>13</sup>

As already mentioned in the introduction, the uncertainty and costs associated with the preference regimes has limited its use and effectiveness. Brenton (2003) claims that for most LDCs, the value of EU preferences is below 5% of total exports (see Table A.1 in the online Appendix). The low value of preferences can be especially ascribed to the strict rules of origin (RoO)<sup>14</sup> and the administrative burden of filling out forms when claiming trade preferences (Gitli 1995; Bjuggren and Hanson Lundström 2012; Gradeva and Martínez-Zarzoso 2016). Bjuggren and Hanson Lundström (2012) show that the US’s more generous rules of origin has led to greater imports from developing countries, whereas the EU’s stricter RoO leads to lower utilization rates of preferences in textiles and clothing trade of developing countries. Next to RoO, non-tariff barriers to trade in the form of technical standards act as another trade impediment (Khorana 2007; Mohan, Khorana, and Choudhury 2012). Moreover, it is often argued that many LDCs lack productive or administrative capacity to make use of these preferences (Huchet-Bourdon, Lichitz, and Rousson 2009; UNCTAD 2016).



While the trade benefits provided to LDCs are variable, have changed over time, and can easily be withdrawn, it is worth noting that countries that are classified as LDCs usually maintain this status for many years and graduation has only happened in a few cases. Since 1971, when the term and category of LDCs was created, the United Nations (UN) has granted LDC countries (at present 48) a range of preferences and asked member states to provide special trade privileges to this group. These unilateral trade privileges to LDCs are compatible with WTO rules, which recognize the LDC category as the only official country grouping. The criteria for being classified as an LDC have been periodically revised and are based on three mainly social and economic outcome measures: per capita income, human resources, and economic vulnerability. Every three years, a so-called tri-annual review is conducted by the CDP to decide which countries should be included and which countries should graduate from the list. Since its creation in the 1970s, only five countries have graduated<sup>15</sup> (Botswana in 1994, Cape Verde in 2007, the Maldives in 2011, Samoa in 2014, and Equatorial Guinea in 2017; see also UNCTAD 2016). Only 24 countries were on the initial list (1971), with 5 countries added in the 1970s, 12 in the 1980s, 8 in the 1990s, and 3 in the 2000s (see Table 1 for these countries and their exact dates). The precise criteria for inclusion and graduation, and how we use them in our identification strategy, are discussed below.

As argued above, however, LDC status may influence a country's exports through other mechanisms. These may range from higher and more concessional aid flows, specific aid-for-trade programs, support for foreign direct investment (FDI), which may boost exports, or greater goodwill in the enforcement of existing trade regulations. Indeed, LDCs receive significantly more aid than non-LDCs (on a per capita or per GDP basis), a larger share of aid, and substantial support through aid-for-trade programs (Alonso 2015; Calí and Te Velde 2011; Martínez-Zarzoso, Nowak-Lehmann, and Rehwald 2017). It might well be the case that these mechanisms also help promote exports beyond the effect of trade preferences.

### 3. Empirical analysis

#### 3.1. Empirical strategy

To assess the impact of being designated an LDC on their exports, it is critical to identify a control group including countries that are as similar as possible to LDCs, but are not classified as LDCs. The identification of such a control group is possible since the rules of inclusion and graduation are asymmetrical. In particular, a country needs to perform poorly in all three criteria of the LDC classification, per capita income, human assets index (HAI), and economic vulnerability index (EVI), to be included in the list. The 2018 inclusion thresholds are: GNI per capita of 1025 USD or less, HAI of 60 or less, and EVI of 36 or more. For graduation, countries only have to be above the cut-offs in two out of three criteria; moreover, the graduation cut-offs are 10 percent higher than the inclusion cut-offs. For instance, the 2018 graduation thresholds are: GNI per capita of 1230 USD or more, HAI of 66 or higher, EVI of 32 or less. In addition, a country must meet these graduation criteria for two consecutive triennial reviews, i.e. over six years, and will then ordinarily graduate after three years, i.e. nine years after having met the criteria for the first time. As a result, it is possible that a country *A* that happened not to be on the list, has the same score as country *B* that is on the list. In particular, this would be the case if country *A* is not doing badly enough to be included on the list (i.e. is



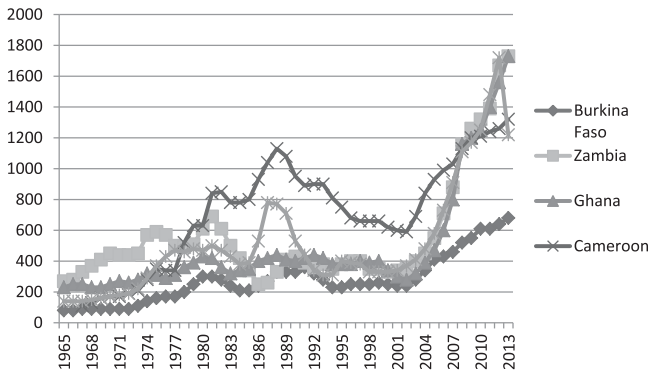
not below the lower inclusion cut-off in all three criteria) but would not have been well enough to graduate (i.e. is not above the higher graduation cut-off in two out of the three criteria).

It is important to point out that inclusion on the list, including the timing of inclusion, is entirely criteria-driven. Changes in government, onset or end of civil wars, or other events do not affect whether and when a country is added to the list unless a country objects to being included which is very rare (see below). Recommendation for graduation is also criteria-driven although the timing of graduation can be delayed at the request of the CDP or the country concerned. This affects very few countries towards the end of the period and all the countries that were granted a delay are not included in our analysis (mainly due to lack of trade data or a very recent delay in graduation).

