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# Third-Country Effects of Regional Trade Agreements

## A Firm-Level Analysis

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## Abstract

Do regional trade agreements negatively impact non-members? This paper revisits this long-standing trade policy question using firm-level data and detailed information on the content of trade agreements. Differently from the conventional view on trade diversion, the analysis identifies a positive spillover effect of regional trade agreements: they increase the probability of export and entry of third-country firms that previously exported to one of the member countries. This spillover effect is driven by deeper trade agreements, as they make member countries more "similar" in terms of the regulatory environment. Indeed, firms exporting regulation-intensive products benefit disproportionately more from deep trade agreements in destination markets, especially if the agreement includes nondiscriminatory provisions and addresses regulatory issues.


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# Third-Country Effects of Regional Trade Agreements: A Firm-Level Analysis*

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# 1 Introduction

Entering foreign markets is costly for firms in terms of information and adaptation costs (Roberts and Tybout, 1997). Empirical evidence shows that firms' decision to serve new foreign markets depends on their prior export experience. Firms' new export destinations tend to be similar to their previous export destinations in terms of culture and geography. Such path dependence of firms' export patterns can be explained by lower export entry costs for firms that previously exported to similar markets. This effect has been called "extended gravity", since export decisions are not only based on the proximity between the origin and destination countries, but also between past and subsequent destinations (Morales, Sheu, and Zahler, 2019). Studies have shown that firms exhibit export patterns consistent with extended gravity, or that firms are "spatial exporters", i.e. they are more likely to serve new markets that are geographically close or similar — in terms of language, colonial history, or per capita income — to their prior export destinations (Defever, Heid, and Larch, 2015).

In this paper, we explore another form of cross-country similarity that can affect firms' entry costs to foreign markets: regional trade agreements (RTAs). The conventional view is that RTAs, by lowering tariffs between members, increase trade policy discrimination faced by firms in third countries leading to a contraction in their exports at the expense of less efficient producers in member countries (trade diversion). However, modern RTAs often go beyond traditional trade policy, covering behind-the-border policy areas such as domestic regulations. "Deep" trade agreements can make member countries more "similar" in terms of the regulatory environment, thus reducing entry costs and increasing exports of firms in third countries -what some have called *negative* trade diversion (Baldwin, 2014). For example, by harmonizing product and technical standards, a deep trade agreement can generate economies of scale for firms that need to comply with one set of standards to reach multiple destinations. Ultimately, the impact on third-country firms of RTAs is an empirical question that in part depends on the content of these agreements.

Using firm-level data from Costa Rica for the period between 1998 and 2012, we first estimate the effect of RTAs of which Costa Rica was not a member on its exports to member countries.[1] We find evidence of a positive spillover effect, corroborating the view of a negative trade diversion. Firms are more likely to export or start exporting to a new destination market if in the previous year they exported to a destination's RTA partner. Moreover, we find that this positive spillover effect increases with the

[1]The focus on Costa Rican firms has two main advantages. First, the firm-level data cover an extended period of time. Second, Costa Rica is a diversified economy in terms of export products and number of destination markets. During the 1998–2012 period, 14,253 Costa Rican firms exported 4,939 HS6-products to 211 economies. The quality of the firm-level data thus allows us to investigate the impact of trade agreements on different types of products over a long period of time.

depth of the agreement as measured by the number of strictly enforceable policy areas covered by the RTA. Finally, we find that the positive effect is driven by the inclusion of nondiscriminatory policy areas in the agreement and that the impact is larger for RTAs that include regulatory provisions.

The empirical strategy exploits the detailed information on RTAs between destination markets, which are exogenous to Costa Rican firms.[2] A large set of fixed effects allow to control for supply and demand shocks as well as unobserved firm characteristics. Furthermore, we also include spatial control variables that capture the similarity of the export destination to firms' previous export markets in terms of common border, language and colonial history. These are important control variables that have been documented to affect both firms' destination-specific sunk costs and the probability of destinations to be in a deep trade agreement (Albornoz, Calvo Pardo, Corcos, and Ornelas, 2012; Lawless, 2013; Defever et al., 2015; Morales et al., 2019). Our specification captures the non-member benefits of RTAs that work through the reduction in entry costs, that is, at the extensive margin. Specifically, the channel identified in this study is the marginal effect of having prior export in other destination markets that become linked through RTAs.

We then exploit the variation in regulation intensity across products to identify the sources of the positive spillover effects. Intuitively, regulatory convergence implied by deep RTAs is expected to reduce adaptation and entry costs particularly for firms exporting regulation-sensitive products. Results indeed suggest that the positive effects of RTAs between destination markets on firm entry and export are largely driven by products that are sensitive to regulations. We proxy regulation-intensive products as those for which WTO members raised Specific Trade Concerns (STC) at the WTO Sanitary and Phytosanitary (SPS) or Technical Barriers to Trade (TBT) committees. This proxy allows to capture the importance of regulatory standards at the HS-4 product level, as perceived by the exporters. The results are robust to alternative measures of regulation intensity (i.e. prior notice requirements by the U.S. Food and Drug Administration) and RTA depth (i.e. type of trade agreement), and to the inclusion of additional fixed effects.

This paper builds on and contributes to several strands of the literature. First, it builds on the extended gravity, spatial exporters, and sequential exporting literature. This group of studies highlights the importance of firms' experience in previous export markets as a mechanism to learn about new markets and reduce their export sunk costs. Learning can be with regard to a firm's self-discovery of its "export profitability" which is correlated across destinations (Albornoz et al., 2012), through firm networks (Chaney, 2014), or about costly product adaptation processes specific to destination

[2]The data provide information on the content of all RTAs in force and notified to the WTO in the period of analysis (Hofmann, Osnago, and Ruta, 2017).

markets (Morales et al., 2019). Through these channels, firms' export sunk costs to new markets depend on their prior export destinations, which can explain the observed spatial correlations in exporting (Evenett and Venables, 2002; Lawless, 2009, 2013; Defever et al., 2015; Meinen, 2015; Morales et al., 2019).[3] While spatial correlation — based on geographic, linguistic, and cultural proximity — in export entry has been well-documented, the literature has not yet explored the extended gravity effects due to "proximity" in trade-related institutions. Using insights from this literature, we fill this gap by investigating the role of regional trade agreements, and firms' prior export experiences to member countries, on export decisions by firms in third-countries.

Second, the paper contributes to the literature on the effects of trade agreements on non-member countries. While much research has documented the benefits of RTAs on member countries, there is less evidence on their impact on non-members.[4] Recent research shows that tariff preferences have a negative impact on imports from non-member countries (e.g. Romalis, 2007; Fugazza and Nicita, 2013; Dai, Yotov, and Zylkin, 2014; Limão, 2016), especially if these preferences are coupled with strict rules of origin (Conconi, García-Santana, Puccio, and Venturini, 2018).[5] It has been shown that tariff erosion can be a factor behind the multiplication of RTAs (Baldwin and Jaimovich, 2012; Chen and Joshi, 2010). In contrast, Mattoo, Mulabdic, and Ruta (2017) analyze the content of trade agreements and find that some provisions included in deep agreements have a public good aspect, as they increase trade also with non-members. This paper provides firm-level evidence on the positive spillover effects of deep trade agreements on firms' entry and export decisions.[6]

Finally, the paper is related to the literature on the effect of non-tariff measures and regulatory cooperation on trade (Ederington and Ruta, 2016). Previous contributions analyzed the direct impact of regulations on bilateral trade (Baldwin, 2000; Fontagné, Orefice, Piermartini, and Rocha, 2015; Fernandes, Ferro, and Wilson, 2017) and on trade with third countries (Chen and Mattoo, 2008; Disdier, Fontagné, and Cadot, 2015; Fontagné and Orefice, 2018).[7] In particular, Chen and Mattoo (2008) study the effects of harmonization and mutual recognition of standards on third countries as well as participating countries. They find that third countries can benefit, depending on the

[3] A related study by Moxnes (2010) estimates global and country-specific sunk entry costs and finds that the latter are about three times larger in magnitude. It also suggests that an international harmonization of product standards can reduce the country-specific element of entry costs.

[4] See Head and Mayer (2014) for a detailed review of the gravity literature.

[5] An exception is Freund (2010) who studies the impact of trade agreements in Latin America and Europe and finds that greater tariff preferences margins do not significantly reduce imports from third countries.

[6] Spillover effects are often incorporated into computable general equilibrium (CGE) models to take into account the reduction in export costs for non-member countries due to regulatory convergence effects of deep trade agreements (e.g. Francois, Manchin, Norberg, Pindyuk, and Tomberger, 2013). Our study provides micro-econometric evidence in support of this assumption.

[7] See Li and Beghin (2012) for a meta-analysis on the trade impact of SPS and TBT measures.

stringency of the harmonized standards and the restrictiveness of the rules of origin. We contribute to this literature by identifying through a firm-level analysis regulatory convergence in deep trade agreements (and, specifically, the presence of SPS and TBT provisions in RTAs) as a source of spillover effect.

The paper is organized as follows. The next section describes the data and provides some descriptive statistics. Section 3 presents the empirical specification and results for the firm-level analysis. Section 4 explores the differential effects for regulation-intensive products. Section 5 provides robustness analysis and Section 6 concludes.

## 2 Data and descriptive statistics

To identify the impact of trade-related institutions in destination markets on Costa Rican firms, we combine data on regional trade agreements, the universe of export transactions at the firm level, and product-level information on regulation sensitivity. First, we use the World Bank Deep Agreements Database to capture the depth of trade agreements (Hofmann et al., 2017). The data set provides information on the detailed content of 279 RTAs, signed by 180 countries between 1957 and 2015. Following Mattoo et al. (2017), we measure the depth of an agreement as the count of strictly enforceable provisions included in the RTA.[8] Other dimensions of the content of RTAs used in the analysis include the presence of regulatory provisions and the preferential or nondiscriminatory nature of provisions. Appendix A.1 provides the details. In a robustness test, we use an alternative measure of RTA depth from Mario Larch's Regional Trade Agreements Database (Egger and Larch, 2008) which categorizes RTAs into partial scope agreements, free trade agreements, and customs unions.

For exporter transactions, we use the Exporter Dynamics Database described in Fernandes, Freund, and Pierola (2016). The underlying data for Costa Rica cover the universe of exporting firms over 1998–2012 and provides information on export value and quantity at the firm-product-destination-year level. The data cover 14,253 firms exporting to 211 destinations. We limit our analysis to destinations with population greater than 5 million, which reduces the sample to 12,918 firms and 115 destinations. Costa Rican data provide a good environment for our analysis due to the extensive time coverage and diversified export profiles in terms of products and destinations.[9] The data also exhibit high rates of firm turnover, providing sufficient dynamics to

[8] The legal enforceability of each provision is assessed based on the presence of dispute settlement or legal language. For more information on the database and coding, see Hofmann et al. (2017). The database is publicly available at https://datacatalog.worldbank.org/dataset/content-deep-trade-agreements.

