City Research Online

City St George's, University of London

Citation: Defever, F. & Reyes, J-D. (2016). Does the Elimination of Export Requirements in Special Economic Zones A ect Export Performance? Evidence from the Dominican Republic (16/04). Department of Economics, City, University of London: City, University of London.

This is the published version of the paper.

This version of the publication may differ from the final published version. To cite this item please consult the publisher's version.

Permanent repository link: https://openaccess.city.ac.uk/id/eprint/16225/

Copyright and Reuse: Copyright and Moral Rights remain with the author(s) and/or copyright holders. Copies of full items can be used for personal research or study, educational, or not-for-profit purposes without prior permission or charge, unless otherwise indicated, provided that the authors, title and full bibliographic details are credited, a hyperlink and/or URL is given for the original metadata page and the content is not changed in any way. For full details of reuse please refer to City Research Online policy.

City Research Online: http://openaccess.city.ac.uk/ publications@citystgeorges.ac.uk

CITY
UNIVERSITY OF LONDON
EST 1894

Department of Economics

Does the Elimination of Export Requirements in Special Economic Zones Affect Export Performance? Evidence from the Dominican Republic

Fabrice Defever[1]
City, University of London

José-Daniel Reyes
The World Bank

Alejandro Riaño
University of Nottingham

Miguel Eduardo Sánchez-Martín
The World Bank

Department of Economics
Discussion Paper Series
No. 16/04

[1] Corresponding author: Fabrice Defever, Department of Economics, City, University of London, Northampton Square, London EC1V 0HB, UK.
Email: fabrice.defever@city.ac.uk

Does the Elimination of Export Requirements in Special Economic Zones Affect Export Performance? Evidence from the Dominican Republic*

Fabrice Defever†, José-Daniel Reyes‡,
Alejandro Riaño§, Miguel Eduardo Sánchez-Martín¶

November 2, 2016

Abstract

Special economic zones, one of the most important instruments of industrial policy in developing countries, often feature export share requirements. That is, firms located in these zones are obliged to export more than a certain stated share of their output to enjoy the wide array of incentives available there, a practice prohibited by the World Trade Organization. This paper exploits the staggered removal of export requirements across products and over time in the special economic zones of the Dominican Republic to evaluate whether the importance of exports originating from the zones was affected by the elimination of export requirements. The findings show that entry increased among firms in special economic zones, while the average value of export transactions fell for existing exporters following the reforms. At the same time, continuous exporters were unaffected by the policy change, possibly because these firms were not constrained by the export requirement. Overall, special economic zones became more important with respect to the number of exporters based there but not in terms of the value of exports. The findings suggest that the elimination of performance requirements made it more attractive for firms to be based in special economic zones.

Keywords: Special Economic Zones; Export Share Requirements; Export Subsidies; Dominican Republic; Agreement on Subsidies and Countervailing Measures.

JEL classification: F12; F13; O47.

*We thank Thomas Farole, Michael Ferrantino, Justo Mirabal and participants at DEGIT XXI-Nottingham and the UNIDO-Kiel Vienna Investment Conference for their thoughtful comments and suggestions. All remaining errors are our own. The findings, interpretations, and conclusions expressed in this paper are entirely those of the authors. They do not represent the view of the World Bank, its Executive Directors, or the countries they represent.

†City, University of London, CEP, GEP and CESifo. f.defever@lse.ac.uk

‡The World Bank.danielreyes@worldbank.org

§University of Nottingham, GEP, CFCM and CESifo. alejandro.riano@nottingham.ac.uk

¶The World Bank.msanchezmartin@worldbank.org

1 Introduction

On July 31, 2007, the General Council of the World Trade Organization (WTO) set December 31st 2015 as the final deadline for the elimination of export subsidies in the Dominican Republic and 18 other developing countries that had previously been exempted from complying with the Agreement on Subsidies and Countervailing Measures (ASCM).[1] The majority of subsidy programs to be scrapped were fiscal incentives available to firms operating in special economic zones (SEZ) — geographically-bounded areas in which customs, tax and investment regulations are more liberal than in the rest of the country (Farole and Akinci, 2011). Although SEZ are not explicitly forbidden by the WTO, firms operating in them are often subject to export share requirements (ESR) (Defever and Riaño, 2016); that is, they are required to export at least a certain stated share of their output in order to be eligible to receive the incentives available in SEZ.[2] The imposition of ESR makes an SEZ contingent upon export performance, thereby falling under the category of prohibited subsidies under the ASCM.[3]

SEZ are pervasive across the world, and are one of the most important tools of industrial policy in developing countries (Rodrik, 2004); Boyenge (2007) reports the existence of 3,500 (more recently, The Economist (2015) puts this figure at 4,300) SEZ in 130 countries, accounting for approximately US$ 200 billion worth of exports. These zones are crucially important for a small open economy like the Dominican Republic, where exports originating from SEZ comprised 70% of aggregate exports and 12% of GDP over the last decade, a period which was also characterized by a chronic trade balance deficit, averaging 8.4% of GDP (Banco Central de la República Dominicana, 2014).

Our objective in this paper is to investigate whether the removal of export share requirements affected export performance in the special economic zones of the Dominican Republic. To do so, we use transaction-level data covering the period 2006-2014, and exploit the fact that the elimination of ESR took place in a staggered fashion over time and across different industries, in order to identify the effect of this reform on the importance of exports originating from SEZ. To

[1] See: General Council decision of July 31, 2007 WT/L/691. The other beneficiaries of this extension were Antigua and Barbuda, Barbados, Belize, Costa Rica, Dominica, El Salvador, Fiji, Grenada, Guatemala, Jamaica, Jordan, Mauritius, Panama, Papua New Guinea, St. Kitts and Nevis, St. Lucia, Saint Vincent and the Grenadines, and Uruguay. The notification also lists the subsidy programs that needed to be reformed.

[2] In fact, as Creskoff and Walkenhorst (2009) point out, they are not mentioned explicitly in any WTO agreement.

[3] Only least developed WTO members and countries whose per capita gross national product is below US$1,000 in 1990 dollars are currently exempt from the disciplines of the ASCM (Creskoff and Walkenhorst, 2009).

be more precise, prior to 2007 all firms based in Dominican SEZ were subject to an 80% ESR — i.e. they could sell at most 20% of their output in the Dominican customs territory. In May 2007, law 56-07 first amended the regulatory framework for SEZ by declaring the textiles, clothing and accessories, hides and skins, footwear, and leather articles sectors to be of 'national priority', based on their importance in terms of exports and employment. The 2007 reform eliminated ESR for SEZ firms in national priority sectors only, and at the same time extended some of the tariff and tax incentives available to firms in SEZ to local producers outside the zones. In June 2011, law 139-11 fully eliminated ESR for all firms in SEZ regardless of their sector of operation. However, and in contrast to the 2007 reform, the latter law did not extend any incentives to non-SEZ firms.

Our empirical analysis is underpinned by a model of subsidies with ESR in a heterogeneous-firm environment proposed by Defever and Riaño (2016). Based on this theoretical framework we develop a set of predictions regarding the consequences of eliminating ESR on firms' extensive and intensive margins of exports, as well as on the share of exports originating from SEZ (both in terms of values and number of exporters) within narrowly-defined HS-6 products.

The model shows that ESR reduce the profitability of firms in SEZ which would have preferred to sell a higher share of its sales in the domestic market than what the ESR allows — which we call 'constrained exporters'. The model predicts that these firms would increase the prices they charge abroad and thereby reduce export sales after the ESR is lifted. Conversely, firms that would have chosen to export 80% or more of their output even in the absence of ESR — i.e. unconstrained exporters — are unaffected by the reform. If, as it was the case in the Dominican Republic, the reform of SEZ maintains the incentives available to firms based there, then the elimination of ESR will make them more attractive locations for firms to be based. Since the latter goes in the opposite direction as the effect of the ESR removal on the intensive margin of exports for existing constrained exporters, the question of the importance of the response of SEZ exports to the policy change is, ultimately, an empirical one.

Our results can be summarized as follows. In terms of the extensive margin, we find that in line with the predictions delivered by our model, export entry among firms in SEZ increased after the removal of ESR — particularly so after the second wave of reform, which targeted firms producing non-priority goods. Moreover, we also find that the exit rate out of export markets increased among non-SEZ firms in priority sectors, possibly due to more intense competition from

firms operating in the zones. Moving on to the intensive margin of exports, we find that the value of export transactions among SEZ firms fell following both waves of reform, as predicted by our model. However, when restricting our analysis to the subset of firms that export in every year throughout our period of study, we find that the change in the value of exports after the policy change becomes statistically insignificant. This result suggests that continuing exporters do not find the ESR constraint binding, whereas more sporadic exporters seem to have reallocated their sales towards the domestic market once this alternative became feasible.

Examining the impact of the removal of ESR on the share of exports — both in terms of value and number of exporting firms — at the product level paints a similar picture to that conveyed by our analysis of export margins. We find that the removal of ESR increased the share of SEZ exporters within HS-6 products by 5.4-7 percentage points relative to the situation in which performance requirements were in place. At the same time, the share of export value accounted for by SEZ does not change significantly after the reforms. As the requirements to operate in SEZ were eased, more exporters chose to locate there; however, the bulk of export value originating from SEZ seems to be accounted for by firms that were based there with the clear objective to export the majority of their output, and were therefore not affected by the removal of ESR.