In order to identify such comparable countries, we look at the last four tri-annual reviews (2006, 2009, 2012, 2015)<sup>16</sup> to identify developing countries that are not on the list of LDCs, but had they been on the list, would not have met the criteria for graduation. 18 countries (listed below in Table 1) meet this condition and are therefore comparable in the three LDC criteria to countries on the list.

One may ask why these 18 countries are not on the LDC list to begin with. Four reasons play a role. Quantitatively, the most important reason is that some countries were not doing poorly enough to be included on the original list in 1971 (either in terms of income or education), but suffered from poor economic or education/health performance since then so that they now perform similarly poorly as countries that were initially placed on the list. However, these countries may not perform poorly enough to meet the strict inclusion criteria and therefore were not placed on the list in the 1980s or 1990s. Most countries fall into this category, e.g. Cameroon, the Congo, Ivory Coast, Kenya, Swaziland, and Vietnam. India and Pakistan were never placed on the list despite performing poorly on the income and human asset criterion for a long time (from the 1970s to the early 2000s) because they never surpassed the economic vulnerability threshold necessary for inclusion. Nigeria was never listed as a LDC because the CDP had an additional inclusion criterion starting in the 1990s, which was that countries should have less than 75 million people, which it had surpassed in the 1990s.<sup>17</sup> Finally, Ghana (in 1991), Papua New Guinea (in 2006 and 2009), and Zimbabwe (since 2006), as a result of economic decline, actually met the inclusion criteria in the past, but their governments did not consent to being listed as a LDC. The decision not to be included on the LDC list was not based on assessments of possible trade benefits and other benefits or costs. Instead, the respective governments did not want to be associated with a list of countries that were the worst off in the world, and also because they often did not want to acknowledge their country's economic decline. Excluding these three countries from the control group does not change the results.

To illustrate our point, consider Figure 1, which shows nominal GDP per capita in US\$ (using the Atlas method), the income indicator used for determining LDC status, for five countries from 1965 to 2013. Zambia became an LDC in 1991, Burkina Faso and Sudan have been LDCs since the beginning and Cameroon and Ghana are two countries that if they had been on the list in the last four tri-annual reviews, would not have graduated in at least one of the criteria. The figure shows that the income levels of off-list countries are similar and quite often below those of LDCs. One should also note, however, that there are some very poor LDCs, such as Burkina Faso, Niger and Mali, that are doing worse than most off-list countries (with the exception of Zimbabwe). Due to these poorly performing LDCs, the average performance of LDCs on the LDC criteria is



**Figure 1.** Per capita incomes, selected LDCs and off-list countries, 1965–2013.

worse than those of off-list countries. Thus, while we have created a much more comparable group of countries through our procedure, we might still underestimate the effect of LDC status under the assumption that poorer LDCs are less able to benefit from LDC status. In a robustness check, we remove the worst-off LDCs (and Zimbabwe from the off-list countries) to make the groups even more comparable.

A difference-in-difference analysis, comparing LDCs with this control group, is applied to identify whether or not official LDC status benefits official LDCs in terms of greater exports. In addition, in our specification with dyadic and exporter- and importer-time fixed effects, we exploit information on countries added later on to the list as well as countries graduating from the list. As shown in Table 1, 13 countries switched their status, and we have trade data on both sides of the switch; 11 of those are countries placed on the LDC list later on, while two are graduates from the list.

Apart from this analysis, we also compare LDCs with all non-LDC developing countries. To assess the impact of trade preferences as a transmission channel, individual trade preference granters are also included in the analysis (US, Canada, EU, Norway, Japan, Australia, New Zealand, and Turkey). In addition, the impact over the period of trade preferences is briefly assessed.

Second, a dummy variable, ‘Trade Preferences’ (GSP), will be used to identify the existence of trade preferences. This dummy also proxies for special conditions concerning tariff-quotas, voluntary export restraints, rules of origin, and non-tariff trade barriers in the form of technical standards.

Third, LDC exports are compared with all non-LDC exports including the analysis of the impact of trade preference schemes. The comparison with the more developed non-LDCs will allow us to uncover the impact of tariff erosion, which can be the result of multilateral tariff liberalization, bilateral free trade, and economic partnership agreements that include non-LDCs.

### **3.2. Model specification: the augmented gravity model of trade**

We analyze the impact of being an LDC and the trade preference-export relationship within the framework of the gravity model of trade, for which theoretical foundations have been developed over the past three decades by Anderson (1979), Bergstrand (1985, 1989 and 1990), Helpman (1987), Deardorff (1998), Feenstra, Markusen, and

Rose (2001), Anderson and Van Wincoop (2003), Feenstra (2004), Haveman and Hummels (2004) and Redding and Venables (2004) among others. Excellent reviews of recent developments can be found in Anderson (2011), Head and Mayer (2014), and Yotov et al. (2016).

Using this modeling framework we are able to evaluate and quantify the impact of trade preferences on bilateral exports controlling for a variety of factors related to the country’s business cycle, level of development, size, and policy factors that affect bilateral trade. Anderson and Van Wincoop (2003) contributed to this literature by deriving trade costs from the gravity model and by suggesting how to model not only bilateral trade costs but also trade costs from third countries, which clearly influence bilateral trade costs. These relative costs are the so-called multilateral resistance terms (MRTs).

In our analysis, we use standard control variables of the gravity model (see Bergstrand 1985, 1989, 1990; Anderson and Van Wincoop 2003; Nelson and Juhasz Silva 2012; Pettersson and Johansson 2013) and augment the model with variables that indicate if a specific country has official LDC status and include controls that signal whether a country enjoys a particular GSP status. In our preferred specification, we account for time-invariant unobservable heterogeneity by using country-pair fixed effects. In addition, we include time-variant importer and exporter dummies in the model to account for MRTs. Given the time span of our analysis, MRTs do not vary yearly, but every six years. The main reason for this choice is twofold. First, we aim to identify the effect of LDC status, and since this dummy is exporter specific and varies yearly, we will only be able to identify this effect if we restrict the temporal variation of the MTRs to six-year intervals. Second, MRTs account for trade costs relative to all trading partners and we assume that these costs only vary substantially in the medium term.<sup>18</sup>

According to the underlying theory of the gravity model, trade between two countries is explained by the nominal incomes of the trading countries, the distance between the economic centers of the exporter and importer, and by several trade impediment and facilitation variables. Geographical distance and a number of dummy variables, such as having a common border, common language, common currency, free trade agreements; and being a former colony, etc. are generally used as proxies for these factors. In our setting, however, these variables are absorbed by dyadic fixed effects.