[9] Costa Rican firms export an average of 7.9 HS4-products, with a median of 2. In terms of destinations, the average is 3 and median is 1. See Appendix Table A.2 for their top exported products ranging across various industries.

study their export participation and entry decisions.[10]

Finally, we use two alternative measures to proxy for the regulation intensity at the product level. First, we use the WTO Specific Trade Concerns (STC) Database, which provides product-level (HS4) information on trade concerns raised in the WTO's SPS and TBT committees. The main advantage of this database is that it captures the "revealed" stringency of standards, as perceived as important trade barriers by exporters, rather than counting the number of standards that may or may not be trade impeding (Fontagné et al., 2015; Fontagné and Orefice, 2018). We classify products to be regulation intensive if at least a concern was raised to one of the committees. There are 312 specific concerns raised on 124 products in the SPS committee and 317 specific concerns raised on 848 products in the TBT committee, together covering a broad range of 863 products across different industries (see Appendix Table A.4 for the distribution of STC-products across industries). Second, we use an alternative measure of regulation intensity based on prior notice requirements by the United States' Food and Drug Administration (FDA). This measure covers a total of 272 HS4-products, mainly in food, drugs, and medical devices, which require prior notice to the FDA.[11]

To construct the data set needed for the first part of our analysis (firm-level), we expand the initial exporters database to make it squared so that every firm-destination-year combination is an observation. For the second part of our analysis using the product-level data, we first aggregate firms' exports data (available at HS6-level) to the HS4-level, which is the level available in the WTO STC data set. Then, we expand the data set so that each firm-product that exported at least once is combined with every destination and year. There are 12,918 firms exporting 1,197 HS4-products to 115 destinations, and there are 102,295 firm-product combinations that are exported at least once.[12] This expanded panel data set allows us to include a rich set of fixed effects and exploit firms' previous export experience to estimate the effect of RTAs on non-member country firms.

Using this data set, we construct two dependent variables: firm export participation and entry dummies. The export participation dummy is equal to 1 if firm $i$ exports to destination $j$ in year $t$, and equal to 0 otherwise. The export entry dummy is equal to

[10] On average, 27% of exporting firms each year are new entrants. Appendix Table A.3 provides yearly statistics on exporting firms and the share of new entrants.

[11] The distribution across industries of products subject to FDA prior notice is reported in Appendix Table A.5. Products are listed at the HS10-level which we aggregate up to HS4-level to be consistent with the level of disaggregation in the WTO STC data set. The list of products that require prior notice to the FDA were downloaded, in June 2018, from https://wayback.archive-it.org/7993/20170721215512/https://www.fda.gov/Food/GuidanceRegulation/GuidanceDocumentsRegulatoryInformation/ImportsExports/ucm170031.htm.

[12] This means that we have $12,918 \times 115 \times 15 = 22,283,550$ observations in the expanded firm-level data set and $102,295 \times 115 \times 15 = 176,458,875$ observations in the expanded firm-product-level data set. Note that the vast majority of these observations are filled with zero trade flows, but are needed for the identification.

1 if firm $i$ exports to destination $j$ in year $t$ and did not do so in $t$-1, equal to 0 if the firm did not export to destination $j$ in year $t$-1 and does not start in year $t$, and it is missing otherwise.[13]

The explanatory variables that capture firm $i$'s export experience in markets other than destination $j$ are constructed as follows:

$$Exp\,Other\,G_{ij(p),t-1} = \max_{k \neq j} \{Exporting\,Dummy_{ik(p),t-1} \times G_{jk,t}\} \tag{1}$$

where $Exp\,Other\,G_{ij(p),t-1}$ indicates whether firm $i$ was exporting (product $p$) to any destination $k$ that has an extended gravity relationship $G$ with country $j$. We construct different variables to identify the spillover effect of RTAs in country $j$ on export participation and entry of Costa Rican firms. We also construct variables to account for spatial exporting patterns that capture if firm $i$ was exporting (product $p$) to any country sharing a border, common language, or colonial history with country $j$.

Tables 1 and 2 provide descriptive statistics of the main variables from our expanded firm-level and product-level data sets, respectively. The first two rows in both tables report unconditional statistics, showing (as expected) that the expanded data set is largely filled with zeros and exporting is a rare event. Export entry, by definition, is a less frequent event than export participation and has fewer observations due to missing values. The subsequent rows report descriptive statistics conditional on exporting.

Table 1: Descriptive statistics: Firm level data set

| Variable | N | Mean | Std. Dev. | Min. | Max. |
|---|---|---|---|---|---|
| **Unconditional (N=22,283,550)** | | | | | |
| Export participation dummy | 22,283,550 | 0.005 | 0.071 | 0 | 1 |
| Export entry dummy | 20,694,907 | 0.002 | 0.045 | 0 | 1 |
| **Conditional on exporting (N=112,835)** | | | | | |
| Export entry dummy | 42,311 | 1 | 0 | 1 | 1 |
| Export Other ... (t-1) | | | | | |
| ... RTA | 106,407 | 0.572 | 0.495 | 0 | 1 |
| ... RTA × Depth | 106,407 | 0.284 | 0.342 | 0 | 1 |
| ... RTA × Depth MFN | 106,407 | 0.404 | 0.429 | 0 | 1 |
| ... RTA × Depth Pref | 106,407 | 0.466 | 0.459 | 0 | 1 |
| ... RTA × SPSorTBT | 106,407 | 0.434 | 0.496 | 0 | 1 |
| ... Border | 106,407 | 0.399 | 0.49 | 0 | 1 |
| ... Language | 106,407 | 0.521 | 0.5 | 0 | 1 |
| ... Colony | 106,407 | 0.016 | 0.124 | 0 | 1 |

In Table 1, the number of non-missing observations for export entry conditional on exporting suggests that an exporting firm's average duration of exports to a given destination is about 2.7 years. Of the firms that exported to a given destination in year $t$, 57% also exported to an RTA partner of that destination in year $t$-1, 40% exported to a destination that shares a border, and 52% to a destination with a common language.

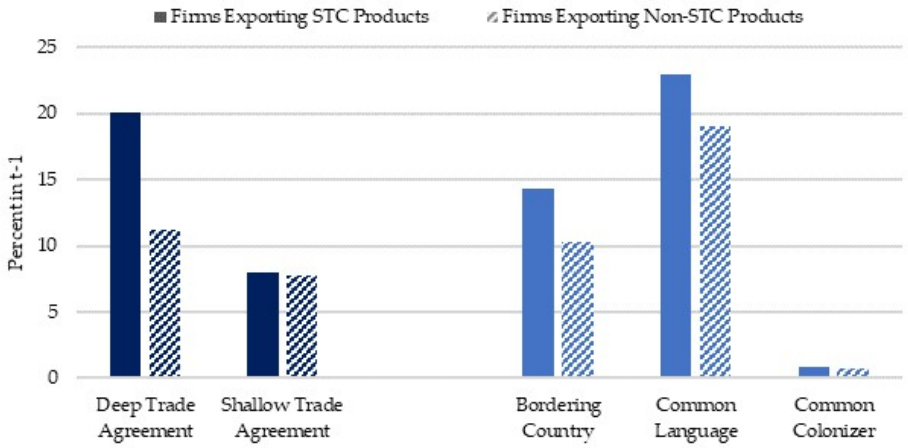
[13] We allow multiple entries for a given firm-destination, as in Koenig, Mayneris, and Poncet (2010) and Fernandes et al. (2017).

All the depth variables have been normalized to range between 0 and 1. Table 2 shows similar patterns at the firm-product-destination data set. The number of observations with positive exports is about 3 times larger than the firm-level data set, meaning that exporting firms on average export about 3 HS-4 products.

Table 2: Descriptive statistics: Firm-product level data set

| Variable | N | Mean | Std. Dev. | Min. | Max. |
|---|---|---|---|---|---|
| **Unconditional (N=176,458,875)** | | | | | |
| Export participation dummy | 176,458,875 | 0.002 | 0.043 | 0 | 1 |
| Export entry dummy | 164,398,830 | 0.001 | 0.033 | 0 | 1 |
| **Conditional on exporting (N=333,318)** | | | | | |
| Export entry dummy | 182,967 | 1 | 0 | 1 | 1 |
| STC | 333,318 | 0.783 | 0.412 | 0 | 1 |
| Export Other ... (t-1) | | | | | |
| ... RTA | 318,249 | 0.364 | 0.481 | 0 | 1 |
| ... RTA × STC | 318,249 | 0.292 | 0.455 | 0 | 1 |
| ... RTA × Depth | 318,249 | 0.16 | 0.273 | 0 | 1 |
| ... RTA × Depth × STC | 318,249 | 0.134 | 0.263 | 0 | 1 |
| ... RTA × Depth MFN | 318,249 | 0.244 | 0.382 | 0 | 1 |
| ... RTA × Depth Pref | 318,249 | 0.286 | 0.422 | 0 | 1 |
| ... RTA × Depth MFN × STC | 318,249 | 0.200 | 0.360 | 0 | 1 |
| ... RTA × Depth Pref × STC | 318,249 | 0.233 | 0.398 | 0 | 1 |
| ... RTA × SPSorTBT | 318,249 | 0.262 | 0.44 | 0 | 1 |
| ... RTA × SPSorTBT × STC | 318,249 | 0.214 | 0.41 | 0 | 1 |
| ... Border | 318,249 | 0.258 | 0.437 | 0 | 1 |
| ... Language | 318,249 | 0.347 | 0.476 | 0 | 1 |
| ... Colony | 318,249 | 0.007 | 0.083 | 0 | 1 |

Figure 1: Statistics by product type, conditional on entry




Deep (Shallow) trade agreements are agreements with the number of provisions higher (lower or equal) than the median agreement.

Figure 1 shows the descriptives for regulation-intensive products (raised in STC) and those that are not. While both types of products depict extended gravity patterns, firms that enter into new markets with regulation-intensive products are more likely to have exported before to geographically and culturally similar destinations. While

the likelihood of previous exports to a country that has a shallow agreement with the new destination is equivalent for the two types of products, the likelihood is higher for regulation-intensive goods in the case of deep trade agreements. This suggests that firms exporting regulation-intensive products benefit disproportionately more from deeper RTAs. In the rest of the paper, we investigate this relationship econometrically.