As noted above, the first wave of SEZ reforms implemented in 2007 sought to level the playing field between SEZ and non-SEZ firms by lowering the tariffs imposed on key inputs utilized by producers in priority sectors (firms in SEZ do not pay tariffs on intermediate inputs). Thus, with a view to assess the effectiveness of this element of the Dominican reform strategy, we investigate if the share of these liberalized products purchased by SEZ declined after 2007. Our conclusions in this dimension are univocally negative; we do not find any substantial change in the share of imports of these goods accounted for by SEZ after the trade liberalization. Thus, although a large number of goods were made duty-free (126 HS-6 products), the ones that were primarily imported by non-SEZ firms were, for the most part, general purpose rather than inputs specific to priority sectors. This rendered the tariff cuts ineffective as an instrument to foster the expansion of firms outside the zones in these sectors.

Taken altogether, our results suggest that the removal of ESR without eliminating the fiscal incentives available to firms in SEZ has increased the attractiveness of operating in special economic zones. Achieving a greater degree of compliance with the WTO disciplines on subsidies has not

substantively reduced the Dominican Republic's reliance on SEZ – if anything, the removal of ESR has helped in cementing their importance in the country's export basket, at least in the short-run.

Achieving compliance with WTO disciplines on subsidies poses a complex challenge for policy makers in countries that rely intensively on exports originating from SEZ in the face of large and chronic trade deficits. Opening up the domestic market to firms based in SEZ can result in unduly intense competition for local firms given the tax advantages available in the zones. Curbing these concessions, however, entails the risk that multinational firms would decide to relocate their operations to countries offering more generous incentive packages. Alternatively, equalizing incentives inside and outside SEZ might not be feasible from a fiscal policy standpoint (FIAS, 2008; World Bank, 2014). Thus, taking stock of the Dominican Republic's experience with eliminating export requirements can help to shed light on the future role of SEZ as an export promotion policy operating within a regulatory framework compatible with the WTO agreements.

Related Work. Export performance requirements have been studied from a theoretical perspective by Davidson et al. (1985), Rodrik (1987) and Chao and Yu (2014), with the aim of determining under which circumstances these measures can improve welfare in countries enacting them. The main conclusion arising from this body of work is that ESR can operate as second-best policies, improving domestic welfare in the presence of pre-existing distortions.[4] For instance, ESR can shift rents towards the enacting country that would otherwise accrue to foreign-owned firms, or can also lessen the overproduction distortion caused by tariffs imposed in import-competing sectors. More recently, Defever and Riaño (2015, 2016), have studied how the use of subsidies with ESR affects the intensity of competition and welfare using a quantitative model calibrated to evaluate the Chinese experience with this class of incentives. We contribute to this literature by focusing on the microeconomic effects of export share requirements on export performance. Moreover, evaluating the consequences of ESR in the context of the reforms undertaken by the Dominican Republic has the advantage — relative to the case of China studied by Defever and Riaño (2015, 2016) — that the set of firms facing ESR are readily identifiable with our data and are only subject to one

[4]The theoretical literature on SEZ has also reached similar conclusions. See e.g. Hamada (1974), Young and Miyagiwa (1987), Young (1991), Devereux and Chen (1995). Heid et al. (2013), on the other hand, show that an expansion of export-oriented *maquiladoras* (i.e. firms exporting all their output) increases labor informality and lowers aggregate welfare.

such requirement.[5] Additionally — and quite importantly — the fact that ESR were eliminated in a staggered way across different sectors provides valuable variation across time and sectors that allows us to identify the consequences of this policy change.

The Dominican Republic being one of the pioneers, and arguably, most successful exponents of the use of SEZ in the Western Hemisphere, stands at the heart of a long-standing debate over their desirability as an industrial policy to foster economic development (Volpe Martincus, 2010). On the one hand, Kaplinsky (1993) argues that SEZ induced the Dominican Republic to specialize in unskilled labor-intensive production, which due to declining terms-of-trade has resulted in immiserizing growth. Willmore (1995), on the contrary, argues that judged by its ability to promote exports without threatening local producers, the Dominican SEZ program has been an unqualified success. Sanchez-Ancochea (2006) and Schrank (2008) qualify this assertion and suggest that the success of SEZ beyond export promotion hinges on the extent to which they have integrated with the local economy — an argument formalized by Rodríguez-Clare (1996). Our paper contributes to this discussion by assessing how recent policy efforts aimed at promoting a new wave of SEZ that goes beyond the low-skill-intensive enclaves of the past, have affected export outcomes — arguably, one of the key performance dimensions for SEZ. Crucially, it does so by utilizing highly detailed transaction-level micro data which allow us to elucidate the effect of the policy changes while controlling for confounding factors that would contaminate the results obtained using only aggregate data.

Our paper is related to work by Bagwell and Staiger (2006) studying the implications of GATT-WTO rules on subsidies on economic outcomes, as well as to broader efforts to quantify the consequences of eliminating "murky" forms of protectionism such as export subsidies, local content requirements, and public procurement measures (Baldwin and Evenett, 2009; Evenett and Wermelinger, 2010). To the best of our knowledge, this paper is the first in carrying out an empirical assessment of whether policy reforms aimed at achieving compliance with WTO rules on subsidies have affected trade outcomes. This is an issue of tremendous importance, since the inherent difficulty in defining and measuring export subsidies, combined with a lack of comparable cross-country data has resulted in fewer empirical studies investigating them than any other instrument

[5] In contrast, Defever and Riaño (2016) document a wide range of often overlapping policy measures subject to different ESR thresholds in China.

of commercial policy under the aegis of the World Trade Organization (World Trade Organization, 2006). Our paper also contributes to a small, but flourishing empirical literature that investigates the effect of SEZ and export processing regimes on exports (Ianchovichina, 2007; Fernandes and Tang, 2012; Wang and Yu, 2012; Alder et al., 2013; Wang, 2013; Davies and Mazhikeyev, 2015; Yücer and Siroën, 2016).

The rest of the paper is organized as follows: Section 2 summarizes the regulations governing SEZ in the Dominican Republic and the changes introduced by laws 56-07 and 139-11, which mandated the elimination of ESR. Section 3 sketches a simple model of trade with heterogeneous firms featuring subsidies subject to export share requirements and outlines predictions regarding how the elimination of ESR would affect export performance at the firm and product level. Section 4 describes our data and provides a set of stylized facts characterizing export patterns in the Dominican Republic, comparing firms in SEZ and those exporting through the national customs regime as well as firms in national priority sectors and other industries. Section 5 discusses our empirical strategy and presents our results. Section 6 concludes.

2 Regulatory Changes in the Special Economic Zones of the Dominican Republic

In this section we provide a brief summary of the incentives and performance requirements faced by firms operating in SEZ in the Dominican Republic; we then discuss the reforms introduced by laws 56-07 and 139-11 in 2007 and 2011 respectively.

Law 8-90 of January 1990 established the regulatory framework governing SEZ (*Zonas Francas*) in the Dominican Republic. According to the law, its key objectives were to attract local and foreign investment, provide training, and foment the transfer of technology and know-how in order to create employment, particularly in economically deprived areas, such as the border with Haiti. Law 8-90 sought to encourage the expansion of SEZ by providing a generous array of fiscal incentives to firms located there: these included duty-free access to imported inputs and capital goods, and a 15-year (20 years for firms located in border zones) 100% exemption of registration, construction, gross sales and transfer of industrial goods taxes. In order to be eligible for these concessions, firms operating in SEZ faced an 80% export share requirement (ESR), while firms located outside SEZ

and exporting through the national customs regime were not subject to any performance obligations regarding their export behavior. SEZ firms were also required to pay the corresponding full import duty on the goods sold in the Dominican Republic.

Until 2007 the ESR applied equally to all SEZ firms regardless of their sector of operation as can be seen in the first row of Table 1. Law 56-07 signed in May 2007 amended law 8-90 and declared the textile, footwear and leather industries 'national priority' sectors. The law's motivation noted that worldwide structural change in the textile, footwear and apparel industries driven by China's increasing preponderance in the world economy and changes in WTO agreements such as end of the MFA agreement have eroded the competitiveness of these sectors in the Dominican Republic. Due to their importance in terms of job creation, the law sought to provide support to producers in these industries in the face of adverse external circumstances. Besides this objective, law 56-07 also aimed at fostering the convergence between SEZ and non-SEZ firms in view of the country's agreement to eliminate performance requirements under the CAFTA-DR trade agreement and the ASCM. This constituted a gradual first step forward towards the SEZ regime achieving compliance with the ASCM — following on the footsteps of China, Vietnam, Mauritius and Costa Rica (Waters, 2013; World Bank, 2014).