In order to study the impact of specific trade preference schemes on exports, we focus on the role played by unilateral trade preferences (GSP) including EU, US, Canadian, Japanese, Australian, New Zealand, Norwegian, and Turkish trade preference systems.

A comprehensive econometric version of the structural gravity model, augmented with GSP and LDC factors, is specified as follows:

$$\left(\frac{X_{ijt}}{X_{it}}\right) = \text{Exp} \left[ \delta_{ij} + \tau_{ip} + \varphi_{jp} + \alpha_1 \ln Y_{it} + \alpha_2 \ln Y_{jt} + \sum_{h=3}^{h=5} \alpha_h BTP_{h\_ijt} + \alpha_6 LDC_{it} + \sum_k \beta_k GSP_{k\_ijt} \right] \varepsilon_{ijt} \tag{1}$$

where  $t$  stands for the year and  $p$  for the time windows used, i.e. the inclusion of dummies that are country specific and vary every  $p$  years.  $X_{ijt}$  is the export level from exporter  $i$  to importer  $j$  over total exports from  $i$  to all destinations in period  $t$  in current US dollars.  $X_{it}$  is total exports of country  $i$  at time  $t$ . We specify the dependent variable in

shares  $\frac{X_{ijt}}{X_{it}}$ , instead of levels because the levels specification gives more importance to large countries, whereas a shares specification gives equal weights to all countries. This technique is known as Multinomial Pseudo Maximum Likelihood (MPML) based on a multinomial distribution.<sup>19</sup> Sotelo (2019) as well as Head and Mayer (2014) pointed out that the implementation of the MPML estimator could be done by applying a PPML estimator that uses trade shares as dependent variables.

Trading-partner (dyadic) fixed effects,  $\delta_{ij}$ , which proxy for time-invariant characteristics in the relationship between  $i$  and  $j$ , are included to account for time-invariant bilateral effects. This leads to the exclusion of time-invariant bilateral factors, namely geographical distance, common border, common language, colonial relationship, etc. The influence of variables that are bilateral and time-invariant cannot be directly estimated when bilateral (dyadic) fixed effects are included.<sup>20</sup>

Exporter-time fixed effects ( $\tau_{ip}$ ) and importer-time-fixed effects ( $\varphi_{jp}$ ) proxy for all sorts of trade barriers that are country specific and vary slowly over time. They control for outward and inward multilateral resistance, i.e. trade barriers from third countries that affect trade costs. We use six-year windows ( $p$ ) for constructing exporter-time and importer-time fixed effects, mainly to account for factors, such as institutions, infrastructure or cultural factors, which vary slowly over time.  $Y_{it}$  ( $Y_{jt}$ ) indicates the GDP<sup>21</sup> of the exporter (importer).  $BTP_{h\_ijt}$  denotes time-variant bilateral factors, namely, common membership in currency unions ( $CU_{ijt}$ ), regional free trade agreements ( $RTA_{ijt}$ ), and the World Trade Organization ( $WTO_{ijt}$ ). The variable  $GSP$  denotes different trade preference dummies that can vary over time and that characterize  $k$  different trade preference schemes ( $GSP_{k\_ijt}$ ) relating to country-pair  $ij$  at time  $t$ .

The model is estimated for data on a maximum of 192 countries (for 184 of them data on GSP schemes are available) over the period from 1973 to 2013. Panel fixed effect techniques that are based on MPML are used.

### 3.3. Data and variables

We use bilateral trade data from 1973 to 2013 for aggregated and disaggregated exports (1-digit level SITC 3) from UN-COMTRADE. The products included in the sectors considered in the empirical analysis are listed in Table A.4 in the online Appendix. Data on income variables are drawn from the World Bank (World Development Indicators Database, 2016). Distances between capitals are computed as great-circle distances using data on straight-line distances in kilometers, latitudes and longitudes, trade impeding or promoting factors, such as being a former colony and sharing a common language or a common border, are taken from the CEPII database.<sup>22</sup> GSP preference dummies were kindly provided by Marco Wagner (Herz and Wagner 2011) and have been extended until 2013 using information from UNCTAD reports. RTA and WTO dummies are from De Sousa (2012). The official LDC list and the characteristics of LDC countries are from the UNDP. Summary statistics are shown in Table A.3 (online Appendix).

## 4. Main results

### 4.1. Results for LDCs and comparable countries

In this section, we start by comparing the exports of official LDC countries with the exports of the control group, 'off-LDC-list' countries (see Table 1). This group is

comprised of countries with a low-income level, a low level of human development, and a high level of economic vulnerability, but which have not obtained LDC status for the reasons discussed above.

The main results for the selected comparable developing countries as exporters are presented in Table 2 for aggregated exports, building up from the most parsimonious gravity model to our preferred specification. We start with a gravity model specified with the usual bilateral trade cost proxies and origin and destination fixed effects in column 1, replace them with bilateral (dyadic) fixed effects in column 2, and with bilateral and time-variant origin and destination fixed effects in column 3 (every 10 years), 4 (every 6 years) and 5 (every 5 years). The estimations contain common year fixed effects and data for around 5900 country-pairs (column 2) for aggregate exports.