# 3 Firm-level analysis

We closely follow the empirical specification adopted by Defever et al. (2015) to estimate the positive impact of deep trade agreements on non-member-country exporters. As a first step, we test whether firms are more likely to export to a new destination if they previously exported to a country that has an RTA with the destination country. Specifically, we run the following regression:

$$y_{ij,t} = \beta_1 \, Exp\,Other\,RTA_{ij,t-1} + \gamma \, \mathbf{X}_{ij,t-1} + \alpha_{ij} + \delta_{i,t} + \theta_{j,t} + \epsilon_{ij,t} \tag{2}$$

where $y_{ij,t}$ is an export participation or entry dummy equal to one if firm $i$ exports or starts exporting to country $j$ in year $t$. We are interested in the extensive margin because we want to identify the extended gravity effect of RTAs that works through a reduction in entry costs.[14] As in the model of extended gravity (Morales et al., 2019), where a firm's entry cost in a market depends on its similarity to its previous export markets, we expect that deep trade agreements that make export destinations more "similar" will reduce the cost of foreign market entry and hence increase the probability of export entry into the integrated markets. Moreover, between export participation and entry, using entry as the outcome variable has some empirical advantages, as it does not suffer from potential biases due to the persistence and state dependence in firms' export status to a given destination.[15] Our preferred dependent variable therefore is the export entry variable, which precisely captures the entry dynamics across firm-destinations, consistent with theoretical models.[16]

[14]The benefits from deep integration in destination markets, in terms of compliance to standards, are more important for the fixed, rather than variable, trade costs (Fernandes et al., 2017; Fontagné and Orefice, 2018). As shown in Chaney (2008), changes in the fixed costs of exporting only affect the extensive margin of trade.

[15]Roberts and Tybout (1997) and Das, Roberts, and Tybout (2007) show that firms' export status is highly correlated to their previous export status in the presence of sunk entry costs.

[16]The literature has documented the role of extensive margins in explaining export patterns. In particular for Costa Rica, Lederman, Rodríguez-Clare, and Xu (2011) provide a detailed analysis on firms' export dynamics and show that "exporting entrepreneurs" (new entrant firms into exporting, extensive margin) are the main driver of export growth in Costa Rica in the medium/long term, although short-run (annual) export growth is dominated by incumbent firms' growth (intensive margin). See Appendix Table A.3 for entry dynamics of Costa Rican firms in our data set.

Our main variable of interest is

$$Exp\,Other\,RTA_{ij,t-1} = \max_{k \neq j} \{Exporting\,Dummy_{ik,t-1} \times RTA_{jk,t}\}$$

which is an indicator variable taking value 1 if firm $i$ exported in $t$-1 to a country that has an RTA with country $j$.[17,18] A positive coefficient would suggest that RTAs facilitate entry of non-member country firms with previous export experience in other RTA markets, compared to those without. $\mathbf{X}_{ij,t-1}$ are spatial exporter controls that capture whether firm $i$ exported in $t$-1 to a country that shares a border, language, or colonizer with country $j$.

We include a rich set of fixed effects, $\alpha_{ij}$, $\delta_{i,t}$, and $\theta_{j,t}$ to control for firm-destination, firm-year and destination-year specific effects, respectively. $\alpha_{ij}$ captures unobserved firm-destination specific factors that are constant over time. $\delta_{i,t}$ captures time-varying supply shocks at the firm level, such as productivity shocks, that affect firms' export decisions in a given year. It also captures any time-varying firm characteristics which are constant across destinations, such as the export status in previous years, controlling for a generic "learning to export" or "sequential exporting" mechanism. $\theta_{j,t}$ accounts for demand shocks at the destination-year level that affect the exports of all Costa Rican firms to a given destination country in a given year. Note that the average effect (across all firms) of RTAs — including those that involve Costa Rica and those that do not — is also captured by $\theta_{j,t}$. For example, if Costa Rica signs an RTA with a country during the sample period, the direct effect of this RTA, affecting all Costa Rican firms, is absorbed by this fixed effect. Coefficient $\beta_1$ therefore identifies the impact of third-country RTAs on firms that previously exported to one of the RTA members, compared to those that did not. In other words, the aggregate trade diversion effect, if any, will be absorbed by $\theta_{j,t}$.

Equation (2) and all following specifications are estimated using a linear probability model, which can accommodate the large number of fixed effects.[19] Standard errors are

[17]The assumption that the effect of prior export experience on subsequent entry costs lasts for one year follows Roberts and Tybout (1997) and Morales et al. (2019). The lagged explanatory variables mean that the first year of our data (1998) is dropped from the regressions, which are therefore run over 1999-2012.

[18]By using the *max* function of the interaction between $Exporting\,Dummy_{ik,t-1}$ and $RTA_{jk,t}$. instead of the *sum*, we assume that there are no cumulative benefits from previous export experience. For instance, we assume that a firm that exports to two out three members of a multilateral trade agreement is not more likely to export to the third one than a firm that exports only to one member.

[19]The use of a linear probability model with binary dependent variables such as export participation and entry is common in the literature (e.g. Bernard and Jensen, 2004; Fontagné et al., 2015; Fernandes et al., 2017). Especially when multiple fixed effects are included, probit and logit models may suffer from the incidental parameter problem and are computationally intensive. Given the importance of including the fixed effects for the estimation, we rely on the linear probability model which allows us to derive qualitative predictions despite a shortcoming that the point estimates are less reliable. The estimates are obtained using STATA command *reghdfe*, developed by Correia (2014).

clustered at the firm level to allow for potential autocorrelation in the choice of export destination at the firm level.

As a second step, we explore whether the third-country effect of RTAs is stronger for deep trade agreements by estimating the following equation:

$$\begin{aligned} y_{ij,t} =& \beta_1 \, Exp\,Other\,RTA_{ij,t-1} + \beta_2 \, Exp\,Other\,Depth_{ij,t-1} + \gamma \, \mathbf{X}_{ij,t-1} \\ &+ \alpha_{ij} + \delta_{i,t} + \theta_{j,t} + \epsilon_{ij,t} \end{aligned} \tag{3}$$

where $Exp\,Other\,Depth_{ij,t-1} = \max_{k \neq j} \{Exporting\,Dummy_{ik,t-1} \times Depth_{jk,t}\}$ captures the depth of the deepest RTA that country $j$ has with a country to which firm $i$ exported in $t$-1. We exploit the richness in the content of RTAs to construct measures of depth and investigate different aspects of third-country RTAs that generate stronger spillover effects for firms that already exported to one of the member countries. The first indicator is the aggregate depth, measured as the additive number of provisions that are strictly legally enforceable. This aggregate depth measure is normalized between 0 and 1 so that $(\beta_1 + \beta_2)$ captures the impact of prior export experience of firm $i$ to a country, to which firm $i$ exported in $t$-1 and has the deepest RTA with country $j$, on its export participation and entry to country $j$.

Going beyond the aggregate depth measure, we further investigate whether certain provisions are particularly important in driving the spillover effect of RTAs. Specifically, we separately estimate the effects of RTA depth based on provisions that are nondiscriminatory (or most favored nation-MFN) and preferential. This distinction is interesting and important for our analysis, since we focus on third-country effects of RTAs. This means that *Depth* in equation (3) becomes a vector of MFN-depth and preferential-depth, measured as the additive number of MFN and preferential provisions respectively, again normalized between 0 and 1.[20] As above, the interaction variables are constructed such that they capture the maximum MFN and preferential depth of country $j$'s RTAs among the set of countries that firm $i$ exported to in $t$-1 . We expect RTAs that are "deep" in MFN-provisions to generate larger spillovers to non-member-country firms. Finally, to test if third-country effects are driven by the harmonization of standards, we check if the effects are stronger for RTAs that include SPS or TBT provisions.

### *Results*

Table 3 presents the first set of results. The dependent variable is the export participation dummy in columns (1)–(4) and the export entry dummy in columns (5)–(8). First looking at export participation, column (1) estimates equation (2) and column

[20] See Appendix A.1 for the list of MFN and preferential provisions.

(2) estimates equation (3), using the aggregate measure of depth. Columns (3) and (4) repeat the estimations including the spatial exporter controls.

Table 3: Third-country effects of RTAs

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|---|---|---|---|---|---|---|---|---|
| | Export participation | | | | Export entry | | | |
| Exp Other...(t-1) | | | | | | | | |
| ... RTA | 0.030*** | 0.022*** | 0.015*** | 0.009*** | 0.013*** | 0.009*** | 0.007*** | 0.005*** |
| | (0.001) | (0.001) | (0.000) | (0.001) | (0.000) | (0.000) | (0.000) | (0.000) |
| ... Depth | | 0.020*** | | 0.015*** | | 0.008*** | | 0.006*** |
| | | (0.002) | | (0.002) | | (0.001) | | (0.001) |
| ... Border | | | 0.060*** | 0.059*** | | | 0.022*** | 0.021*** |
| | | | (0.002) | (0.002) | | | (0.001) | (0.001) |
| ... Language | | | 0.006*** | 0.007*** | | | 0.004*** | 0.004*** |
| | | | (0.000) | (0.000) | | | (0.000) | (0.000) |
| ... Colony | | | -0.017*** | -0.016*** | | | -0.006*** | -0.006*** |
| | | | (0.001) | (0.001) | | | (0.001) | (0.001) |
| Observations | 20,797,980 | 20,797,980 | 20,797,980 | 20,797,980 | 20,694,604 | 20,694,604 | 20,694,604 | 20,694,604 |
| R-squared | 0.462 | 0.463 | 0.466 | 0.466 | 0.178 | 0.178 | 0.179 | 0.179 |
| Firm-year FE | YES | YES | YES | YES | YES | YES | YES | YES |
| Dest-year FE | YES | YES | YES | YES | YES | YES | YES | YES |
| Firm-dest FE | YES | YES | YES | YES | YES | YES | YES | YES |

Robust standard errors, clustered at the firm level, are in parentheses. The dependent variable $y_{ij,t}$ is a dummy variable equal to 1 if firm $i$ exported (or started exporting) to country $j$ in year $t$. *** p<0.01, ** p<0.05, * p<0.1

Results in column (1) show that firms are more likely to export to a country if in the previous year they exported to a destination's RTA partner. In other words, an RTA between two countries makes it more likely for Costa Rican firms to export to both countries if they have previously exported to one of the two. The probability of exporting increases by 3 percentage points if the firm previously exported to a country that has an RTA with the destination country. This provides evidence that on net RTAs have a positive spillover effect on non-member firms operating in one of the RTA markets.