Table 1: Changes in SEZ Regulations in the Dominican Republic, 2006-2014

<table>
<tr><th></th><th>Period</th><th>National Priority Sectors</th><th>Non-priority Sectors</th></tr>
<tr><td rowspan="3">SEZ firms</td><td>2006-07</td><td colspan="2">80% ESR; duty-free imports of intermediate inputs and capital goods; full exemption of gross sales, registration, construction and transfer of industrial goods (ITBIS) taxes for 15 years (20 years for firms in border SEZ)</td></tr>
<tr><td>2008-11</td><td>ESR fully removed; duty-free access to domestic market</td><td>80% ESR remains; duty-free access on domestic sales if product is not produced in DR or has at least 25% of local input content</td></tr>
<tr><td>2012-14</td><td>Domestic sales remain free of import duties but are subject to a 3.5% tax on gross sales and 18% VAT</td><td>ESR fully removed; Domestic sales are subject to import duty, 3.5% tax on gross sales and 18% VAT</td></tr>
<tr><td rowspan="3">Non-SEZ firms</td><td>2006-07</td><td colspan="2">No ESR; subject to national customs regime</td></tr>
<tr><td>2008-11</td><td>Duty-free access to 126 'priority' intermediate inputs; exemption of tax on transfer of industrial goods (ITBIS)</td><td>No change</td></tr>
<tr><td>2012-14</td><td colspan="2">No change</td></tr>
</table>

Source: Law 56-07 (available in Spanish at https://www.dgii.gov.do/legislacion/leyesTributarias/Documents/56-07.pdf) and law 139-11 (available in Spanish at https://www.dgii.gov.do/legislacion/leyesTributarias/Documents/139-11.pdf).

The second and fifth rows of Table 1 outline the main policy changes brought about by law 56-07 for SEZ and non-SEZ firms in priority and non-priority sectors. SEZ firms in priority sectors saw the full removal of ESR, which meant that they could now sell all their output in the Dominican Republic if they wished to do so; moreover, these domestic sales were not subject to import duties. Priority-sector firms operating outside SEZ received tax concessions similar to those available to their SEZ counterparts and enjoyed duty-free access to 126 HS-6 key imported inputs.

The 2007 reform maintained the 80% ESR for SEZ firms producing non-priority goods but offered them duty-free access to the domestic market provided that either the good in question was not produced in the Dominican Republic or, that it incorporated at least 25% of locally-sourced intermediate inputs in value terms. Tax concessions available to SEZ firms in both priority and non-priority sectors did not change with this reform. Firms producing non-priority goods and located outside SEZ were not directly affected by law 56-07.

Law 139-11 (June 2011) completely eliminated export share requirements for all SEZ firms regardless of their sector of operation in accordance to the compromises signed under the CAFTA-DR free trade agreement. SEZ firms in priority sectors retain their duty-free access to the Dominican market whereas their non-priority counterparts need to pay the customary import tariffs mandated by the national customs regime. All SEZ firms are required to pay a 3.5% gross sales tax and 18% VAT on their domestic sales (see row 3 of Table 1), while non-SEZ firms were not directly affected by this law.

3 How Does Eliminating Export Share Requirements Affect Export Performance?

In order to understand how the elimination of export share requirements for firms in special economic zones affects export performance, we use a theoretical framework developed by Defever and Riaño (2016), which is in turn based on the workhorse Melitz (2003) model of international trade with heterogeneous firms, to guide our empirical analysis. However, since our focus lies on individual firm and product-level effects of the policy change, we abstract from general equilibrium considerations.

To fix ideas, consider an environment with two countries, Home (H), which we take to be the

Dominican Republic, and Foreign (F), which represents the rest of the world. There is a continuum of firms operating at Home, each of which produces a unique differentiated good ω using labor as the sole input. We assume, for simplicity, that all firms are homogenous in terms of their productivity, which implies that all producers have a constant marginal cost, c.[6] The demand function faced by a firm selling product ω in market $i \in \{H, F\}$, is:

$$q_i(\omega) = A_i(\omega) p_i(\omega)^{-\sigma}, \tag{1}$$

where $\sigma > 1$ denotes the elasticity of demand and $p_i(\omega)$ is the price charged by firm ω in market i.[7] The term $A_i(\omega)$ encompasses both aggregate variables such as a country's GDP and price level — both of which are common across all producers — as well as product appeal factors that are firm-destination-specific. Including the latter is necessary to produce a non-degenerate distribution of export intensity. As discussed below, this implies that some firms will export the majority of their output even without export share requirements.

We assume that firms can sell domestically without incurring any additional cost, but face a fixed cost f_x and an iceberg transport cost $\tau \geqslant 1$ if they export. Crucially, firms can choose to sell their output abroad either through the national customs regime or via a special economic zone. Non-SEZ firms are free to sell however much they want domestically but do not receive any incentives. On the other hand, firms located in SEZ stand to receive a subsidy s_r on their sales or marginal costs (e.g. duty-free access to imported inputs, corporate income tax exemptions or lower utility rates) and/or a subsidy s_f on their fixed costs (e.g. lower registration costs or access to better port infrastructure) provided they export more than a fraction $\underline{\eta}$ of their sales, which prior to 2007 would have been set at 0.8 for all firms in Dominican SEZ. We explain the profit maximization problem of firms operating in these two regimes below.

All firms sell some of their output domestically. As it is well known, given the demand function (1), firms set a price at Home, $p_H(\omega) = \frac{\sigma c}{\sigma - 1}$, which is a constant mark up above their marginal cost, thus generating domestic sales $r_H(\omega) = \left(\frac{\sigma-1}{\sigma c}\right)^{\sigma-1} A_H(\omega)$, which are increasing in the domestic de-

[6] Assuming instead that firms differ in terms of productivity, as is standard in the literature, does not alter the conclusions of the analysis that follows. This is the case because firm-level export intensity is independent of productivity when demand functions are iso-elastic.

[7] Such a demand function would obtain if individuals have love-for-variety Dixit-Stiglitz utility functions as in Krugman (1980) or Melitz (2003).

mand shifter. Domestic profits are in turn given by $\pi_H(\omega) = \kappa A_H(\omega)$, where $\kappa \equiv (\sigma-1)^{\sigma-1}\sigma^{-\sigma}c^{1-\sigma}$.

Let us now consider the problem of an exporter selling its output through the national customs regime. Since the marginal cost of production is constant, this firm will choose to export if the profit from selling abroad exceeds the fixed cost f_x; otherwise it would prefer to only sell domestically. A non-SEZ exporter sets price $p_F(\omega) = \tau p_H(\omega)$ in the foreign market; its export sales are given by $r_F(\omega) = \tau^{1-\sigma}\left(\frac{\sigma-1}{\sigma c}\right)^{\sigma-1} A_F(\omega)$, and export profits are $\pi_F(\omega) = \kappa\tau^{1-\sigma}A_F(\omega) - f_x$. It follows that only firms with sufficiently high foreign demand appeal choose to export; that is, those for which $A_F(\omega) \geqslant A_F^* = (f_x/\kappa)\tau^{\sigma-1}$. Total profits for non-SEZ exporters are therefore given by $\pi(\omega) = \kappa\left(A_H(\omega) + \tau^{1-\sigma}A_F(\omega)\right) - f_x$.

Define the 'natural' export intensity of an exporter, $\eta(\omega)$, as the share of its total sales accounted for by exports in the absence of subsidies or ESR:

$$\eta(\omega) \equiv \frac{r_F(\omega)}{r_H(\omega) + r_F(\omega)} = \frac{\tau^{1-\sigma}A_F(\omega)}{A_H(\omega) + \tau^{1-\sigma}A_F(\omega)}. \tag{2}$$

It is straightforward to show that any deviations from (2) would reduce firms' profits by distorting the necessary condition that marginal revenue has to be equalized across markets. As (2) makes clear, firms can operate at very high export intensities in the absence of ESR, for instance, if they conduct assembly operations as a link in a global value chain, if they produce highly sophisticated products with little domestic demand (medical instruments would be a relevant example for the Dominican Republic) or have built an extensive network of foreign customers.[8]

The profit maximization problem of a firm located in the SEZ facing an ESR $\underline{\eta} \in (0,1]$ and receiving subsidies (s_r, s_f) is:

$$\max_{p_H^z(\omega), p_F^z(\omega)} \left\{ (1+s_r)\left[A_H(\omega)\left(p_H^z(\omega)\right)^{1-\sigma} + A_F(\omega)\left(p_F^z(\omega)\right)^{1-\sigma}\right] - c\left[A_H(\omega)\left(p_H^z(\omega)\right)^{-\sigma} + \tau A_F(\omega)\left(p_F^z(\omega)\right)^{-\sigma}\right] - (1-s_f)f_x \right\} \quad \text{subject to:} \quad \frac{A_F(\omega)\left(p_F^z(\omega)\right)^{1-\sigma}}{A_H(\omega)\left(p_H^z(\omega)\right)^{1-\sigma} + A_F(\omega)\left(p_F^z(\omega)\right)^{1-\sigma}} \geqslant \underline{\eta}, \tag{3}$$

where the superscript z indexes variables for firms based in SEZ. Defever and Riaño (2016) show that the solution to problem (3) involves two types of firms operating in SEZ, which we denote

[8] If fixed costs associated with selling domestically were included in the model, then 'pure exporters', i.e. firms selling all their output abroad, would arise when domestic profits are not sufficiently high to cover the domestic fixed cost.

unconstrained and constrained exporters.

Unconstrained exporters are those that do not find the ESR constraint binding; i.e. firms with natural export intensity of at least $\underline{\eta}$. These firms do not need to distort their allocation of sales across domestic and foreign markets to receive the subsidies available in SEZ. Thus, they charge prices $p_H^z(\omega) = \frac{1}{1+s_r}\frac{\sigma c}{\sigma-1}$ and $p_F^z(\omega) = \tau p_H^z(\omega)$ and realize total profits $\pi^z(\omega) = (1+s_r)^\sigma \kappa \left(A_H(\omega) + \tau^{1-\sigma} A_F(\omega)\right) - (1-s_f)f_x$. For unconstrained exporters in SEZ any incentive conditioned on ESR operates in the same way as a standard unconditional production subsidy. This means that they charge lower prices, both domestically and abroad, and earn higher profits than in the absence of subsidies, while still operating at their natural export intensity.