In column 1, the gravity model with exporter and importer fixed effects, the LDC dummy is positive and significant. Adding further fixed effects does not change the results much for the LDC dummy, as we can see comparing columns 3, 4, and 5 with column 2.

Quantitatively, results in column 4 of Table 2 indicate that LDCs export 30%<sup>23</sup> more in total. This result, being the most conservative point estimate, seems quite large but it should be noted that the levels of LDC exports, and thus the level of the dependent variable (export shares) is quite low, only 0.04% for LDCs, so that a 30% increase is quite possible (see Table A.3). The effect of preferences (GSP dummy variable) on exports is mostly non-significant, however this is an average effect that could be hiding heterogeneous effects across sectors or across preference regimes.

**Table 2.** LDCs & comparable 'off-LDC-list' countries as exporters, all importers.

Dep. Variable: Export shares Fixed Effects Included:	(1) i,j,t	(2) ij, t	(3) ij, iy10, jy10	(4) ij, iy6, jy6	(5) ij, iy5, jy5
Ind. Variables:					
Least Developed Country Status (LDC)	0.327*** [0.0792]	0.511*** [0.0788]	0.510*** [0.121]	0.260** [0.108]	0.460*** [0.0748]
Generalized System of Preferences (GSP)	-0.123 [0.0924]	0.0822 [0.0849]	-0.191** [0.0928]	-0.159 [0.144]	0.0446 [0.0797]
Ln Income Exporter	0.786*** [0.0711]	0.778*** [0.0659]	0.587*** [0.0718]	0.247*** [0.0831]	0.762*** [0.0630]
Ln Income Importer	-0.185*** [0.0632]	-0.184*** [0.0522]	-0.440*** [0.0650]	-0.00551 [0.0711]	-0.192*** [0.0502]
Ln Geographical Distance	-1.307*** [0.0360]				
Common Colony	0.696*** [0.0661]				
Common Official Language	0.257*** [0.0567]				
Common Border	0.699*** [0.0552]				
Common Currency	0.879*** [0.110]	0.0771 [0.165]	0.183 [0.359]	-0.247 [0.303]	0.0702 [0.146]
World Trade Organization	0.0808 [0.0503]	0.151*** [0.0503]	0.0757 [0.0559]	0.110* [0.0617]	0.140*** [0.0506]
Regional Trade Agreement	0.244*** [0.0530]	0.00902 [0.0530]	0.108** [0.0532]	0.243*** [0.0602]	0.0377 [0.0519]
Pseudo-R Squared	0.391	0.431	0.441	0.444	0.440
Number of Observations	229,917	189,056	170,138	162,955	189,027

Note: Robust standard errors clustered by country pair are in brackets. \*\*\* $p < 0.01$ , \*\* $p < 0.05$ , \* $p < 0.1$ . Estimation technique MPML with country pair and exporter-time and importer-time fixed effects (CPFE&CTFE). Export share = exports from  $i$  to  $j$  as a ratio of total exports.

**Table 3.** LDCs & comparable 'off-LDC-list' countries as exporters, all importers.

Dep. Variable (export shares):	(1) Xtot	(2) Xnoen	(3) Xmanu	(4) Xrawm	(5) Xfood	(6) Xche	(7) Xmachtr	(8) Xotherm
Ind. Variables:								
Least Developed Country Status (LDC)	0.260**	0.168	-0.197	-0.258	0.952***	-0.0224	0.233	0.182
	[0.108]	[0.122]	[0.122]	[0.180]	[0.202]	[0.111]	[0.204]	[0.206]
Generalized System of Preferences (GSP)	-0.159	0.239**	0.133*	0.289**	-0.163	0.376***	0.186	0.344***
	[0.144]	[0.0976]	[0.0702]	[0.114]	[0.123]	[0.120]	[0.152]	[0.125]
Ln Income Exporter	0.247***	0.193**	0.0580	-0.137***	0.112	0.433***	0.547***	0.224**
	[0.0831]	[0.0828]	[0.0431]	[0.0480]	[0.0955]	[0.107]	[0.155]	[0.0914]
Ln Income Importer	-0.00551	0.0315	-0.0274	0.0886*	0.145*	-0.138	0.0285	-0.0932
	[0.0711]	[0.0711]	[0.0333]	[0.0470]	[0.0821]	[0.0870]	[0.133]	[0.0768]
Common Currency	-0.247	-0.0855	0.377	0.106	0.604*	-1.400*	-0.558	-0.329
	[0.303]	[0.275]	[0.300]	[0.264]	[0.343]	[0.735]	[0.553]	[0.480]
World Trade Organization	0.110*	0.110*	-0.00678	-0.00735	0.101*	0.158**	-0.0142	0.0624
	[0.0617]	[0.0600]	[0.0414]	[0.0591]	[0.0600]	[0.0797]	[0.0780]	[0.0838]
Regional Trade Agreement	0.243***	0.359***	0.226***	0.172***	0.230***	0.405***	0.137	0.236***
	[0.0602]	[0.0652]	[0.0475]	[0.0447]	[0.0632]	[0.0766]	[0.0930]	[0.0798]
Pseudo-R Squared	0.444	0.426	0.53	0.397	0.437	0.499	0.467	0.452
Number of Observations	162,955	162,365	127,875	120,067	122,369	76,272	107,199	119,248

Note: Robust standard errors clustered by country pair are in brackets. \*\*\* $p < 0.01$ , \*\* $p < 0.05$ , \* $p < 0.1$ . xtot = total exports; xnoen = total exports without energy products; xmanu = manufactured exports; xrawm = raw material exports; xfood = agricultural exports; xche = exports of chemical products; xmachtr = exports of machinery and transport goods; xotherm = exports of textiles and other manufactured goods. The controls include dyadic, exporter-6year-interval and importer-6year-interval fixed effects (CPFE&CTFE). Estimation technique MPML with CPFE & CTFE.