This positive spillover effect is larger for deeper agreements — in terms of the number of strictly enforceable provisions included — as shown by the positive coefficient on the interaction term in column (2). Deep trade agreements increase the probability of export participation for firms with previous export experience in one of the member states by 2.1 percentage points, additional to the 2.2 percentage points that is estimated for shallow agreements.[21]

The results are robust to the inclusion the extended gravity variables: controlling for previous export experience to countries that share a border, a common language, or a common colonizer with the destination country. The observed positive impact of extended border and language variables are consistent with existing studies. The

[21]These magnitudes are for the deepest and shallowest RTAs between current and past destination markets.

inclusion of these control variables reduces the magnitude of the RTA spillover effects, by about half, which is expected given that countries that share such similarities may also be more likely to have RTAs. The coefficients however remain positive and significant, confirming that our results are not driven by spatial exporting patterns due to standard gravity variables.

The magnitude of the increase in export and entry probabilities may seem small. After controlling for spatial exporting patterns, an average RTA increases the probability of export by 1.5 percentage points and the probability of export entry by 0.7 percentage points. However, the marginal effects to the observed probability of firms' export participation and entry are substantial. For example, having exported to France this year increases the probability of a firm to export to the Netherlands (who has an RTA with France) next year by 64%, and for the firm to start exporting to the Netherlands by 78%.[22]

Columns (5)–(8) present the results on the probability of export entry. This stricter specification, as explained above, is our preferred one, as we expect deep trade agreements to affect the extensive margin of exports through the reduction of export entry costs for firms with previous export experience to one of the member countries. Despite smaller magnitudes, the results are consistent with our hypothesis: firms that exported in the previous year to a country are more likely to start exporting to another country if the two countries are or become part of an RTA. An average RTA increases the probability of export entry by 0.7 percentage points, while the probability increases by 1.1 percentage points for deep RTAs (columns 7–8).

Table 4 shows the third-country effects of RTAs that are deep in terms of nondiscriminatory (MFN) and preferential provisions. Results in odd columns show that MFN provisions have a positive impact on entry and exporting status of firms located in non-member counties, while the inclusion of preferential provisions decrease the export probability of firms with previous export experience in the RTA area.[23] Preferential provisions in RTAs, such as tariff reductions, usually grant preferences only to RTA partners, distorting the relative prices with respect to non-members. On the other hand, MFN-provisions included in deep trade agreements, such as provisions on competition policy, standards, or services, affect *all* imports into the countries, and can

[22]The marginal effects are calculated based on Costa Rican firms' probability of export and entry to the Netherlands. Across all years in our sample of exporting firms, the probability to export to the Netherlands is 2.35% and the probability of export entry is 0.9%. Therefore, the marginal effects of exporting previously to a country that has an RTA with the Netherlands (and does not share a border, language, or common colonizer) is 0.015/0.0235=0.64 for export participation and 0.007/0.009=0.78 for export entry. The Netherlands is the destination with the sixth highest export probability for Costa Rican firms. For destinations that Costa Rican firms are less likely to export to, the marginal effects are larger.

[23]The point estimates are less informative than the direction of effects because of the normalization of depth variables as well as the use of a linear probability model.

therefore promote exports of firms in non-member countries. This evidence shows that deep RTAs have positive spillover effects through nondiscriminatory provisions that can more than offset traditional negative effects on non-member firms of discriminatory measures.

Table 4: Third-country effects of deep RTAs with certain provisions

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|---|---|---|---|---|---|---|---|---|
| | Export participation | | | | Export entry | | | |
| Exp Other...(t-1) | | | | | | | | |
| ... RTA | 0.025*** | 0.022*** | 0.010*** | 0.009*** | 0.011*** | 0.010*** | 0.006*** | 0.005*** |
| | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) | (0.000) | (0.000) | (0.000) |
| ... Depth MFN | 0.055*** | | 0.036*** | | 0.021*** | | 0.015*** | |
| | (0.003) | | (0.002) | | (0.001) | | (0.001) | |
| ... Depth Pref | -0.036*** | | -0.021*** | | -0.014*** | | -0.009*** | |
| | (0.002) | | (0.002) | | (0.001) | | (0.001) | |
| ... SPSorTBT | | 0.013*** | | 0.011*** | | 0.005*** | | 0.004*** |
| | | (0.001) | | (0.001) | | (0.000) | | (0.000) |
| ... Border | | | 0.058*** | 0.059*** | | | 0.021*** | 0.021*** |
| | | | (0.002) | (0.002) | | | (0.001) | (0.001) |
| ... Language | | | 0.007*** | 0.006*** | | | 0.004*** | 0.004*** |
| | | | (0.000) | (0.000) | | | (0.000) | (0.000) |
| ... Colony | | | -0.016*** | -0.017*** | | | -0.005*** | -0.006*** |
| | | | (0.001) | (0.001) | | | (0.001) | (0.001) |
| Observations | 20,797,980 | 20,797,980 | 20,797,980 | 20,797,980 | 20,694,604 | 20,694,604 | 20,694,604 | 20,694,604 |
| R-squared | 0.463 | 0.463 | 0.466 | 0.466 | 0.178 | 0.178 | 0.179 | 0.179 |
| Firm-year FE | YES | YES | YES | YES | YES | YES | YES | YES |
| Dest-year FE | YES | YES | YES | YES | YES | YES | YES | YES |
| Firm-dest FE | YES | YES | YES | YES | YES | YES | YES | YES |

Robust standard errors, clustered at the firm level, are in parentheses. The dependent variable $y_{ij,t}$ is a dummy variable equal to 1 if firm $i$ exported (or started exporting) to country $j$ in year $t$. *** p<0.01, ** p<0.05, * p<0.1

We also find that agreements that include SPS or TBT provisions, which address sanitary and technical standards, have larger positive impact on entry decisions of Costa Rican firms. While an RTA without these provisions increases the probability of export entry for firms with previous export experience to one of the member countries by 0.5 percentage points, the effect for agreements that include SPS or TBT provisions is 0.4 percentage points higher than and statistically different from those do not include them (column 7). These findings support our hypothesis that deep integration entailing some form of regulatory convergence matters as it makes destination markets more "similar". Specifically, it facilitates exports from third-country firms that already adapted to the standards of one of the RTA member countries. We explore this channel further in the next section by testing whether these effects are stronger for regulation-intensive goods.

# 4 Regulation-intensive products

To further pin down the mechanism at work, we exploit the information on products. Specifically, we test whether the third-country effect of deep trade agreements is stronger

for regulation-sensitive products by estimating the following regression:

$$\begin{aligned} y_{ijp,t} = {} & \beta_1 \, Exp\,Other\,RTA_{ijp,t-1} + \beta_2 \left(Exp\,Other\,RTA_{ijp,t-1} \times STC_p\right) \\ & + \beta_3 \, Exp\,Other\,Depth_{ijp,t-1} + \beta_4 \left(Exp\,Other\,Depth_{ijp,t-1} \times STC_p\right) \\ & + \gamma \, \mathbf{X}_{ijp,t-1} + \alpha_{ijp} + \delta_{ip,t} + \theta_{jp,t} + \epsilon_{ijp,t} \end{aligned} \tag{4}$$

where $p$ denotes HS4-product. $Exp\,Other\,RTA_{ijp,t-1}$ indicates whether firm $i$ exported product $p$ in $t$-1 to a country that has an RTA with country $j$, and $STC_p$ is a proxy for the regulation intensity of product $p$. The baseline presents the results with $STC_p$ taking value 1 if a Specific Trade Concern (STC) on product $p$ has been raised in the SPS or TBT committee at the WTO.[24] The fixed effects in equation (4) are adjusted to vary at the product level. For example, $\delta_{ip,t}$ captures all characteristics and shocks at the destination-product-year level, such as the stringency of product standards in the destination country, tariffs, as well as product-specific demand shocks. Again, this extensive set of fixed effects allows to control for a wide range of unobserved factors that can otherwise bias the estimates.

Tables 5 and 6 report the results of estimating equation (4) with STC defined as an indicator variable for products targeted by trade concerns. Column (7) shows that, controlling for extended gravity variables, an average RTA increases the probability of export entry for firms that previously exported to one of the member countries, and this effect is not significantly different for regulation-sensitive products. For export participation, the effect is slightly larger for the exports of products for which specific trade concerns are raised (column 3).

The differential impact on regulation-intensive products however become evident when the depth of RTAs is taken into account. While shallow trade agreements appear to have smaller positive effects for regulated products, deep trade agreements boost export entry of regulation-intensive products from third-country firms that have been exporting into one of the member markets (column 8).[25] This suggests that the aggregate positive spillover effects of deep RTAs, presented in Table 3, are driven by the increased export entry and participation of firms exporting highly regulated products.

Product-level results also confirm the positive impact of the inclusion of MFN provisions and regulatory provisions in deep trade agreements (Table 6). These RTAs generate stronger third-country effects for regulation-intensive products. Column (7) shows that the inclusion of nondiscriminatory provisions increases the probability of firm entry, particularly for regulation-intensive products. Provisions on SPS or TBT

[24] Results for the continuous and alternative measures of regulation intensity are presented in the robustness section.

[25] As the *Depth* variable ranges between 0 and 1, the *RTA* coefficients in columns 2, 4, 6, and 8 capture the spillover effects of shallow RTAs (i.e., when $Depth = 0$). Therefore, the negative coefficients on $RTA \times STC$ indicate that shallow RTAs have positive spillover effects which are weaker for regulation-intensive products.