Constrained exporters, on the other hand, are firms with natural export intensity strictly below the ESR threshold, but that nevertheless choose to alter their export intensity in order to be eligible to operate in the SEZ and receive the subsidies available there. These firms curtail domestic sales, by increasing prices at Home while at the same time increasing export sales until they reach an export intensity exactly equal to $\underline{\eta}$ (see Defever and Riaño, 2016, Proposition 1). Therefore, constrained exporters in SEZ set prices,

$$p_H^z(\omega) = \left[\frac{(1-\underline{\eta})^{\frac{\sigma}{\sigma-1}} A_F(\omega)^{\frac{1}{\sigma-1}} + \underline{\eta}^{\frac{\sigma}{\sigma-1}} \tau A_H(\omega)^{\frac{1}{\sigma-1}}}{(1-\underline{\eta})^{\frac{1}{\sigma-1}} A_F(\omega)^{\frac{1}{\sigma-1}}}\right] \frac{1}{1+s_r}\frac{\sigma c}{\sigma-1}, \tag{4}$$

$$p_F^z(\omega) = \left[\frac{(1-\underline{\eta})^{\frac{\sigma}{\sigma-1}} A_F(\omega)^{\frac{1}{\sigma-1}} + \underline{\eta}^{\frac{\sigma}{\sigma-1}} \tau A_H(\omega)^{\frac{1}{\sigma-1}}}{\underline{\eta}^{\frac{1}{\sigma-1}} A_H(\omega)^{\frac{1}{\sigma-1}}}\right] \frac{1}{1+s_r}\frac{\sigma c}{\sigma-1}, \tag{5}$$

which result in profits:

$$\pi^z(\omega) = \kappa(1+s_r)^\sigma \Theta\left(A_H(\omega), A_F(\omega), \underline{\eta}, \tau\right) - (1-s_f)f_x, \tag{6}$$

where Θ, is defined as:

$$\Theta \equiv \frac{A_H(\omega)A_F(\omega)}{\left[(1-\underline{\eta})^{\frac{\sigma}{\sigma-1}} A_F(\omega)^{\frac{1}{\sigma-1}} + \underline{\eta}^{\frac{\sigma}{\sigma-1}} \tau A_H(\omega)^{\frac{1}{\sigma-1}}\right]^{\sigma-1}}. \tag{7}$$

The profit shifter term Θ is strictly concave in $\underline{\eta}$ reaching a global maximum at a firm's natural export intensity, $\eta(\omega)$. Thus, firms with relatively high natural export intensity — yet lower than

the ESR threshold — are more likely to operate as constrained exporters in SEZ.

Based on the characterization of optimal firm behavior above, we can establish a set of predictions delivered by the model in response to the reforms introduced by laws 56-07 and 139-11. These predictions are based on a comparative static exercise which entails a marginal reduction in the ESR threshold $\underline{\eta}$.[9] We first note that unconstrained SEZ exporters would not modify their pricing or sales choices if the ESR constraint was relaxed, since they are already operating at their natural export intensity. Constrained SEZ exporters would, however, seize the opportunity to increase their domestic sales, and would do so by redirecting some of their output to be sold at Home. Thus, constrained exporters would simultaneously lower domestic prices and increase export prices, thereby either achieving their natural export intensity, or, at the very least, operating at the newer lower ESR threshold.

Prediction 1 *Relaxing the ESR constraint (i.e. a reduction in $\underline{\eta}$), everything else equal, would induce constrained SEZ exporters to lower domestic prices and increase export prices. This in turn implies an increase in domestic sales and a reduction in export sales for this group of firms. Unconstrained exporters do not change their prices nor their sales in either market in response to the policy change.*

Lowering the ESR threshold increases the profitability of being based in SEZ for constrained exporters if the incentives available to SEZ firms are maintained after the reform — as laws 56-07 and 139-11 did — thereby making SEZ more attractive locations for firms to operate from. This yields our second prediction,

Prediction 2 *Relaxing the ESR constraint, everything else equal, would induce some firms exporting through the national customs regime to operate in SEZ.*

Taking Predictions 1 and 2 together implies an ambiguous response of exports originating from SEZ to a relaxation of the ESR constraint. On the one hand, export sales of constrained exporters

[9] A full elimination of the ESR while maintaining the incentives to SEZ in the model would imply that all firms would prefer to operate in SEZ. This would not happen in reality because there is a limited supply of locations in industrial parks in which SEZ are established and also because firms that wish to operate in SEZ need gain the approval of the *Consejo Nacional de Zonas Francas de Exportación*, a public-private body that regulates SEZ. In the context of the model, a fixed cost associated with changing a firm's status from the national customs regime to SEZ would prevent an equilibrium in which all firms choose to operate in SEZ; following this route would leave our conclusions unchanged.

fall in response to a reduction in $\underline{\eta}$. On the other hand, new entry into SEZ would increase total export sales from SEZ. The combination of these two effects, therefore, yields our third prediction:

Prediction 3 *A relaxation of the ESR, everything else equal, has an ambiguous effect on the value of exports originating from SEZ.*

The magnitude of the overall effect depends on the relative importance of constrained exporters operating in SEZ vis-à-vis unconstrained exporters, as well as on the share of non-SEZ exporters that would find profitable to switch to SEZ after the ESR is relaxed, a feature that depends crucially on the distribution of demand shifters $A_i(\omega)$ across firms. In the remainder of the paper we set out to investigate whether the predictions delivered by our model bear out in the data.

4 Data and Stylized Facts

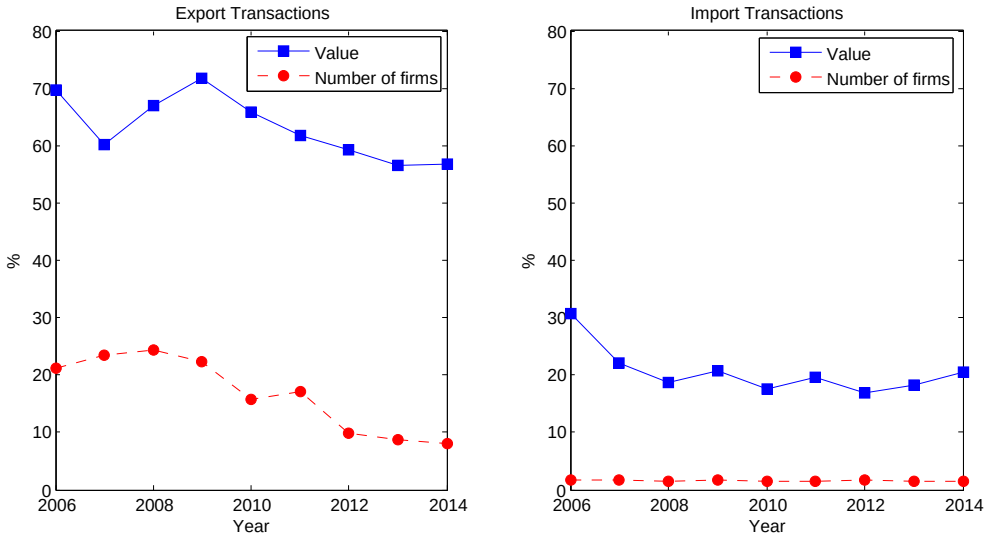
In this section we first describe the data used in the paper and provide summary statistics illustrating the broad export and import patterns observed over our period of analysis. We next shift focus towards documenting the importance of SEZ and national priority sectors in the Dominican Republic's export basket and examine whether there are any discernable changes in export performance, at least at the aggregate level, following the reforms implemented in 2007 and 2011. We conclude by exploring the extent to which the tariff concessions mandated by law 56-07 affected priority-sector firms outside the SEZ.

Our study exploits detailed firm-level customs data provided by the Dominican Republic Customs Agency (*Dirección General de Aduanas*, DGA). The data contains all export and import transaction values by product at the HS 6-digit level and by origin/destination for the period 2006-2014. Throughout this period, the universe of firms consists of 29,682 firms reporting at least one positive export transaction in at least one of 4,466 HS-6 digit products to at least one of 230 customs territories. Crucially, our data identifies trade flows that originate or reach firms located in SEZ.

The Dominican Republic is one of the world's pioneers in the use of SEZ with a program ongoing for more than 40 years (Burgaud and Farole, 2011). Figure 1 shows that SEZ exports account for more than half of aggregate export value throughout our period of interest — although

their importance has dwindled both in terms of value and number of exporters.[10] Conversely, SEZ firms comprise a substantially smaller share of the country's imports and constitute less than 2% of all importing firms. This striking difference underscores the significance of the SEZ regime at the macroeconomic level for the Dominican Republic — the foreign exchange earnings generated by SEZ exports plays a key role in enabling the import flows required by the rest of the economy.

Figure 1: Importance of SEZ on Export and Import Transactions, 2006-2014



Source: Authors' calculations based on customs transaction data from the DGA.

Zooming in into firm-level export and import performance, Table 2 shows that SEZ firms differ substantially from firms trading through the national customs regime. SEZ firms are larger in terms of the value of their export and import transactions, export and import more products, sell to more destination markets and acquire imported inputs from a wider range of countries than non-SEZ firms. These differences remain when we compare median performance outcomes, which help to ensure that the results are not driven by outliers. These figures are in line with those reported by Fernandes et al. (2016) for countries at a similar stage of development.