In Table 3 we look at export shares and its components. Column 1 replicates our preferred specification for total exports, column 2 excludes energy (mineral fuels, lubricants and related materials), and the most important sectors at the 2-digit SITC disaggregation level are shown in columns (3) to (8). It shows that LDC status leads to about 151% more agriculture-related exports (column 4) than the control group. The coefficient of the term GSP is positive, sizable, and significant in the case of non-fuel exports, but not for agricultural exports. For manufacturing exports, the positive effects are due to increases in raw materials, chemical goods and textiles, and other manufactured goods. Therefore, it seems that the non-significance of the GSP term in Table 2 was due to the inclusion of the energy sector.

Thus, while preferences for LDCs matter in a quantitatively significant manner, being an LDC has an additional positive effect on exports, possibly related to the other benefits they receive (e.g. overall aid, aid for trade, or more generous implementation of existing trade rules).

Meanwhile, the impact of belonging to a regional trade agreement (RTA) increases total exports by 28%, manufactured exports by 25%, agriculture-related exports by 26%, chemicals by 50%, and textile and other exports by around 27%. It is important to note that LDCs differ in their competitiveness of different product categories, especially agriculture and textile and the effect could also be heterogeneous between countries depending on their comparative advantages.

## 4.2. Results for all countries

In this sub-section, we present the results obtained for the whole sample of countries thus comparing LDCs with all other exporting countries (non-LDC developing countries and

developed countries). As in the previous section, exports to other developing countries and OECD countries are considered and we focus on the comparison between the GSP regimes and official LDC status.

Table 4 looks at specific individual trade preference systems, different granters of trade preferences: Canada (GSP\_IM\_CA), the US (GSP\_IM\_US), Australia (GSP\_IM\_AUT), New Zealand (GSP\_IM\_NZ), Japan (GSP\_IM\_JAP), the EU (GSP\_IM\_EU), Norway (GSP\_IM\_NOR), and Turkey (GSP\_IM\_TUR). We find that only Canadian and Australian trade preference systems have a positive and statistically significant impact on developing countries' total exports: They increase imports into Canada by 116% and into Australia by about 44%. In contrast, the trade preferences granted by all of the other above-mentioned preference granters (US, New Zealand, Japan, EU, Norway and Turkey) do not show a significant positive impact on the trade preferences of receiving countries' total exports. However, the results shown in columns 2–8 indicate that the coefficient of the GSP factor varies by sector. In particular, when energy exports are excluded in column 2, the preferences granted by New Zealand and Japan also show a positive impact on exports. Moreover, the GSP regimes of the EU and Turkey seems to increase exports of manufactured goods (column 3) and more specifically, of machinery and transport the former and also of other manufactures the latter (columns 7 and 8).

**Table 4.** Results for all countries including specific non-reciprocal preference regimes.

Dep. Variable: Export shares:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Ind. Variables:	Xtot	Xnoen	Xmanu	Xrawm	Xfood	Xche	Xmachtr	Xotherm
LDC Status	0.262** [0.122]	0.171 [0.114]	0.112 [0.128]	-0.653** [0.295]	1.008*** [0.208]	-0.0284 [0.106]	0.231 [0.207]	0.161 [0.200]
GSP Canada	0.772*** [0.181]	0.786*** [0.192]	0.945*** [0.320]	0.441*** [0.133]	0.200** [0.0903]	0.180 [0.179]	1.057*** [0.218]	0.471* [0.272]
GSP United States	-0.123** [0.0620]	0.0239 [0.0514]	0.0217 [0.0582]	0.132* [0.0698]	0.303*** [0.0773]	0.374*** [0.0865]	0.0633 [0.0699]	-0.122** [0.0614]
GSP Australia	0.362*** [0.0761]	0.426*** [0.0584]	0.386*** [0.0907]	0.312*** [0.0986]	0.642*** [0.108]	0.146 [0.177]	0.316*** [0.121]	0.408*** [0.0810]
GSP New Zealand	0.0469 [0.0884]	0.239*** [0.0591]	-0.194*** [0.0672]	-0.0640 [0.129]	0.141 [0.115]	-0.527*** [0.0947]	-0.0823 [0.0755]	-0.195** [0.0947]
GSP Japan	0.133 [0.117]	0.452*** [0.165]	0.466** [0.187]	-0.810*** [0.132]	-0.115 [0.106]	0.653** [0.306]	0.469** [0.235]	0.447*** [0.160]
GSP European Union	-0.00988 [0.0274]	0.00697 [0.0245]	0.0611** [0.0269]	-0.127** [0.0571]	-0.000694 [0.0400]	-0.140*** [0.0411]	0.151*** [0.0423]	0.0180 [0.0302]
GSP Norway	-0.111 [0.135]	-0.225 [0.138]	-0.372** [0.172]	0.457*** [0.128]	0.607*** [0.103]	0.654*** [0.204]	-0.496** [0.220]	-0.166 [0.195]
GSP Turkey	0.0743 [0.0575]	0.0684 [0.0507]	0.225*** [0.0595]	-0.685*** [0.104]	-0.255** [0.117]	-0.138 [0.110]	0.462*** [0.0850]	0.164** [0.0708]
World Trade Organization	0.175*** [0.0264]	0.172*** [0.0238]	0.0847*** [0.0267]	0.445*** [0.0483]	0.384*** [0.0335]	0.106*** [0.0332]	0.0800*** [0.0270]	0.141*** [0.0307]
Common Currency	0.0243 [0.0158]	0.0242* [0.0145]	0.0226 [0.0163]	0.0229 [0.0251]	0.0119 [0.0189]	0.0522*** [0.0179]	0.0231 [0.0203]	0.0168 [0.0172]
Regional Trade Agreement	0.150*** [0.0121]	0.142*** [0.0113]	0.139*** [0.0130]	0.131*** [0.0180]	0.207*** [0.0144]	0.124*** [0.0150]	0.0976*** [0.0155]	0.167*** [0.0139]
Observations	713,625	711,085	594,850	538,344	573,280	463,044	524,846	565,180
Pseudo-R Squared	0.399	0.406	0.421	0.404	0.393	0.408	0.436	0.421