Table 5: Third-country effects of RTAs: Regulation-intensive products

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|---|---|---|---|---|---|---|---|---|
| | Export participation | | | | Export entry | | | |
| Exp Other...$_{(t-1)}$ | | | | | | | | |
| ... RTA | 0.017*** | 0.018*** | 0.005*** | 0.007*** | 0.008*** | 0.008*** | 0.003*** | 0.004*** |
| | (0.001) | (0.001) | (0.001) | (0.001) | (0.000) | (0.000) | (0.000) | (0.000) |
| ... RTA x STC | 0.000 | -0.004*** | 0.001* | -0.003*** | -0.000 | -0.002*** | 0.000 | -0.001*** |
| | (0.001) | (0.001) | (0.001) | (0.001) | (0.000) | (0.000) | (0.000) | (0.000) |
| ... Depth | | -0.002* | | -0.004*** | | -0.001 | | -0.001** |
| | | (0.001) | | (0.001) | | (0.001) | | (0.001) |
| ... Depth x STC | | 0.012*** | | 0.011*** | | 0.005*** | | 0.004*** |
| | | (0.002) | | (0.001) | | (0.001) | | (0.001) |
| ... Border | | | 0.045*** | 0.045*** | | | 0.017*** | 0.016*** |
| | | | (0.001) | (0.001) | | | (0.000) | (0.000) |
| ... Language | | | 0.003*** | 0.003*** | | | 0.002*** | 0.002*** |
| | | | (0.000) | (0.000) | | | (0.000) | (0.000) |
| ... Colony | | | -0.013*** | -0.013*** | | | -0.003*** | -0.003*** |
| | | | (0.001) | (0.001) | | | (0.000) | (0.000) |
| Observations | 164,595,130 | 164,595,130 | 164,595,130 | 164,595,130 | 164,298,452 | 164,298,452 | 164,298,452 | 164,298,452 |
| R-squared | 0.338 | 0.338 | 0.340 | 0.340 | 0.156 | 0.156 | 0.156 | 0.156 |
| Firm-prod-year FE | YES | YES | YES | YES | YES | YES | YES | YES |
| Dest-prod-year FE | YES | YES | YES | YES | YES | YES | YES | YES |
| Firm-prod-dest FE | YES | YES | YES | YES | YES | YES | YES | YES |

Robust standard errors, clustered at the firm-product level, are in parentheses. The dependent variable $y_{ijp,t}$ is a dummy variable equal to 1 if firm $i$ exported (or started exporting) product $p$ to country $j$ in year $t$. STC=1 if a Specific Trade Concern (STC) on product $p$ has been raised in the WTO. *** p<0.01, ** p<0.05, * p<0.1

promote firm entry only for these products (column 8). Similar results apply to export participation — columns (3) and (4). We also find that shallow trade agreements, which focus on preferential trade policy liberalization only, have a smaller third-country effect for regulation-intensive products.

A possible interpretation of these results is that a deep trade agreement between two destination countries makes the two markets more similar by promoting some form of regulatory convergence.[26] Thus, the RTA makes it easier for firms in a third-country to start exporting, especially regulation-intensive products, to an additional destination if they already comply with the standards of one of the members.[27]

[26] As more detailed data on the content of specific provisions in RTAs become available, future research may look into the differential trade effects on members' and non-members' firms of different forms of regulatory convergence (e.g. harmonization of standards, mutual recognition).

[27] One concern is that these positive spillover effects might be driven by rules of origin. This could be the case if, for instance, shallow RTAs had stricter rules of origin than deep agreements. Then, Costa Rican firms exporting intermediate products would face less discrimination by members part of a deep agreement than those part of a shallow one. A second concern is that deep agreements increase FDI between member countries and that Costa Rican suppliers of intermediates are just following their old customers in the new markets instead of benefiting from a more uniform regulatory environment. To show that our results are not driven by these alternative mechanisms, Table A.6 presents the results for a subset of firms exporting consumption goods. Excluding intermediate exports does not alter our main results.

Table 6: Third-country effects of deep RTAs: Regulation-intensive products

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|---|---|---|---|---|---|---|---|---|
| | Export participation | | | | Export entry | | | |
| Exp Other...$_{(t-1)}$ | | | | | | | | |
| ... RTA | 0.018*** | 0.017*** | 0.005*** | 0.004*** | 0.009*** | 0.008*** | 0.004*** | 0.003*** |
| | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) | (0.000) | (0.000) | (0.000) |
| ... RTA x STC | -0.002** | -0.003*** | 0.000 | -0.001 | -0.001** | -0.001*** | -0.000 | -0.001 |
| | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) | (0.000) | (0.001) | (0.000) |
| ... Depth MFN | 0.025*** | | 0.008*** | | 0.011*** | | 0.006*** | |
| | (0.002) | | (0.002) | | (0.001) | | (0.001) | |
| ... Depth Pref | -0.021*** | | -0.005*** | | -0.010*** | | -0.005*** | |
| | (0.002) | | (0.002) | | (0.001) | | (0.001) | |
| ... Depth MFN x STC | 0.014*** | | 0.012*** | | 0.005*** | | 0.005*** | |
| | (0.003) | | (0.003) | | (0.001) | | (0.001) | |
| ... Depth Pref x STC | -0.008*** | | -0.008*** | | -0.003** | | -0.003** | |
| | (0.002) | | (0.002) | | (0.001) | | (0.001) | |
| ... SPSorTBT | | 0.001 | | 0.001* | | -0.000 | | 0.000 |
| | | (0.001) | | (0.001) | | (0.000) | | (0.000) |
| ... SPSorTBT x STC | | 0.005*** | | 0.003*** | | 0.002*** | | 0.001*** |
| | | (0.001) | | (0.001) | | (0.001) | | (0.001) |
| ... Border | | | 0.044*** | 0.045*** | | | 0.016*** | 0.017*** |
| | | | (0.001) | (0.001) | | | (0.000) | (0.000) |
| ... Language | | | 0.003*** | 0.003*** | | | 0.002*** | 0.002*** |
| | | | (0.000) | (0.000) | | | (0.000) | (0.000) |
| ... Colony | | | -0.013*** | -0.013*** | | | -0.003*** | -0.003*** |
| | | | (0.001) | (0.001) | | | (0.000) | (0.000) |
| Observations | 164,595,130 | 164,595,130 | 164,595,130 | 164,595,130 | 164,298,452 | 164,298,452 | 164,298,452 | 164,298,452 |
| R-squared | 0.338 | 0.338 | 0.340 | 0.340 | 0.156 | 0.156 | 0.156 | 0.156 |
| Firm-prod-year FE | YES | YES | YES | YES | YES | YES | YES | YES |
| Dest-prod-year FE | YES | YES | YES | YES | YES | YES | YES | YES |
| Firm-prod-dest FE | YES | YES | YES | YES | YES | YES | YES | YES |

Robust standard errors, clustered at the firm-product level, are in parentheses. The dependent variable $y_{ijp,t}$ is a dummy variable equal to 1 if firm $i$ exported (or started exporting) product $p$ to country $j$ in year $t$. STC=1 if a Specific Trade Concern (STC) on product $p$ has been raised in the WTO. *** p<0.01, ** p<0.05, * p<0.1

# 5 Robustness analysis

This section presents a series of robustness checks. First, we use different measures of products' regulation intensity: continuous STC measure and FDA prior notice requirements. Second, we use an alternative measure of depth to provide further evidence that the positive spillover effects are driven by deeper forms of regional integration. Finally, we include additional fixed effects to control for firm-destination-year effects. All regressions in the robustness analysis include spatial exporting controls, although coefficients are not reported for brevity.

## 5.1 Continuous measure of regulation intensity

The baseline specification uses a binary variable as a proxy for the regulation intensity of products. We can also construct a continuous measure from the STC data by counting the number of times each product was raised as a concern in the SPS/TBT committees

at the WTO across all countries and years.[28] We then normalize these continuous measures to range between 0 and 1. The results, reported in Table 7, confirm that deep trade agreements generate positive spillover effects for firms that previously exported to one of the member countries, increasingly so for products that are highly sensitive to regulations.

Table 7: Continuous STC measure

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|---|---|---|---|---|---|---|---|---|
| | Export participation | | | | Export entry | | | |
| Exp Other...(t-1) | | | | | | | | |
| ... RTA | 0.004*** | 0.006*** | 0.004*** | 0.003*** | 0.003*** | 0.004*** | 0.004*** | 0.003*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| ... RTA x STC (cnt) | 0.014*** | -0.010*** | 0.006** | 0.002 | 0.004*** | -0.005*** | 0.000 | -0.001 |
| | (0.002) | (0.002) | (0.002) | (0.002) | (0.001) | (0.001) | (0.001) | (0.001) |
| ... Depth | | -0.004*** | | | | -0.001*** | | |
| | | (0.001) | | | | (0.000) | | |
| ... Depth x STC (cnt) | | 0.055*** | | | | 0.022*** | | |
| | | (0.005) | | | | (0.002) | | |
| ... Depth MFN | | | 0.008*** | | | | 0.006*** | |
| | | | (0.001) | | | | (0.001) | |
| ... Depth Pref | | | -0.005*** | | | | -0.005*** | |
| | | | (0.001) | | | | (0.001) | |
| ... Depth MFN x STC (cnt) | | | 0.080*** | | | | 0.029*** | |
| | | | (0.007) | | | | (0.003) | |
| ... Depth Pref x STC (cnt) | | | -0.053*** | | | | -0.017*** | |
| | | | (0.005) | | | | (0.003) | |
| ... SPSorTBT | | | | 0.001*** | | | | 0.000 |
| | | | | (0.000) | | | | (0.000) |
| ... SPSorTBT x STC (cnt) | | | | 0.019*** | | | | 0.008*** |
| | | | | (0.002) | | | | (0.001) |
| Observations | 164,595,130 | 164,595,130 | 164,595,130 | 164,595,130 | 164,298,452 | 164,298,452 | 164,298,452 | 164,298,452 |
| R-squared | 0.338 | 0.338 | 0.340 | 0.340 | 0.156 | 0.156 | 0.156 | 0.156 |
| Spatial controls | YES | YES | YES | YES | YES | YES | YES | YES |
| Firm-prod-year FE | YES | YES | YES | YES | YES | YES | YES | YES |
| Dest-prod-year FE | YES | YES | YES | YES | YES | YES | YES | YES |
| Firm-prod-dest FE | YES | YES | YES | YES | YES | YES | YES | YES |

Robust standard errors, clustered at the firm-product level, are in parentheses. The dependent variable $y_{ijp,t}$ is a dummy variable equal to 1 if firm $i$ exported (or started exporting) product $p$ to country $j$ in year $t$. STC (cnt) is the incidence of Specific Trade Concerns (STC) on product $p$, normalized between 0 and 1, that has been raised in the WTO. Coefficients on spatial exporting controls are not reported for brevity. *** p<0.01, ** p<0.05, * p<0.1

## 5.2 Alternative measure of regulation intensity: FDA prior notice

Table 8 presents the results using an alternative proxy for the regulation intensity of products: prior notice requirements for FDA. This alternative measure captures different types of regulations compared to the STC data set, as it is concentrated mainly in food, drugs, and medical devices, imported or offered for import into the United States that require prior notice to the FDA. Using this measure, the results show that the third-country effect is weaker for FDA-regulated products in case of shallow RTAs,

[28] This frequency ranges from 1 to 30 in SPS STC and 1 to 46 in the TBT STC. The most frequently raised product in the SPS STC is 0201 meat of bovine animals (fresh or chilled), and in the TBT STC is 2204 wine of fresh grapes. SPS and TBT combined, the most frequently raised product is 0201 meat and bovine animals (fresh or chilled), raised in 68 STCs.

but stronger for FDA-regulated products for deep RTAs. Similarly, results for MFN and regulatory provisions hold. Finally, the results are also robust to using a continuous measure, counting the number of detailed products (HS10) within HS4-products that require prior notice.[29]