[10] Schrank (2008) reports that the share of aggregate exports accounted for by SEZ exceeded 80% in the early 2000s

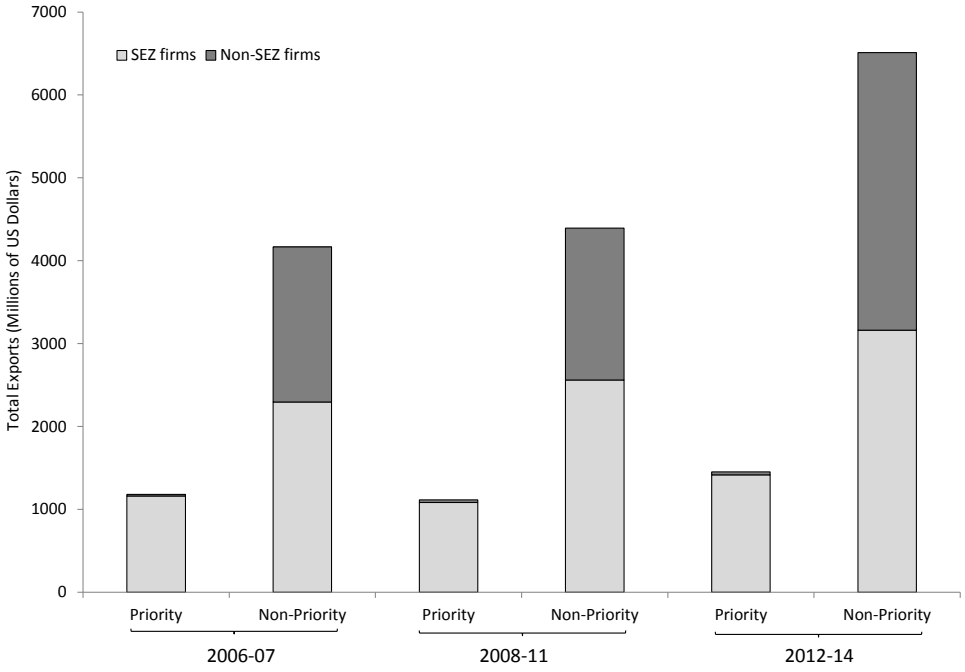
Table 2: Importance of SEZ on Export and Import Transactions, 2006-2014

		Special Economic Zones		National Customs Regime	
		Exports	Imports	Exports	Imports
Transaction value per firm	Mean	44.98	54.05	5.62	3.32
	Median	0.27	4.99	0.05	0.04
Products per firm	Mean	6.38	46.32	4.03	9.91
	Median	1.00	20.00	1.00	2.00
Destinations/origins per firm	Mean	2.58	4.82	1.61	1.47
	Median	1.00	2.00	1.00	1.00

Source: Authors' calculations based on customs transaction data from the DGA. Export and import transaction values are denominated in hundreds of thousands US Dollars. Figures are averaged across the period 2006-2014.

Export Performance across SEZ and National Priority Status. We now provide a first look at aggregate export performance according to firms' SEZ status and whether they operate or not in national priority sectors, which experienced an earlier removal of ESR. Following the discussion in Section 2 regarding the reforms of the SEZ regime in the Dominican Republic, we consider three periods of analysis: pre-reform (2006-07), introduction of national priority sectors (2008-12) and full ESR elimination reform (2012-14).

Figure 2: Export Performance across SEZ and National Priority Status



Source: Authors' calculations based on customs transaction data from the DGA.

Figure 2 shows very minor change in total export sales between 2006-07 and 2008-12, both for priority and non-priority sectors and SEZ and non-SEZ firms. This stability of course masks a significant fall in exports during the global financial crisis in 2008-09, which was subsequently followed by a rapid recovery in 2010. The textiles and apparel, leather and footwear industries accounted for approximately one-fifth of the Dominican Republic's aggregate exports, almost all of which originated from SEZ throughout our period of study. The importance of national priority products in the Dominican export basket has declined secularly since 2000, both because of the erosion of trade preferences and more intense competition by low-wage producers at the regional (e.g. Haiti, Honduras and Nicaragua) and global level (e.g. Bangladesh, China and Vietnam). These two channels have resulted in Dominican exporters experiencing substantial market share losses, particularly in the US market. Non-SEZ firms account for a larger share of export value in non-priority sectors, with their importance increasing over time — a pattern consistent with a long-term trend of greater export dynamism for firms operating outside SEZ identified by Burgaud and Farole (2011) and World Bank (2014).

At first pass, the elimination of the ESR for SEZ firms and the extension of fiscal incentives to non-SEZ firms in priority sectors mandated by law 56-07 does not appear to have had a strong impact on aggregate export flows in national priority sectors. SEZ firms still account for the overwhelming majority of priority sector exports in terms of value, with the share of non-SEZ exports increasing by only 1 percentage point, from 1.5 to 2.5%, after the 2007 reform. Extending the fiscal incentives available on SEZ to firms exporting through the national customs regime does not appear to have reoriented exports away from SEZ in priority sectors.

The fall in the share of aggregate exports originating in SEZ presented in Figure 1, however, understates their continuing preponderance in the Dominican Republic's international trade. Table 3 presents the top 20 HS-2 export products during our sample period, as well as the number of exporting firms and the share of exports originating in SEZ. For only one out of the top-10 exported products is the average share of SEZ exports below 40%, and in fact, for 7 out of 10 broadly defined sectors, this share exceeds 90%. Thus, even though the export portfolio of the Dominican Republic has gradually diversified over the last decade (World Bank, 2014), its main comparative advantage sectors are still highly reliant on SEZ.

Table 3: Top-20 Export Products, 2006-2014

HS-2 Sector	Export Value	# Firms	% Exported from SEZ
Optical and medical instruments	690.33	368.00	96
Precious metals and jewelry	615.27	390.22	42
Electrical machinery and equipment	539.83	492.11	94
Iron and steel	526.37	150.22	5
Tobacco	450.96	233.56	95
Apparel and clothing	396.13	336.67	99
Plastics	263.41	591.33	61
Cotton	263.32	88.56	99
Knitted goods	251.70	266.22	99
Footwear	225.77	114.67	98
Tin articles	178.14	567.67	8
Pharmaceutical products	154.50	177.89	89
Cocoa	153.88	80.00	39
Sugar confectionaries	132.10	100.67	5
Beverages	125.33	161.22	9
Paper	113.84	300.11	78
Mineral fuels	108.34	68.00	2
Misc. edible preparations	87.15	134.00	43
Salt, earth and cement	85.30	115.22	1
Nuclear reactors and related machinery	83.50	617.78	63

Source: Authors' calculations based on customs transaction data from the DGA. Export and import transaction values are denominated in millions of US Dollars. Figures are averaged across the period 2006-2014. Shaded rows indicate national priority sectors.

Although both Figure 2 and Table 3 clearly illustrate the fact that SEZ account for the lion's share of exports in national priority sectors, Table 4 shows that there is still substantial heterogeneity — both in terms of export performance and the importance of SEZ — across individual products. In terms of export values, SEZ account for the majority of exports across priority products, with the exception of special yarns and carpets (HS 56 and 57 respectively) — both of which have quite low export sales. The number of non-SEZ firms is also more important in low export value products, such as leather goods, yarns and crocheted fibres (HS 42, 56 and 60 respectively).

Table 4: Exports of National Priority Sectors

Sector	HS 2 code	Special Economic Zones			National Customs Regime		
		Export Value	# Firms	% Exports	Export Value	# Firms	% Exports
Leather goods	41	11.49	14.44	66	5.83	29.33	34
	42	10.03	47.78	93	0.79	74.89	7
	43	0.02	1.57	60	0.01	1.80	40
Textiles and textile articles	50	0.47	2.89	88	0.06	5.56	12
	51	0.41	7.89	80	0.10	3.89	20
	52	261.07	60.56	99	2.25	28.00	1
	53	0.12	6.00	63	0.07	5.11	37
	54	3.09	17.63	94	0.19	8.78	6
	55	4.17	42.67	96	0.16	15.89	4
	56	0.53	12.78	32	1.12	36.56	68
	57	0.02	2.67	35	0.04	10.11	65
	58	6.67	51.44	92	0.57	36.89	8
	59	0.52	8.11	96	0.02	9.89	4
	60	7.29	21.11	65	3.87	139.89	35
	61	249.14	151.33	99	2.56	114.89	1
	62	392.28	188.67	99	3.86	148	1
	63	42.54	73.33	90	4.54	163.33	10
Footwear	64	221.12	37.33	98	4.65	77.33	2

Source: Authors' calculations based on customs transaction data from the DGA. Export and import transaction values are denominated in millions of US Dollars. Figures are averaged across the period 2006-2014.

Law 56-07 also provided duty-free access for 126 imported inputs to firms in national priority sectors operating outside SEZ. Table 5 presents the top 20 HS-6 liberalized inputs in terms of import value as well as the share of value imported destined to SEZ and the percentage of imports purchased by national priority exporters outside SEZ. This table suggests that the reduction in tariffs mandated by law 56-07 was likely to have a minor impact on non-SEZ firms in priority sectors, given that the most important inputs liberalized were almost exclusively imported by SEZ firms — which could already purchase these products duty-free. The last column of Table 5 also shows that the majority of import value of products that are primarily purchased by non-SEZ firms (with the exception of ammonium sulphate) is accounted for by exporters selling products other than textiles, leather and apparel. Thus, it seems that the liberalized products were either mostly imported by SEZ firms, or were general-purpose rather than inputs specific to priority sector producers.