Note: LDC = Least Developed Countries. GSP = Generalized System Preferences. Robust standard errors clustered by country pair are in brackets. \*\*\* $p < 0.01$ , \*\* $p < 0.05$ , \* $p < 0.1$ ; xtot = total exports; xnoen = total exports without energy products; xmanu = manufactured exports; xrawm = raw material exports; xfood = agricultural exports; xche = exports of chemical products; xmachtr = exports of machinery and transport goods; xotherm = exports of textiles and other manufactured goods. Estimation technique MPML with CPFE & CTFE. The coefficients of income variables are not reported to save space.



Food exports seem to benefit from the GSP regimes of Canada, US, Australia, and Norway (column 6). In short, the impact of preference regimes is sector-specific and depends on the conditions of the granting country, as could be expected.

With respect to the role of LDC status, we find that it has a positive and statistically significant effect on total exports leading to an increase of 30%. More specifically, agricultural exports increase by 174% and they seem to drive the result for total exports. The estimates differ only slightly from Table 3 where the impact on total exports is an increase of 30%, and 159% for food exports.

In terms of additional control variables, we observe that several factors promote total exports (col. 1) in a statistically significant way. If both countries share a common currency (comcur), the exporting country's exports increases in a non-significant way, and if both parties belong to a regional trade agreement (RTA), they export 16% more and if they both belong to the WTO, exports increase by 19%.

### 4.3. Extensions and robustness

As a first extension, we focus on country characteristics of LDCs using the reduced sample of LDCs and comparable countries in Table 5. We differentiate between LDCs that are regular exporters (category omitted), big exporters (LDC\_bigexp) and small exporters (LDC\_sids, including islands, landlocked and very small countries; see Table 1 for the classification). Looking at the coefficients belonging to the big exporters among the LDCs, we find clear evidence that the big exporters are much more successful than the off-list countries in terms of agriculture-related exports.

Table 6 shows that LDC status did not help LDCs to export more in the period 1973–1990. Trade preferences for LDCs in combination with LDC status have only

**Table 5.** LDCs and comparable 'off-LDC-list' countries as exporters.

Dep. Variable (export shares):	(1) Xnoen	(2) Xmanu	(3) Xfood	(4) Xotherm
Ind. Variables:				
LDC Big Exporters	0.177 [0.123]	-0.195 [0.123]	0.987*** [0.214]	0.180 [0.207]
LDC Small Islands	-0.680 [0.545]	-2.903*** [0.800]	0.358 [0.964]	-1.469 [1.236]
Ln Income Exporter	0.231*** [0.0805]	0.0550 [0.0423]	0.131 [0.0938]	0.239*** [0.0900]
Ln Income Importer	0.0118 [0.0679]	-0.0232 [0.0327]	0.132* [0.0789]	-0.0853 [0.0738]
Common Currency	0.232 [0.268]	0.211 [0.276]	0.725** [0.299]	-0.175 [0.483]
World Trade Organization	0.115* [0.0598]	-0.00623 [0.0414]	0.101* [0.0595]	0.0546 [0.0830]
Regional Trade Agreement	0.365*** [0.0622]	0.222*** [0.0463]	0.243*** [0.0605]	0.253*** [0.0781]
Constant	-9.659*** [1.272]	-1.979*** [0.733]	-9.362*** [1.463]	-7.104*** [1.562]
Observations	194,970	148,808	137,160	136,926
Pseudo-R Squared	0.432	0.537	0.440	0.458

Note: LDC denotes Least Developed Countries. Robust standard errors clustered by country pair are in brackets \*\*\* $p < 0.01$ , \*\* $p < 0.05$ , \* $p < 0.1$ . LDC-regular exporters is the left-out category. Estimation technique MPML with CPFE & CTFE.

**Table 6.** The impact of trade preferences over time for all countries.

Dep. Variable (export shares):	Period 1973–1990				Period 1991–2013			
	(1) Xtot	(2) Xmanu	(3) Xfood	(4) Xotherm	(5) Xtot	(6) Xmanu	(7) Xfood	(8) Xotherm
Ind. Variables:								
Least Developed Country Status (LDC)	-0.794	-0.824	-0.236	-0.827	0.277**	0.215	1.146***	0.525***
	[0.428]	[0.523]	[0.428]	[0.552]	[0.126]	[0.137]	[0.257]	[0.200]
Generalized System of Preferences (GSP)	-0.0142	0.732***	-0.470***	0.607***	0.122***	0.115***	0.0948***	0.0206
	[0.0804]	[0.123]	[0.0708]	[0.105]	[0.0203]	[0.0224]	[0.0290]	[0.0252]
Ln Income Exporter	0.101***	0.0184	0.126***	-0.0960***	0.149***	0.173***	0.0651***	0.134***
	[0.0182]	[0.0216]	[0.0304]	[0.0237]	[0.0191]	[0.0202]	[0.0248]	[0.0213]
Ln Income Importer	-0.0498***	-0.0138	-0.0611**	0.0478	-0.0808***	-0.0931***	-0.0394*	-0.0816***
	[0.0181]	[0.0259]	[0.0297]	[0.0301]	[0.0147]	[0.0154]	[0.0203]	[0.0179]
Common Currency	0.0815	-0.299*	0.127	-0.389**	0.0658***	0.0359**	0.199***	0.0463**
	[0.0801]	[0.175]	[0.100]	[0.193]	[0.0160]	[0.0174]	[0.0240]	[0.0198]
World Trade Organization	0.00769	0.0234	0.0793	0.0545	-0.00863	-0.00667	0.000926	-0.0257
	[0.0438]	[0.0544]	[0.0532]	[0.0587]	[0.0148]	[0.0160]	[0.0183]	[0.0169]
Regional Trade Agreement	0.100***	0.0351	0.257***	0.0811**	0.114***	0.107***	0.102***	0.119***
	[0.0235]	[0.0388]	[0.0334]	[0.0386]	[0.0131]	[0.0136]	[0.0171]	[0.0149]
Constant	-3.939***	-2.250***	-4.265***	-0.674	-4.959***	-5.244***	-3.531***	-4.318***
	[0.392]	[0.544]	[0.634]	[0.585]	[0.367]	[0.395]	[0.443]	[0.396]
Observations	146,027	87,291	109,788	81,263	452,174	426,258	380,462	409,729
Pseudo-R Squared	0.399	0.423	0.373	0.402	0.386	0.398	0.385	0.405