Table 8: Alternative measure of regulation-intensity: FDA prior notice

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|---|---|---|---|---|---|---|---|---|
| | Export participation | | | | Export entry | | | |
| Exp Other...(t-1) | | | | | | | | |
| ... RTA | 0.005*** | 0.006*** | 0.004*** | 0.004*** | 0.003*** | 0.003*** | 0.004*** | 0.003*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| ... RTA x FDA | 0.005*** | -0.004*** | 0.002* | 0.001 | 0.001*** | -0.003*** | -0.001* | -0.001** |
| | (0.001) | (0.001) | (0.001) | (0.001) | (0.000) | (0.000) | (0.000) | (0.000) |
| ... Depth | | -0.002** | | | | -0.000 | | |
| | | (0.001) | | | | (0.000) | | |
| ... Depth x FDA | | 0.021*** | | | | 0.008*** | | |
| | | (0.002) | | | | (0.001) | | |
| ... Depth MFN | | | 0.012*** | | | | 0.008*** | |
| | | | (0.001) | | | | (0.001) | |
| ... Depth Pref | | | -0.008*** | | | | -0.007*** | |
| | | | (0.001) | | | | (0.001) | |
| ... Depth MFN x FDA | | | 0.026*** | | | | 0.008*** | |
| | | | (0.003) | | | | (0.001) | |
| ... Depth Pref x FDA | | | -0.017*** | | | | -0.004*** | |
| | | | (0.002) | | | | (0.001) | |
| ... SPSorTBT | | | | 0.002*** | | | | 0.001*** |
| | | | | (0.000) | | | | (0.000) |
| ... SPSorTBT x FDA | | | | 0.007*** | | | | 0.003*** |
| | | | | (0.001) | | | | (0.000) |
| Observations | 164,595,130 | 164,595,130 | 164,595,130 | 164,595,130 | 164,298,452 | 164,298,452 | 164,298,452 | 164,298,452 |
| R-squared | 0.340 | 0.340 | 0.340 | 0.340 | 0.156 | 0.156 | 0.156 | 0.156 |
| Spatial controls | YES | YES | YES | YES | YES | YES | YES | YES |
| Firm-prod-year FE | YES | YES | YES | YES | YES | YES | YES | YES |
| Dest-prod-year FE | YES | YES | YES | YES | YES | YES | YES | YES |
| Firm-prod-dest FE | YES | YES | YES | YES | YES | YES | YES | YES |

Robust standard errors, clustered at the firm-product level, are in parentheses. The dependent variable $y_{ijp,t}$ is a dummy variable equal to 1 if firm $i$ exported (or started exporting) product $p$ to country $j$ in year $t$. FDA=1 if product $p$ requires submission to FDA for prior notice to be imported into the United States. Coefficients on spatial exporting controls are not reported for brevity. *** p<0.01, ** p<0.05, * p<0.1

## 5.3 Alternative measure of depth

We use another measure of depth based on Mario Larch's Regional Trade Agreements Database from Egger and Larch (2008). Without focusing on individual provisions, this data set classifies RTAs into three broad categories —- partial scope agreements (PS), free trade agreements (FTA), and customs unions (CU) —- that are increasingly more comprehensive.[30] Table 9 provides additional supporting evidence that deep RTAs generate positive spillover effects on third-country exporters. Columns (1) and (4)

[29] This ranges from 0 to 156, with the maximum being for 0406 cheese and curd. Results are reported in Appendix Table A.7.

[30] FTA and CU are as defined in Paragraphs 8(b) and 8(a), respectively, of Article XXIV of GATT 1994, and a partial scope agreement means that the agreement covers only certain products. For more details on the database, see https://www.ewf.uni-bayreuth.de/en/research/RTA-data/index.html.

present the results of firm-level analysis without the product dimension, equivalent to Table 3. The larger coefficients for CU, followed by FTA, confirm our baseline results that positive spillover effects are larger for deeper RTAs. The probability of export entry into a new destination country increases by 0.6 percentage points if a firm exported in the previous year to a country that has an FTA with the new destination. For firms that exported to a country that is part of a CU with the new destination, the probability of export entry increases by 1.6 percentage points. PS agreements, which usually only grant tariff preferences, have a negative impact on export participation and entry.

Table 9: Alternative measure of depth

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| | Export participation | | | Export entry | | |
| Exp Other...$_{(t-1)}$ | | | | | | |
| ... CU | 0.038*** | 0.021*** | 0.019*** | 0.016*** | 0.010*** | 0.010*** |
| | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) | (0.000) |
| ... FTA | 0.010*** | 0.004*** | 0.003*** | 0.006*** | 0.002*** | 0.002*** |
| | (0.001) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| ... PS | -0.006*** | -0.002*** | -0.002*** | -0.001*** | 0.000 | 0.000*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| ... CU x STC | | 0.002 | | | 0.000 | |
| | | (0.001) | | | (0.001) | |
| ... FTA x STC | | 0.000 | | | -0.000 | |
| | | (0.001) | | | (0.000) | |
| ... PS x STC | | -0.000** | | | -0.000** | |
| | | (0.000) | | | (0.000) | |
| ... CU x STC (cnt) | | | 0.030*** | | | 0.007*** |
| | | | (0.004) | | | (0.002) |
| ... FTA x STC (cnt) | | | 0.004*** | | | 0.001 |
| | | | (0.001) | | | (0.001) |
| ... PS x STC (cnt) | | | -0.008*** | | | -0.003*** |
| | | | (0.001) | | | (0.000) |
| Observations | 20,797,980 | 164,595,130 | 164,595,130 | 20,694,604 | 164,298,452 | 164,298,452 |
| R-squared | 0.467 | 0.340 | 0.340 | 0.179 | 0.157 | 0.157 |
| Spatial controls | YES | YES | YES | YES | YES | YES |
| Firm-prod-year FE | YES | YES | YES | YES | YES | YES |
| Dest-prod-year FE | YES | YES | YES | YES | YES | YES |
| Firm-prod-dest FE | YES | YES | YES | YES | YES | YES |

Robust standard errors, clustered at the firm-product level, are in parentheses. The dependent variable $y_{ijp,t}$ is a dummy variable equal to 1 if firm $i$ exported (or started exporting) product $p$ to country $j$ in year $t$. STC=1 if a Specific Trade Concern (STC) on product $p$ has been raised in the WTO. STC (cnt) is the incidence of STCs on product $p$, normalized between 0 and 1. Coefficients on spatial exporting controls are not reported for brevity. *** p<0.01, ** p<0.05, * p<0.1

Columns (2) and (4), equivalent to Table 5, show the results for regulation-intensive products. Using the broad classification of RTAs, we do not find statistically significant evidence that deeper RTAs have stronger spillover effects for regulation-intensive goods. This however could be reflecting the shortcomings of this categorical measure of depth, which by construction does not capture the varying content of different RTAs. Using a more informative measure of regulations intensity (continuous STC measure, as in Table 7), we do find evidence that deeper trade agreements have larger effects on regulation-intensive goods.

## 5.4 Full set of fixed effects

The baseline regressions at the product level include three sets of fixed effects, controlling for unobserved heterogeneity at the product-destination-year, firm-product-year, and firm-product-destination level (equation (4)). The high dimensional panel allows us to further include firm-destination-year fixed effects. The additional fixed effects control for any shock that affects firms' export decision to a given destination in each year, only leaving the variation across products (within firm-destination-year) to exploit. This means that the identification relies on multi-product firms exporting different products to different destinations. Our main findings remain consistent using this specification, implying that third-country effects for multi-product firms are driven by adaptation or learning at the product level, with limited spillovers across products (Table 10).[31]

Table 10: Full set of fixed effects

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|---|---|---|---|---|---|---|---|---|
| | Export participation | | | | Export entry | | | |
| Exp Other...$_{(t-1)}$ | | | | | | | | |
| ... RTA | 0.004*** | 0.004*** | 0.002*** | 0.002*** | 0.002*** | 0.002*** | 0.002*** | 0.002*** |
| | (0.000) | (0.001) | (0.001) | (0.001) | (0.000) | (0.000) | (0.001) | (0.000) |
| ... RTA x STC | 0.003*** | 0.000 | 0.002** | 0.001** | 0.001*** | 0.000 | 0.001 | 0.000 |
| | (0.001) | (0.001) | (0.001) | (0.001) | (0.000) | (0.000) | (0.001) | (0.000) |
| ... Depth | | -0.001 | | | | 0.000 | | |
| | | (0.001) | | | | (0.001) | | |
| ... Depth x STC | | 0.006*** | | | | 0.003*** | | |
| | | (0.001) | | | | (0.001) | | |
| ... Depth MFN | | | 0.008*** | | | | 0.006*** | |
| | | | (0.002) | | | | (0.001) | |
| ... Depth Pref | | | -0.004** | | | | -0.004*** | |
| | | | (0.002) | | | | (0.001) | |
| ... Depth MFN x STC | | | 0.009*** | | | | 0.004** | |
| | | | (0.002) | | | | (0.001) | |
| ... Depth Pref x STC | | | -0.006*** | | | | -0.002 | |
| | | | (0.002) | | | | (0.001) | |
| ... SPSorTBT | | | | 0.003*** | | | | 0.001** |
| | | | | (0.001) | | | | (0.000) |
| ... SPSorTBT x STC | | | | 0.002** | | | | 0.001** |
| | | | | (0.001) | | | | (0.001) |
| Observations | 156,595,040 | 156,595,040 | 156,595,040 | 156,595,040 | 156,302,077 | 156,302,077 | 156,302,077 | 156,302,077 |
| R-squared | 0.536 | 0.536 | 0.536 | 0.536 | 0.431 | 0.431 | 0.431 | 0.431 |
| Spatial controls | YES | YES | YES | YES | YES | YES | YES | YES |
| Firm-prod-year FE | YES | YES | YES | YES | YES | YES | YES | YES |
| Dest-prod-year FE | YES | YES | YES | YES | YES | YES | YES | YES |
| Firm-prod-dest FE | YES | YES | YES | YES | YES | YES | YES | YES |
| Firm-dest-year FE | YES | YES | YES | YES | YES | YES | YES | YES |

Robust standard errors, clustered at the firm-product level, are in parentheses. The dependent variable $y_{ijp,t}$ is a dummy variable equal to 1 if firm $i$ exported (or started exporting) product $p$ to country $j$ in year $t$. STC=1 if a Specific Trade Concern (STC) on product $p$ has been raised in the WTO. Coefficients on spatial exporting controls are not reported for brevity. *** p<0.01, ** p<0.05, * p<0.1

[31] This is in line with Defever et al. (2015) who find no evidence of across-product learning for multi-product exporters.