Table 5: Top 20 HS-6 'Priority Input' Imports

HS-6 Product	HS6 code	Import Value	% SEZ Imports	% of non-SEZ Imports used in Priority Sectors
White spirit	271011	1437.24	1	4
Plastic articles nes	392690	278.8	90	2
Soles and heels for footwear of rubber or plastic	640620	22.71	96	2
Bovine leather, vegetable pre-tanned	410411	18.1	99	0
Cartons, boxes & cases, of corrugated paper	481910	16.12	78	2
Other bovine leather, vegetable pre-tanned	410449	14.26	98	1
Footwear uppers and parts thereof, except stiffeners	640610	12.64	99	0
Ammonium sulphate	310221	12.4	0	52
Pigments and preparations based on titanium dioxide	320611	11.63	2	15
Cotton sewing thread for retail	520420	11.56	99	1
Pesticides, rodenticides	380892	11.4	1	23
Composition leather, in slabs, sheets or strip	411510	11.27	99	1
Parts of footwear nes, gaiters and leggings	640699	10.05	99	0
Cartons, boxes & cases, folding, non-corrugated paper	481920	7.55	65	6
Sheet etc, cellular of polyurethane	392113	7.52	85	7
Finishing agents, dye carriers, dressing, mordants	380991	7.18	81	1
Knitted non-pile fabrics	600330	7.03	94	1
Chemical products and preparations	382490	6.93	10	17
Goat or kid skin leather	410622	6.9	95	2
Buckles and clasps	830890	6.71	83	3
Chemical colouring matter	320416	5.79	98	0
Adhesives based on rubber	350691	5.61	38	12
Cotton sewing thread ($\leqslant 85\%$)	520419	5.44	86	11
Tulles and other net fabric	580410	5.24	98	0
Made up articles of textile material	630790	5.2	57	9

Source: Authors' calculations based on customs transaction data from the DGA. Import values are denominated in millions of US Dollars. Figures are averaged across the period 2006-2014. Shaded rows indicate HS-6 products that are primarily imported by non-SEZ firms.

5 Empirical Analysis and Results

Our main objective in this paper is to determine whether the removal of export share requirements in SEZ, first in national priority sectors and subsequently across all other industries, affected the prevalence of SEZ in the exports of the Dominican Republic. We will also evaluate whether the input tariff reduction experienced by non-SEZ firms in priority sectors had an impact on the import behavior of these firms.

Our identication strategy relies on the comparison between priority and non-priority sectors, which experienced the removal of ESR at different points in time. We first describe the construction of our key explanatory variables related to the removal of the ESR for firms in SEZ, which occurred in July 2007 (law 56-07) and June 2011 (law 139-11). As we noted in Section 4 above, we can consider three distinctive periods in our analysis: 2006-2007, when the ESR is in place for SEZ firms in both priority and non-priority sectors, 2008-2011, when the ESR was lifted only for SEZ firms operating in priority sectors and, 2012-2014, when the ESR had been removed for all firms based in the zones regardless of their sector of operation. Since is likely that firms required some time to adapt their behavior to changes stipulated in the two laws, we aggregate the data at a yearly frequency and consider the impact of the first and second regulatory changes starting from the beginning of 2008 and 2012 respectively. Thus, we define the variable POST08_t as taking the value 1 from 2008 onwards and 0 otherwise, and likewise, POST12_t is a dummy variable that turns on from 2012 onwards.

Did the removal of ESR affect the Extensive and Intensive Margin of Exports at the Firm-level? We first investigate if the elimination of export performance requirements affected the export entry and exit behavior of firms within HS-6 products over time, i.e. the extensive margin of exports. Our identication strategy relies on the comparison between priority and non-priority sectors and the different time in which they were subject to the elimination of ESR. We aggregate our data at the firm-product-location-year level, with products being defined at the HS-6 digit level and location indicates whether a firm is located or not in an SEZ. We then estimate the impact of the two waves of reform separately for firms located in SEZ and outside them. Our OLS estimating equation for the extensive margin of exports is therefore given by:

$$\begin{aligned}\text{Entry/Exit}_{ij\ell t} = \beta_1(\text{Post08}_t * \text{Priority}_j * \text{SEZ}_\ell) + \beta_2(\text{Post08}_t * \text{Priority}_j * \text{non-SEZ}_\ell) + \\ \beta_3(\text{Post12}_t * \text{Non-Priority}_j * \text{SEZ}_\ell) + \beta_4(\text{Post12}_t * \text{Non-Priority}_j * \text{non-SEZ}_\ell) + f_{j\ell} + f_{\ell t} + T_{\tilde{j}t} + \varepsilon_{ij\ell t},\end{aligned} \tag{8}$$

where i indexes firms, j, HS-6 products, ℓ, locations, and t, years. $\text{Entry}_{ij\ell t}$ is a dummy variable that takes the value 1 if a firm-product-location combination reports a positive export value at time

t but not in the previous year. Similarly, $\text{Exit}_{ij\ell t}$ takes the value 1 if a firm-product-location exports in year t but does not report any export sales in year $t+1$. As noted above, SEZ_ℓ is a dummy that takes value 1 if a firm is located in a special economic zone and 0 otherwise, while non-SEZ_ℓ is the opposite image. $T_{\tilde{j}t}$ is an HS-2-product-specific linear trend which intends to control for broadly-defined time-varying sectoral supply and demand shifts. We estimate the effect of policy changes within and outside the zone independently. To this end, the set of HS-6 digit product fixed effects $f_{j\ell}$ and year fixed effects $f_{\ell t}$, are set to be specific to location ℓ. Including this battery of location-specific fixed effects allows for differential average effects on export performance according to firms' SEZ status as well as controlling for time-varying differences within and outside the zones. The standard errors in regressions (8) and (9) below are clustered at the HS-6 product level.

Table 6 presents our findings regarding the effect of laws 56-07 and 139-11 on the extensive margin of exports for firms according to their SEZ and national priority status. Prediction 2 suggests that inasmuch as the removal of ESR induces more firms to locate in SEZ, we should expect a positive effect on export entry among firms located in SEZ. At the same time, firms' relocation towards SEZ might also increase the exit rate among firms exporting through the national customs regime. The results reported in columns (1) and (2) of Table 6 provide support for this hypothesis. Export entry increased for SEZ firms in both priority and non-priority sectors after the removal of the ESR constraint — although the effect is statistically significant only for SEZ producers in non-priority sectors. The entry rate into exporting for these firms increased by 10 percentage points following the reform implemented in 2011. We also observe an increase in the exit rate of firms exporting through the national customs regime in priority sectors after 2008 (column 2). This is expected as eliminating the export requirement would intensify the competition faced by non-SEZ firms. Nevertheless, it is somewhat puzzling to observe this response following the 2007 reform, since the government extended some of the tax incentives available in SEZ to priority sector producers outside the zones; in contrast, law 139-11 did not provide any incentives to non-SEZ firms. As we discuss in more detail below when we investigate the input tariff reduction mandated by law 56-07, this dimension of the SEZ reform was largely ineffective in providing incentives to firms outside SEZ.

We next investigate the response of the intensive margin of exports. More specifically, we explore how the export value of firms operating in a given location, selling a given HS-6 product,

was affected by the elimination of ESR for each of the four types of firms considered in our analysis of the extensive margin above. Equation (9) presents our OLS estimating equation for the intensive margin, where the dependent variable is the log of export value by firm i exporting HS-6 product j from location ℓ in year t, and all other variables have been defined above:

$$\ln Y_{ij\ell t} = \beta_1(\text{Post08}_t{*}\text{Priority}_j{*}\text{SEZ}_\ell)+\beta_2(\text{Post08}_t{*}\text{Priority}_j{*}\text{non-SEZ}_\ell)+\beta_3(\text{Post12}_t{*}\text{Non-Priority}_j{*}\text{SEZ}_\ell) + \beta_4(\text{Post12}_t * \text{Non-Priority}_j * \text{non-SEZ}_\ell) + f_{ij\ell} + f_{\ell t} + T_{\tilde{j}t} + \varepsilon_{ij\ell t}. \quad (9)$$

The results reported in column (3) of table 6 show that firms operating in SEZ experienced a reduction in the value of individual export transactions at the HS-6 product level after ESR were eliminated, with the magnitude of the effect being quite similar for SEZ firms independently of their sector of operation. Firms exporting through the national customs regime were, on the other hand, largely unaffected along this margin. This result is consistent with Prediction 1 from our model. After the limit on domestic sales was lifted, constrained exporters increase export prices lowering exports sales. However, this average effect encompasses both the change in behavior of constrained exporters, which were previously forced to export 80% of their output, as well as unconstrained exporters, which would have been unaffected by the elimination of the export requirement. In order to disentangle these two different responses, we re-estimate regression (9) on the set of continuing exporters, i.e. those firms that have conducted export transactions in every year of our sample.[11] We do so with the view that perennial exporters are more likely to be unconstrained (Békés and Muraközy, 2012).[12] The results reported in column (4) show that although the negative effect of the removal of ESR on the intensive margin of exports for SEZ firms remains, it becomes statistically insignificant as we expected. Lastly, we do not find any evidence that the removal of ESR had any discernable effect on the size of export transactions sold by non-SEZ exporters.