Note: LDC = Least Developed Countries. GSP = Generalized System Preferences. Robust standard errors clustered by country pair are in brackets. \*\*\* $p < 0.01$ , \*\* $p < 0.05$ , \* $p < 0.1$ ; xtot = total exports; xmanu = manufactured exports; xfood = agricultural exports; xotherm = exports of textiles and other manufactured goods. Estimation technique MPML with CPFE & CTFE.

become effective in the period 1991–2013 (columns 5–8). This is to be expected as preference schemes targeting LDCs were only established starting in the 1990s (Guillamont, 2009). Also, poor countries have increasingly been integrated into global value chains in agricultural and some manufacturing products, and LDCs appear to have benefited from that. Moreover, in the 1990s and 2000s, being on the list of LDCs independently of being GSP beneficiaries is also associated with higher manufactured goods exports, agricultural exports, textiles, and other manufactured goods. In addition, receiving non-reciprocal preferences contributed to promoting total exports, manufacturing exports, and food exports. Hence, in the period 1991–2013, both LDC status and availability of trade preferences contributed to the promotion of exports.

As a third robustness check, we estimated the model for an alternative control group using quantitative criteria to select the control group. To construct the control group, we first selected countries that were within 10% of the graduation threshold from 2003-onwards. We then included the countries that in any of the triennial reports (2003, 2006, 2009, 2012) were within the given 10% of the graduation threshold levels (per capita income < 1500, human assets < 73, and economic vulnerability > 35). In this way we arrive at the list we use in Tables 2 and 3, but excluding Kenya and India. We have therefore re-estimated the model excluding Kenya and India and the results, which do not practically differ from those in Table 3, are shown in Table A.5 (online Appendix).

Next, we estimate the model for all countries and total exports for the 2000s (see Table A.6 in the online Appendix). We investigate whether preferences have eroded in recent years due to the ratification of numerous RTAs.

We find a diminishing impact of preferences granted by Canada and Australia and even a total erosion of the ones granted by New Zealand, Japan, and EU. The Canadian GSP impact declines drastically for total exports and becomes negative (column (2)) for total exports and remains positive but much smaller for non-energy exports. Interestingly, Turkish GSP preferences become effective only in the 2000s.

The diminished impact of Canada's GSPs and the erosion of the impact of Australia's GSPs are likely correlated with an expansion of product coverage and lower tariff rates in response to the signing of many bilateral trade agreements, which also benefited industrialized and non-LDC developing countries.

Between 2009 and 2012, Canada concluded several bilateral trade agreements, e.g. with Panama, Jordan, Colombia, Peru, and the European Free Trade Association (EFTA). Australia signed the ASEAN-Australia-New Zealand Free Trade Agreement in 2010. A further erosion of Australia's GSPs is to be expected as Australia signed bilateral trade agreements with China (2015), Japan (2015) and South Korea (2014).

In 2015, Australia signed the so-called Australia-Transpacific Partnership Agreement, which covers Brunei, Canada, Chile, Japan, Malaysia, Mexico, Peru, New Zealand, Singapore, US, and Vietnam.

The ineffectiveness of non-reciprocal trade preferences granted by the EU could be due to the heterogeneity of the preference regimes with different developing countries. Another factor could be that only a quarter of LDCs enjoy nameable (in terms of products exported) trade preferences, which are relevant when taking their export value into account (see Table A.1 in the online Appendix from Brenton (2003)). To test this argument, we have also estimated the model for specific preference schemes (see Table A.7, online Appendix). The results for GSP Plus and for EBA show some positive effects for manufacturing exports, in particular for raw materials and food (GSP Plus) and for machinery and other manufacturing including textile and footwear (EBA).

Finally, as discussed above, while the off-list countries are very similar to LDCs that are close to the graduation threshold, they may be systematically better off than the worst off LDCs that are far from graduation. To further investigate this, we removed the worst off LDCs to make the groups even more comparable. In the sub-sample analysis, we remove Benin, Burkina Faso, Burundi, Chad, Eritrea, Ethiopia, Gambia, Guinea, Guinea-Bissau, Liberia, Madagascar, Mali, Mozambique, Niger, Sierra Leone, Somalia, South Sudan, and Togo from the LDC list and Zimbabwe from the off-list countries. The results are shown in Table A.8 in the online Appendix and are comparable to those in Table 3. The restricted sample confirms our previous findings and the coefficients for the LDC status variable are very similar to those found in Table 3; however, they show a slightly higher magnitude as expected. Thus, we find that the effect of LDC status among the most comparable group is statistically significant, substantial, and robust.

## 5. Conclusions

We find that LDC status (compared to non-LDC status) grants LDCs a large advantage, as far as total exports and agricultural exports are concerned. This effect tends to be larger when a trade preference scheme is not operating effectively. We argue that LDC status is helpful in promoting exports because it potentially reduces the uncertainty attached to a particular GSP regime, which is revised periodically and depends on the decision of the granters, whereas graduation from LDC status is very unlikely to happen in the short run and must be confirmed by the UN.