# 6 Conclusion

How do regional trade agreements affect non-members' exports? The conventional view is that RTAs, by lowering tariffs between members, increase trade policy discrimination faced by firms in third countries, leading to trade diversion. However, modern RTAs often go beyond traditional trade policy and can increase the similarity of export markets, possibly reducing entry costs and leading to higher exports. This paper builds on the recent literature on extended gravity and uses detailed firm-level data on exports from Costa Rica and information on the content of RTAs to shed new light on this question.

We find that RTAs increase the probability of export and entry of non-member firms that previously exported to one of the member countries. The positive spillover effects are larger for deeper trade agreements and especially those that include nondiscriminatory (MFN) provisions and provisions on regulatory issues (i.e. SPS/TBT measures). Moreover, the positive effects of deep RTAs are largely driven by products that are sensitive to regulations, suggesting that firms that already export to one of the members benefit from prior adaptation to the regulatory regime and face reduced entry costs to new destinations.

These findings have important policy implications. While multilateral trade negotiations have been stalled in recent years, RTAs made much progress. This paper has an upbeat message, as its results indicate that the trade benefits of deep trade agreements could be substantially larger than what previous research indicates. Besides the direct effects through trade creation between members, this paper identifies a new source of positive externality for deep RTAs that facilitates exports and entry for firms in non-member countries. It also points to the importance of properly designing the content of new trade agreements. The identified spillover effect is driven by provisions in deep trade agreements, such as SPS and TBT measures, that promote regulatory convergence. An important question left for future research is how to carefully craft these rules in RTAs to maximize the positive spillover effects on non-members.

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# Appendix

## A.1 Provisions in deep RTAs

Table A.1: List of provisions

| **WTO plus** | **WTO extra** | |
|---|---|---|
| **Tariff industrial goods** | ***Competition policy*** | Health |
| **Tariff agricultural goods** | ***Investment measures*** | Human rights |
| ***Customs*** | ***Movement of capital*** | Illegal immigration |
| **Export taxes** | ***IPR*** | Illicit drugs |
| ***SPS measures*** | Labor market regulation | Industrial cooperation |
| ***State trading enterprises*** | Environmental laws | Information society |
| ***TBT measures*** | Visa and asylum | Anti-corruption |
| **Countervailing measures** | Consumer protection | Mining |
| **Anti-dumping** | Data protection | Money laundering |
| ***State aid*** | Approximation of legislation | Nuclear safety |
| **Public procurement** | Agriculture | Political dialogue |
| ***TRIMS measures*** | Audiovisual | Public administration |
| ***GATS*** | Civil protection | Regional cooperation |
| ***TRIPS*** | Innovation policies | Research and technology |
| | Cultural cooperation | SMEs |
| | Economic policy dialogue | Social matters |
| | Education and training | Statistics |
| | Energy | Taxation |
| | Financial assistance | Terrorism |

The provisions in bold are the core provisions, of which the MFN provisions are italics. Non-italicized bold provisions are preferential ones. The list of provisions in RTAs comes from Horn, Mavroidis, and Sapir (2010); MFN and preferential provisions are identified in Baldwin and Low (2009).

## A.2 Costa Rican exports

Table A.2: Top exported products

| HS2 | N. of firms | Share (%) | Industry Description |
|---|---|---|---|
| 39 | 1409 | 7.6 | Plastics and articles thereof |
| 84 | 1273 | 6.9 | Nuclear reactors, boilers, machinery and mechanical appliances; parts thereof |
| 85 | 1119 | 6.0 | Electrical machinery and equipment and parts thereof; sound recorders and reproducers |
| 08 | 1037 | 5.6 | Edible fruit and nuts; peel of citrus fruit or melons |
| 06 | 792 | 4.3 | Live trees and other plants; bulbs, roots and the like; cut flowers and ornamental foliage |
| 49 | 768 | 4.1 | Printed books, newspapers, pictures and other products of printing industry; manuscripts, typescripts and plans |
| 48 | 757 | 4.1 | Paper and paperboard; articles of paper pulp, of paper or of paperboard |
| 73 | 677 | 3.7 | Articles of iron or steel |
| 94 | 575 | 3.1 | Furniture; bedding, mattresses, mattress supports, cushions and similar stuffed furnishings; lamps and lighting |
| 90 | 542 | 2.9 | Optical, photographic, cinematographic, measuring, checking, precision, medical or surgical instruments |
| 38 | 484 | 2.6 | Miscellaneous chemical products |
| 44 | 360 | 1.9 | Wood and articles of wood; wood charcoal, |
| 07 | 337 | 1.8 | Edible vegetables and certain roots and tubers |
| 20 | 329 | 1.8 | Preparations of vegetables, fruit, nuts or other parts of plants |
| 40 | 306 | 1.7 | Rubber and articles thereof |

Table A.3: Exporting firms and turnover

| | Firms | | Firm-destinations | | Firm-product-destinations | |
|---|---|---|---|---|---|---|
| Year | Number | Share of new entrants (%) | Number | Share of new entrants (%) | Number | Share of new entrants (%) |
| 1998 | 2240 | | 6428 | | 15069 | |
| 1999 | 2290 | 37 | 6222 | 40 | 15453 | 56 |
| 2000 | 2236 | 27 | 6313 | 33 | 15709 | 50 |
| 2001 | 2406 | 30 | 6503 | 34 | 16537 | 48 |
| 2002 | 2380 | 28 | 6374 | 30 | 16655 | 45 |
| 2003 | 2468 | 28 | 6649 | 31 | 17695 | 48 |
| 2004 | 2563 | 26 | 6850 | 30 | 18634 | 44 |
| 2005 | 2662 | 25 | 7254 | 28 | 19649 | 43 |
| 2006 | 2737 | 23 | 7586 | 27 | 20674 | 41 |
| 2007 | 2752 | 19 | 7936 | 25 | 21438 | 40 |
| 2008 | 2662 | 17 | 7974 | 25 | 23044 | 42 |
| 2009 | 2624 | 18 | 7931 | 27 | 26393 | 49 |
| 2010 | 3560 | 38 | 9424 | 35 | 33158 | 57 |
| 2011 | 3629 | 34 | 9629 | 32 | 36012 | 53 |
| 2012 | 3691 | 33 | 9762 | 30 | 37198 | 53 |

## A.3 Regulation-intensive products

Table A.4: STC product distribution

| Industry (HS2) | | SPS | | TBT | |
|---|---|---|---|---|---|
| | | Products (HS4) | Concern-products | Products (HS4) | Concern-products |
| 01 | Live animals | 6 | 24 | 6 | 84 |
| 02 | Meat and edible meat offal | 10 | 111 | 10 | 339 |
| 03 | Fish and crustaceans, molluscs and other | 4 | 7 | 7 | 229 |
| 04 | Dairy produce, birds' eggs, natural honey | 10 | 48 | 10 | 313 |
| 05 | Products of animal origin | 10 | 20 | 11 | 11 |
| 06 | Live trees and other plants | 3 | 9 | 2 | 2 |
| 07 | Edible vegetables and certain roots and tubers | 5 | 12 | 14 | 421 |
| 08 | Edible fruit and nuts; peel of citrus fruit or melons | 8 | 34 | 14 | 422 |
| 09 | Coffee, tea, mate and spices | 4 | 5 | 10 | 292 |
| 10 | Cereals | 5 | 12 | 8 | 233 |
| 11 | Products of the milling industry, malt, starches | 2 | 2 | 9 | 262 |
| 12 | Oil seeds and oleaginous fruits | | | 14 | 410 |
| 14 | Vegetable plaiting materials | 1 | 1 | | |
| 15 | Animal or vegetable fats and oils and their cleavage products | 14 | 15 | 21 | 618 |
| 16 | Preparations of meat, of fish or of crustaceans, molluscs | 5 | 20 | 5 | 153 |
| 17 | Sugars and sugar confectionery | 3 | 3 | 4 | 116 |
| 18 | Cocoa and cocoa preparations | | | 6 | 175 |
| 19 | Preparations of cereals, flour, starch or milk | | | 5 | 152 |
| 20 | Preparations of vegetables, fruit, nuts or other parts of plants | 2 | 5 | 9 | 263 |
| 21 | Miscellaneous edible preparations | 4 | 12 | 6 | 181 |
| 22 | Beverages, spirits and vinegar | 3 | 3 | 9 | 337 |
| 23 | Residues and waste from the food industries | 9 | 20 | 1 | 1 |
| 24 | Tobacco and manufactured tobacco substitutes | | | 2 | 9 |
| 25 | Salt, sulphur, earths and stone, plastering materials, lime and cement | | | 5 | 8 |
| 26 | Ores, slag and ash | | | 1 | 1 |
| 27 | Mineral fuels, mineral oils and products of their distillation | | | 4 | 4 |
| 28 | Inorganic chemicals; organic or inorganic compounds of precious metals | | | 51 | 210 |
| 29 | Organic chemicals | | | 42 | 209 |
| 30 | Pharmaceutical products | 2 | 2 | 6 | 43 |
| 31 | Fertilisers | 1 | 1 | 5 | 26 |
| 32 | Tanning or dyeing extracts | | | 15 | 52 |
| 33 | Essential oils and resinoids; perfumery, cosmetic or toilet preparations | | | 7 | 183 |
| 34 | Soap, organic surface-active agents, washing and lubricating preparations | | | 7 | 22 |
| 35 | Albuminoidal substances, modified starches, glues, enzymes | 2 | 2 | 7 | 23 |
| 36 | Explosives; pyrotechnic products; matches; pyrophoric alloys | | | 6 | 22 |
| 37 | Photographic or cinematographic goods | | | 7 | 21 |
| 38 | Miscellaneous chemical products | | | 25 | 107 |
| 39 | Plastics and articles thereof | | | 5 | 8 |
| 40 | Rubber and articles thereof | | | 7 | 28 |
| 41 | Raw hides and skins (other than furskins) and leather | 5 | 5 | 8 | 24 |
| 42 | Articles of leather; saddlery and harness; travel goods, handbags | 1 | 1 | 5 | 27 |
| 43 | Furskins and artificial fur; manufactures thereof | 1 | 1 | 4 | 18 |