[11] Notice that since we do not observe the value of firms' domestic sales, we cannot directly distinguish constrained and unconstrained exporters in SEZ.

[12] Interviews with managers at several firms in SEZ carried out in December 2015, reveal that large foreign-owned firms that export permanently sell almost all their output abroad, perhaps with the exception of defective orders that are sometimes sold locally. Interestingly, some of these large multinationals even choose to serve the Dominican market via affiliates located in other CAFTA-DR country members, since by doing so they avoid paying import tariffs that they would otherwise face if they were to sell directly from their SEZ plant.

Table 6: Response of Firm-level Intensive and Extensive Margins of Exports to the Removal of ESR

	Extensive margin		Intensive margin	
	Entry	Exit	Value	Value
	[1]	[2]	[3]	[4]
$\text{Post08}_t * \text{Priority}_j * \text{SEZ}_\ell$	0.035	-0.024	-0.234**	-0.146
	(0.025)	(0.020)	(0.102)	(0.361)
$\text{Post08}_t * \text{Priority}_j * \text{non-SEZ}_\ell$	0.010	0.040**	0.106	0.579
	(0.021)	(0.026)	(0.108)	(0.824)
$\text{Post12}_t * \text{Non-Priority}_j * \text{SEZ}_\ell$	0.097***	-0.039	-0.218**	-0.148
	(0.021)	(0.026)	(0.098)	(0.286)
$\text{Post12}_t * \text{Non-Priority}_j * \text{non-SEZ}_\ell$	0.002	-0.016	0.183	-0.331
	(0.019)	(0.022)	(0.151)	(0.440)
Observations	188,623	170,991	203,137	3,672
R^2	0.047	0.019	0.010	0.090

***, significant at the 1% level; **, significant at the 5% level; *, significant at the 10% level. All regressions are estimated by OLS. Robust standard errors clustered at the HS-6 product level. Specifications [1] and [2] include HS-6 product × location and year × location fixed effects, as well as HS-2 product-specific linear trends. Specifications [3] and [4] include firm × HS-6 product × location, year × location fixed effects and HS-2 product-specific linear trends. Column [3] includes all firms, whereas the regression reported in column [4] is restricted to only include firms that have conducted export transactions in a given HS-6 product in every year of our sample.

Did the elimination of ESR affect the importance of exports originating from SEZ? We now present our main conclusion concerning the change in the importance of exports originating from SEZ after the elimination of ESR. As we discussed in Section 3, if the constraint on domestic sales is lifted for SEZ firms and the level of fiscal incentives available in the zones remains unchanged, we would expect that more firms find profitable to be based in SEZ, and this in turn should increase the share of SEZ exports for a given HS-6 product (Prediction 2). On the other hand, if a substantial number of firms in SEZ were constrained by the 80% ESR, we would expect that the elimination of ESR would induce these producers to reallocate some of their sales towards the domestic market, thereby reducing the importance of exports originating from the SEZ (Prediction 1). Therefore, Prediction 3 tells us that, overall, the SEZ reform is expected to have an ambiguous effect on the share of SEZ exports.

We now aggregate our data at the HS-6 product-year level and use as our dependent variable the shares of export value originating from SEZ and the number of exporters located in SEZ in a given HS-6 product. We are interested in gauging the effect that the 2007 and 2011 reforms had in

products belonging to priority and non-priority sectors. Thus, we focus in the coefficients β_1 and β_2 in the following OLS regression equation:

$$\text{ShrSEZ}_{jt} = \beta_1(\text{Post08}_t * \text{Priority}_j) + \beta_2(\text{Post12}_t * \text{Non-Priority}_j) + f_j + f_t + T_{\tilde{j}t} + \varepsilon_{jt}, \qquad (10)$$

where j indexes HS-6 products and t indexes years as before; f_j and f_t denote product and year fixed effects respectively. This set of fixed effects and product trends control both for time-invariant characteristics that affect the attractiveness of exporting a particular product from SEZ, as well as for time-varying secular changes at the sectoral level, which could confound the interpretation of the difference-in-differences coefficients. As in our previous regressions, robust standard errors in regression (10) are clustered at the HS-6 product level.

Table 7 presents our estimates of regression (10). Our results confirm the initial impression provided by Table 6 and are also consistent with Predictions 2 and 3 of our model. The share of exports accounted for by SEZ did not change significantly after the reforms. Conversely, we find that scrapping the ESR had a positive and significant effect on the share of exporting firms operating in SEZ. More precisely, the share of firms in priority sectors exporting through SEZ increased by 7 percentage points on average relative to the situation with ESR, while law 139-11 led to an increase of 5.4 percentage points in the share of SEZ exporters in non-priority sectors. The fact that the increase in the share of SEZ exporters is slightly higher in priority sectors suggests that the efforts to extend the incentives available in SEZ to firms based outside them were largely ineffective. Overall, the results reported in Table 7 suggest that the effect of the elimination of ESR on the attractiveness of locating in SEZ dominated the negative effect on the intensive margin of constrained exporters. Thus, granting access to the domestic market to firms in the zones has helped in consolidating their importance in the export basket of the Dominican Republic — at least in the short term.

Table 7: Share of SEZ in Export Value and Number of Firms at the HS-6 Product-level

	Export Value [1]	Number of Firms [2]
$\text{Post08}_t * \text{Priority}_j$	0.033	0.069***
	(0.024)	(0.019)
$\text{Post12}_t * \text{Non-Priority}_j$	0.039	0.054**
	(0.031)	(0.025)
Observations	19,141	19,145
R^2	0.055	0.109

All regressions are estimated by OLS and include HS-6 product and year fixed effects as well as HS-2 product-specific linear trends. Robust standard errors clustered at the HS-6 product level. ***, significant at the 1% level; **, significant at the 5% level; *, significant at the 10% level.

Input Tariff Reductions for Non-SEZ Firms in Priority Sectors. Lastly, we investigate whether the tariff cuts mandated by law 56-07 had any significant impact on the share of imports of these products accounted for by SEZ across HS-6 products, both in terms of value and number of importing firms. Thus, our estimating equation is given by:

$$\text{ShrSEZ}_{jt} = \beta_1(\text{Post08}_t * \text{Priority Input}_j) + f_j + f_t + T_{jt} + \varepsilon_{jt}, \tag{11}$$

where Priority Input_j takes the value 1 if HS-6 product j import tariff was set to zero under law 56-07, and all other control variables have been defined previously. Notice that since law 139-11 did not extend any import tariff reductions, equation (11) does not include an interaction term for liberalized inputs after 2012.

As we discussed in Section 4, Table 5 shows that the most important goods (in terms of total import value) that were made duty-free for non-SEZ firms operating in national priority sectors were either almost exclusively imported by SEZ firms, or, general-purpose inputs imported by a large number of firms in priority and non-priority sectors alike. Thus, we examine whether there is a difference in the share of imports destined to SEZ depending on the importance of these goods in the production of national priority sectors. Since we do not have an input-output table that would allow us to categorize inputs as specific to priority sectors or general-purpose, we follow an alternative strategy and classify each of the 126 HS-6 products liberalized as specific, if the first two digits of their product nomenclature correspond to those of a national priority product. Thus,

for instance, the HS-6 product 'bovine leather' is classified as a priority input because its first two digits correspond to the leather goods sector, which is listed as a priority sector. Conversely, 'white spirit', which is also a priority input, is instead considered to be a non-priority product. Columns (3) and (4) of Table 8 present estimates of the following OLS regression that modifies equation (11):

$$\text{ShrSEZ}_{jt} = \beta_1(\text{Post08}_t * \text{Priority Input}_j * \text{Priority Product}_j) + \beta_2(\text{Post08}_t * \text{Priority Input}_j * \text{Non-Priority Product}_j) + f_j + f_t + T_{\tilde{j}t} + \varepsilon_{jt}, \quad (11')$$

Column (1) of Table 8 shows an insignificant reduction in the share of liberalized inputs imported by SEZ firms after 2008, and similarly, column (2) reveals that there is no change in the share of SEZ firms importing these goods either. Column (3), however, shows that the reduction in the share of imports of priority inputs destined to SEZ occurred primarily among products that were not used specifically by firms in the apparel, textiles and leather industries. If — as the results in Table 8 imply — non-SEZ firms did not receive a sufficient boost in incentives after the removal of ESR, tougher competition from SEZ firms in the domestic market could contribute to the rise in the share of SEZ exports after the elimination of ESR.

Table 8: Share of SEZ in Import Value and Number of Firms at HS-6 Product-level

	Import Value [1]	# Firms [2]	Import Value [3]	# Firms [4]
$\text{Post08}_t * \text{Priority input}_j$	-0.033	-0.004		
	(0.021)	(0.015)		
$\text{Post08}_t * \text{Priority input}_j * \text{Priority}_j$			-0.019	0.034
			(0.043)	(0.036)
$\text{Post08}_t * \text{Priority input}_j * \text{Non-Priority}_j$			-0.040*	-0.022
			(0.022)	(0.013)
Observations	40,770	40,784	40,770	40,784
R^2	0.018	0.029	0.018	0.029

All regressions are estimated by OLS and include HS-6 product and year fixed effects as well as HS-2 product-specific linear trends. Robust standard errors clustered at the HS-6 product level. ***, significant at the 1% level; **, significant at the 5% level; *, significant at the 10% level.