In addition, we found that the trade preference schemes are effective in some cases, in the sense that the GSP systems promote exports from developing countries (LDCs and non-LDCs), but the results are heterogeneous and vary depending on the country offering the preferences and on the sector of exports considered.

When we compare the export effect of trade preferences for LDCs with that for 'off-LDC-list' developing countries (untreated LDCs), a substantial export advantage ranging from 30% (for total exports) to more than 159% (for food and agricultural exports) for LDCs is noticeable. In addition, differentiating among LDC exporters by country size, geographic location, and export strength shows that big exporters have a large export advantage for food products compared to off-LDC-list countries and the regular and island LDCs. The main limitation of our empirical application is that the identification strategy of the export effect of LDC status relies on a limited number of switchers, that is, countries that move onto and off of the official list. For this reason, a more detailed analysis using highly disaggregated trade data is still needed and is an area for future research. It will also allow for the inclusion of product-level data into the analysis and allow for a cleaner identification strategy.

In terms of policy, on the one hand, our results suggest that LDC status seems to generate important benefits. On the other hand, it implies that graduating countries face the threat of declining exports. This is potentially a serious problem as the number of countries that are becoming or will soon become eligible for graduation is currently rapidly increasing. Ten LDCs have been identified for graduation in the coming five years and more are likely to move towards graduation soon, including countries that are major exporters of manufactured goods and benefit a great deal from trade preferences, such as Bangladesh, Cambodia, and Myanmar. For these countries, a smooth transition to non-LDC status, which should involve a slow winding down of trade preferences and other benefits over many years, will be critical.

## Notes

1. The 2018 LDC identification criteria are available at: <https://www.un.org/development/desa/dpad/least-developed-country-category/ldc-criteria.html>.
2. The loss of LDC-specific preferential treatment in the G20 countries is estimated to be equivalent to a 3–4 percent reduction in merchandise export revenues (UNCTAD 2016, 17).
3. See Guillaumont (2009) for details on the inclusion and graduation criteria and their changes over time.
4. The list includes Equatorial Guinea, which graduated in 2017, and South Sudan, which was included in 2012.
5. As argued above, the LDC category might promote their exports through other mechanisms, such as more preferential aid, more lenient treatment in the enforcement of trade regulations as well as other bilateral and multilateral support measures that lead to increased exports. Thus, it is important to assess the complete impact of LDC status on trade.
6. For a complete list see <http://ptadb.wto.org/ptaList.aspx>.
7. As cited in Harrison (2014).
8.  $t^{MFN}$  is the tariff under Most Favoured Nations treatment;  $t^{TP}$  is the tariff under the relevant trade preference scheme.
9. A summary of the main empirical findings of specific studies on EU and US trade preferences can be found in the online Appendix in Table A.2 ([https://www.researchgate.net/publication/343995454\\_Online\\_Appendix\\_Does\\_the\\_Designation\\_of\\_Least\\_Developed\\_Country\\_Status\\_Promote\\_Exports/](https://www.researchgate.net/publication/343995454_Online_Appendix_Does_the_Designation_of_Least_Developed_Country_Status_Promote_Exports/)).
10. They also show robustness checks with fixed effects LS (dyadic effects) and year dummies.

11. They usually include country-year fixed effects for exporters and importers (in the main results with a Heckman approach) and country-pair (dyadic) effects in the robustness checks with PPML. In order to reduce the amount of dummy variables, they use data with 4 year intervals.
12. Since first difference regressions reflect short-run development, a value of 91% seems to be unrealistic. Values computed by the Heckman or PPML approach produce more plausible figures in the range of around a 30 percent increase in exports.
13. Other developed countries also apply some graduation rules. For instance, EU standard GSP and GSP+ are subject to income and product graduation (Stevens et al. 2011).
14. The total costs of border formalities – in order to determine the origin of a product – are in the range of 3% to 6% of the total export value of a product (Inama 2003; Mohan, Khorana, and Choudhury 2012).
15. The timeline of a country's graduation is available at: <https://www.un.org/development/desa/dpad/least-developed-country-category/ldc-graduation.html>.
16. Going back further is difficult as the criteria have changed slightly over time and data is not available for earlier years. Since most developing countries also recorded economic growth and improvements in education and health in the 1990s, going back further (i.e. to a time when they were poorer and education and health were worse) would be very unlikely to change the list of comparator countries.
17. The argument was that more populous countries would be better able to deal with their structural handicaps. Surpassing 75 million does not lead to graduation, however, which is why Bangladesh and Ethiopia are still LDCs.
18. As robustness checks, we vary the frequency of the time-country dummies and the results remain similar, with the only exception being agricultural exports, for which the LDC dummy coefficient has a much higher magnitude when using six-year intervals.
19. As with the more popular Poisson Pseudo Maximum Likelihood (PPML), MPML also yields consistent estimates of the first-moment parameters, provided that the conditional expectation is correctly specified (Gourieroux, Monfort, and Trognon 1984; Eaton, Kortum, and Sotelo 2013; Sotelo 2019).
20. A traditional gravity model including the usual 'gravity' variables was also estimated for comparative purposes. Results are available upon request.
21. We utilize GDP rather than GNP in order to avoid counting income received by third countries (international transfer payments such as aid) twice.
22. <http://www.cepii.fr/anglaisgraph/bdd/fdi.html>. These variables are used to estimate a traditional gravity model for comparative purposes (see Table 2, columns 1 and 2).
23.  $[(\exp(0.260) - 1) * 100\%]$ .

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## ORCID

Stephan Klasen  <http://orcid.org/0000-0003-4078-755X>

Inmaculada Martínez-Zarzoso  <http://orcid.org/0000-0002-3247-8557>

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