6 Conclusions

For more than four decades the Dominican Republic has relied extensively on providing fiscal incentives to firms located in special economic zones to promote exports. An instrumental element of this developmental strategy was the requirement that firms located in SEZ had to export at least 80% of their output, thus limiting the extent of competition faced by local producers outside the zones. The impending deadline to make the SEZ program compliant with the disciplines stipulated by the WTO Agreement on Subsidies and Countervailing Measures by December 2015, led to the elimination of export share requirements in the SEZ. A distinctive feature of the reform strategy pursued by the Dominican Republic — which we take advantage of in order to identify the impact of the removal of ESR on the export performance of SEZ — was that the requirements were eliminated in a staggered fashion over time and across different industries. Namely, the export share requirement was first removed for producers of leather, textiles and apparel and leather, the so called 'national priority' sectors in 2007, and afterwards for all SEZ producers in 2011.

From a theoretical standpoint, ESR distort the allocation of sales across domestic and export markets for exporters taking advantage of the incentives available in SEZ, but that would prefer to sell a higher share of their output locally than what the export requirement allows them to. On the one hand, eliminating the constraint on domestic sales would induce these exporters to increase the prices they charge abroad in order to reach their undistorted export intensity, thus reducing export sales. On the other hand, removing the ESR while retaining the incentives available in SEZ, would encourage firms to locate there, thereby increasing the share of exports originating from SEZ for a given product. Since these two mechanisms work in opposite directions, the question of how did the ESR reform affect the importance of SEZ exports — which is the focus of this paper — is ultimately, an empirical one.

Our results show that removing the ESR in SEZ has made them a more attractive location for firms to operate from in the Dominican Republic. Our empirical assessment of the response of export margins to the elimination of ESR shows, in line with our theoretical framework, that the reforms promoted entry into export markets within SEZ, while at the same time producing a reduction in the value of export shipments for existing exporters in SEZ (although the latter effect stops being significant when we focus on continuing exporters). When we look at how the

importance of SEZ exports in narrowly-defined HS-6 products was affected by the two waves of elimination of ESR, we find that the share of exporters from SEZ increased between 5.5 to 7 percentage points relative to the situation with ESR, whereas the increase in the share of export value after the reforms was largely insignificant. These findings suggest that the lion's share of exports (in terms of value) originated in SEZ is accounted for by unconstrained exporters that did not find the ESR constraint binding. Nevertheless, the entry of new exporters after the removal of export requirements more than compensated the reduction in the value of individual export shipments by established constrained exporters, and therefore, we see that the importance of SEZ in terms of the number of exporting firms for a given product, increased following the reforms. In regard to the objective of harmonizing the incentives between firms inside and outside SEZ, we find that the tariff reductions introduced by law 56-07 did not provide a sufficiently strong boost, in terms of the import behavior of firms relying on the national customs regime, to elicit a significant change in the composition of exports in the Dominican Republic.

Overall, we conclude that at least in the short-run, making the special economic zones regime compatible with WTO rules on export subsidies has not significantly diminished the Dominican Republic's reliance on the zones.

References

Alder, S., L. Shao, and F. Zilibotti (2013): "Economic Reforms and Industrial Policy in a Panel of Chinese Cities," UBS Center Working Paper Series, Working Paper No. 5.

Bagwell, K. and R. W. Staiger (2006): "Will International Rules on Subsidies Disrupt the World Trading System?" *American Economic Review*, 96, 877–895.

Baldwin, R. and S. Evenett (2009): "The Collapse of Global Trade, Murky Protectionism, and the Crisis: Recommendations for the G20," VoxEU.org Publication.

Banco Central de la República Dominicana (2014): "El Reto de las Zonas Francas con el Cambio en las Reglas de Juego en 2015," Análisis de Coyuntura Internacional No. 29.

Békés, G. and B. Muraközy (2012): "Temporary trade and heterogeneous firms," *Journal of International Economics*, 87, 232–246.

Boyenge, J. P. S. (2007): "ILO Database on Export Processing Zones, Revised," International Labour Organization.

Burgaud, J.-M. and T. Farole (2011): "When Trade Preferences and Tax Breaks are no Longer Enough: The Challenges of Adjustment in the Dominican Republics Free Zones," in *Special Economic Zones: Progress, Emerging Challenges and Future Directions*, ed. by T. Farole and G. Akinci, World Bank.

Chao, C.-C. and E. S. H. Yu (2014): *Trade-Related Investment Measures: Theory and Applications*, London: Imperial College Press.

Creskoff, S. and P. Walkenhorst (2009): "Implications of WTO Disciplines for Special Economic Zones in Developing Countries," World Bank Policy Research Working Paper 4892.

Davidson, C., S. J. Matusz, and M. E. Kreinin (1985): "Analysis of Performance Standards for Direct Foreign Investments," *Canadian Journal of Economics*, 18, 876–890.

Davies, R. B. and A. Mazhikeyev (2015): "The Impact of Special Economic Zones on Exporting Behavior," University College Dublin Working Paper 15/28.

Defever, F. and A. Riaño (2015): "Gone for Good? Subsidies with Export Share Requirements in China: 2002-2013," *World Bank Economic Review Papers & Proceedings*, 29, S125–S144.

——— (2016): "Protectionism through Exporting: Subsidies with Export Share Requirements in China," CEP Working Paper 1431.

Devereux, J. and L. L. Chen (1995): "Export Zones and Welfare: Another Look," *Oxford Economic Papers*, 47, 704–713.

Evenett, S. J. and M. Wermelinger (2010): "A snapshot of contemporary protectionism: how important are the murkier forms of trade discrimination?" in *Rising Non-Tariff Protectionism and Crisis Recovery*, United Nations Economic and Social Commission for Asia and the Pacific (ESCAP).

Farole, T. and G. Akinci (2011): *Special Economic Zones: Progress, Emerging Challenges and Future Directions*, Washington DC: The World Bank.

Fernandes, A. M., C. Freund, and M. D. Pierola (2016): "Exporter behavior, country size and stage of development: Evidence from the exporter dynamics database," *Journal of Development Economics*, 119, 121–137.

Fernandes, A. P. and H. Tang (2012): "Determinants of Vertical Integration in Export Processing: Theory and Evidence from China," *Journal of Development Economics*, 99, 396–414.

FIAS (2008): *Special Economic Zones: Performance, Lessons Learned, and Implications for Zone Development*, Washington, DC: World Bank.

Hamada, K. (1974): "An Economic Analysis of the Duty Free Zone," *Journal of International Economics*, 4, 225–241.

Heid, B., M. Larch, and A. Riaño (2013): "The Rise of the Maquiladoras: A Mixed Blessing," *Review of Development Economics*, 17, 252–267.

Ianchovichina, E. (2007): "Are Duty Drawbacks on Exports Worth the Hassle?" *Canadian Journal of Economics*, 40, 881–913.

Kaplinsky, R. (1993): "Export Processing Zones in the Dominican Republic: Transforming manufactures into commodities," *World Development*, 21, 1851–1865.

Krugman, P. (1980): "Scale Economies, Product Differentiation, and the Pattern of Trade," *American Economic Review*, 70, 950–959.

Melitz, M. J. (2003): "The Impact of Trade on Intra-Industry Reallocations and Aggregate Productivity," *Econometrica*, 71, 1695–1725.

Rodríguez-Clare, A. (1996): "Multinationals, Linkages, and Economic Development," *American Economic Review*, 86, 852–873.

Rodrik, D. (1987): "The Economics of Export-Performance Requirements," *The Quarterly Journal of Economics*, 102, 633–650.

——— (2004): "Industrial Policy for the Twenty-First Century," CEPR Discussion Paper 4767.

Sanchez-Ancochea, D. (2006): "Development trajectories and new comparative advantages: Costa Rica and the Dominican Republic under Globalization," *World Development*, 34, 996–1015.

Schrank, A. (2008): "Export Processing Zones in the Dominican Republic: Schools or Stopgaps?" *World Development*, 36, 1381–1397.

The Economist (2015): "Special Economic Zones: Not so Special," April 3, 2015.

Volpe Martincus, C. (2010): *Odyssey in International Markets: An Assessment of the Effectiveness of Export Promotion in Latin America and the Caribbean*, Washington, DC: Inter-American Development Bank.

Wang, J. (2013): "The Economic Impact of Special Economic Zones: Evidence from Chinese Municipalities," *Journal of Development Economics*, 101, 133–147.

Wang, Z. and Z. Yu (2012): "Trading Partners, Traded Products, and Firm Performance: Evidence from China's Exporter-Importers," *The World Economy*, 35, 1795–1824.

Waters, J. J. (2013): "Achieving World Trade Organization Compliance for Export Processing Zones while Maintaining Economic Competitiveness for Developing Countries," *Duke Law Review*, 63, 481–524.

Willmore, L. (1995): "Export processing zones in the Dominican Republic: A comment on Kaplinsky," *World Development*, 23, 529–535.

World Bank (2014): *How to Sustain Export Dynamism by Reducing Duality in the Dominican Republic*, Washington, DC: World Bank.

World Trade Organization (2006): *World Trade Report 2006: Exploring the Links Between Subsidies, Trade and the WTO*, Geneva: World Trade Organization.

Young, L. (1991): "Unemployment and the optimal export-processing zone," *Journal of Development Economics*, 37, 369–385.

Young, L. and K. F. Miyagiwa (1987): "Unemployment and the formation of duty-free zones," *Journal of Development Economics*, 26, 397–405.

Yücer, A. and J.-M. Siroën (2016): "Trade Performance of Export Processing Zones," *The World Economy*.