Table A.4: STC product distribution (cont'd)

| Industry (HS2) | | SPS | | TBT | |
|---|---|---|---|---|---|
| | | Products (HS4) | Concern-products | Products (HS4) | Concern-products |
| 44 | Wood and articles of wood; wood charcoal | 2 | 6 | 9 | 9 |
| 48 | Paper and paperboard; articles of paper pulp, paper or paperboard | | | 5 | 5 |
| 50 | Silk | | | 7 | 42 |
| 51 | Wool, fine or coarse animal hair; horsehair yarn and woven fabric | 2 | 2 | 13 | 80 |
| 52 | Cotton | | | 12 | 73 |
| 53 | Other vegetable textile fibres, paper yarn and woven fabrics of paper yarn | | | 11 | 69 |
| 54 | Man-made filaments | | | 8 | 52 |
| 55 | Man-made staple fibres | | | 16 | 111 |
| 56 | Wadding, felt and nonwovens; special yarns; twine, cordage, ropes and cables | | | 9 | 58 |
| 57 | Carpets and other textile floor coverings | | | 5 | 35 |
| 58 | Special woven fabrics, tufted textile fabrics, lace, tapestries, trimmings | | | 11 | 71 |
| 59 | Impregnated, coated, covered or laminated textile fabrics | | | 11 | 66 |
| 60 | Knitted or crocheted fabrics | | | 6 | 45 |
| 61 | Articles of apparel and clothing accessories, knitted or crocheted | | | 17 | 164 |
| 62 | Articles of apparel and clothing accessories, not knitted or crocheted | | | 17 | 175 |
| 63 | Other made up textile articles | | | 10 | 103 |
| 64 | Footwear, gaiters and the like | | | 6 | 39 |
| 65 | Headgear and parts thereof | | | 7 | 45 |
| 68 | Articles of stone, plaster, cement, asbestos, mica or similar materials | | | 4 | 7 |
| 69 | Ceramic products | | | 14 | 38 |
| 70 | Glass and glassware | | | 20 | 26 |
| 71 | Natural or cultured pearls, precious or semi-precious stones, precious metals | | | 18 | 20 |
| 72 | Iron and steel | | | 17 | 25 |
| 73 | Articles of iron or steel | | | 13 | 23 |
| 74 | Copper and articles thereof | | | 7 | 7 |
| 75 | Nickel and articles thereof | | | 8 | 9 |
| 76 | Aluminium and articles thereof | | | 2 | 2 |
| 80 | Tin and articles thereof | | | 1 | 1 |
| 82 | Tools, implements, cutlery, spoons and forks, of base metal | | | 8 | 8 |
| 83 | Miscellaneous articles of base metal | | | 3 | 4 |
| 84 | Nuclear reactors, boilers, machinery and mechanical appliances | | | 39 | 222 |
| 85 | Electrical machinery and equipment and parts thereof | | | 37 | 267 |
| 86 | Railway or tramway locomotives | | | 6 | 7 |
| 87 | Vehicles other than railway or tramway rolling-stock | | | 15 | 101 |
| 88 | Aircraft, spacecraft, and parts thereof | | | 2 | 2 |
| 90 | Optical, photographic, cinematographic, measuring, precision, medical, surgical instruments | | | 33 | 99 |
| 91 | Clocks and watches and parts thereof | | | 3 | 5 |
| 92 | Musical instruments; parts and accessories of such articles | | | 2 | 2 |
| 94 | Furniture, bedding, mattresses, mattress supports, cushions | | | 6 | 26 |
| 95 | Toys, games and sports requisites | | | 8 | 46 |
| 96 | Miscellaneous manufactured articles | | | 2 | 4 |
| **Total** | | **124** | **383** | **848** | **8252** |

Table A.5: FDA Product Distribution

| Industry (HS2) | | Products (HS4) |
|---|---|---|
| 01 | Live animals | 6 |
| 02 | Meat and edible meat offal | 10 |
| 03 | Fish and crustaceans, molluscs and other | 7 |
| 04 | Dairy produce, birds' eggs, natural honey | 10 |
| 05 | Products of animal origin | 7 |
| 06 | Live trees and other plants | 1 |
| 07 | Edible vegetables and certain roots and tubers | 14 |
| 08 | Edible fruit and nuts; peel of citrus fruit or melons | 14 |
| 09 | Coffee, tea, mate and spices | 10 |
| 10 | Cereals | 8 |
| 11 | Products of the milling industry, malt, starches | 9 |
| 12 | Oil seeds and oleaginous fruits | 14 |
| 13 | Lac; gums, resins and other vegetable saps and extracts | 2 |
| 14 | Vegetable plaiting materials | 1 |
| 15 | Animal or vegetable fats and oils and their cleavage products | 21 |
| 16 | Preparations of meat, of fish or of crustaceans, molluscs | 5 |
| 17 | Sugars and sugar confectionery | 4 |
| 18 | Cocoa and cocoa preparations | 6 |
| 19 | Preparations of cereals, flour, starch or milk | 5 |
| 20 | Preparations of vegetables, fruit, nuts or other parts of plants | 9 |
| 21 | Miscellaneous edible preparations | 6 |
| 22 | Beverages, spirits and vinegar | 9 |
| 23 | Residues and waste from the food industries | 9 |
| 25 | Salt, sulphur, earths and stone, plastering materials, lime and cement | 6 |
| 27 | Mineral fuels, mineral oils and products of their distillation | 2 |
| 28 | Inorganic chemicals; organic or inorganic compounds of precious metals | 18 |
| 29 | Organic chemicals | 24 |
| 30 | Pharmaceutical products | 2 |
| 31 | Fertilisers | 1 |
| 32 | Tanning or dyeing extracts | 4 |
| 33 | Essential oils and resinoids; perfumery, cosmetic or toilet preparations | 2 |
| 35 | Albuminoidal substances, modified starches, glues, enzymes | 6 |
| 38 | Miscellaneous chemical products | 3 |
| 39 | Plastics and articles thereof | 3 |
| 40 | Rubber and articles thereof | 1 |
| 41 | Raw hides and skins (other than furskins) and leather | 3 |
| 42 | Articles of leather; saddlery and harness; travel goods, handbags | 1 |
| 72 | Iron and steel | 1 |
| 96 | Miscellaneous manufactured articles | 1 |
| 98 | (Reserved for special uses by Contracting Parties) | 7 |
| **Total** | | **272** |

## A.4 Additional robustness tables

Table A.6: Consumer goods only

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|---|---|---|---|---|---|---|---|---|
| | Export participation | | | | Export entry | | | |
| Exp Other...(t-1) | | | | | | | | |
| ... RTA | 0.018*** | 0.018*** | 0.006*** | 0.007*** | 0.008*** | 0.008*** | 0.004*** | 0.005*** |
| | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) |
| ... RTA x STC | 0.001 | -0.007*** | 0.001 | -0.006*** | -0.001 | -0.004*** | -0.001 | -0.003*** |
| | (0.001) | (0.002) | (0.001) | (0.002) | (0.001) | (0.001) | (0.001) | (0.001) |
| ... Depth | | 0.000 | | -0.003 | | -0.000 | | -0.001 |
| | | (0.003) | | (0.003) | | (0.002) | | (0.002) |
| ... Depth x STC | | 0.017*** | | 0.016*** | | 0.007*** | | 0.006*** |
| | | (0.003) | | (0.003) | | (0.002) | | (0.002) |
| ... Border | | | 0.050*** | 0.049*** | | | 0.017*** | 0.017*** |
| | | | (0.001) | (0.001) | | | (0.001) | (0.001) |
| ... Language | | | 0.003*** | 0.003*** | | | 0.002*** | 0.002*** |
| | | | (0.000) | (0.000) | | | (0.000) | (0.000) |
| ... Colony | | | -0.020*** | -0.020*** | | | -0.003*** | -0.003*** |
| | | | (0.002) | (0.002) | | | (0.001) | (0.001) |
| Observations | 163,358,330 | 163,358,330 | 163,358,330 | 163,358,330 | 63,249,000 | 63,249,000 | 63,249,000 | 63,249,000 |
| R-squared | 0.331 | 0.331 | 0.334 | 0.334 | 0.151 | 0.151 | 0.152 | 0.152 |
| Firm-prod-year FE | YES | YES | YES | YES | YES | YES | YES | YES |
| Dest-prod-year FE | YES | YES | YES | YES | YES | YES | YES | YES |
| Firm-prod-dest FE | YES | YES | YES | YES | YES | YES | YES | YES |

Robust standard errors, clustered at the firm-product level, are in parentheses. The dependent variable $y_{ijp,t}$ is a dummy variable equal to 1 if firm $i$ exported (or started exporting) product $p$, classified as consumption goods by BEC, to country $j$ in year $t$. STC=1 if a Specific Trade Concern (STC) on product $p$ has been raised in the WTO. *** p<0.01, ** p<0.05, * p<0.1

Table A.7: Continuous FDA measure

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|---|---|---|---|---|---|---|---|---|
| | Export participation | | | | Export entry | | | |
| Exp Other...(t-1) | | | | | | | | |
| ... RTA | 0.006*** | 0.004*** | 0.005*** | 0.004*** | 0.003*** | 0.003*** | 0.004*** | 0.003*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| ... RTA x FDA (cnt) | 0.022*** | 0.001 | 0.001 | 0.006 | 0.005*** | -0.005*** | -0.008*** | -0.003 |
| | (0.004) | (0.005) | (0.005) | (0.005) | (0.002) | (0.002) | (0.002) | (0.002) |
| ... Depth | | 0.003*** | | | | 0.001*** | | |
| | | (0.001) | | | | (0.000) | | |
| ... Depth x FDA (cnt) | | 0.052*** | | | | 0.026*** | | |
| | | (0.009) | | | | (0.004) | | |
| ... Depth MFN | | | 0.017*** | | | | 0.009*** | |
| | | | (0.001) | | | | (0.001) | |
| ... Depth Pref | | | -0.011*** | | | | -0.008*** | |
| | | | (0.001) | | | | (0.001) | |
| ... Depth MFN x FDA (cnt) | | | 0.048*** | | | | 0.014** | |
| | | | (0.014) | | | | (0.007) | |
| ... Depth Pref x FDA (cnt) | | | -0.010 | | | | 0.007 | |
| | | | (0.011) | | | | (0.006) | |
| ... SPSorTBT | | | | 0.003*** | | | | 0.001*** |
| | | | | (0.000) | | | | (0.000) |
| ... SPSorTBT x FDA (cnt) | | | | 0.025*** | | | | 0.013*** |
| | | | | (0.005) | | | | (0.002) |
| Observations | 164,595,130 | 164,595,130 | 164,595,130 | 164,595,130 | 164,298,452 | 164,298,452 | 164,298,452 | 164,298,452 |
| R-squared | 0.340 | 0.340 | 0.340 | 0.340 | 0.156 | 0.156 | 0.156 | 0.156 |
| Spatial controls | YES | YES | YES | YES | YES | YES | YES | YES |
| Firm-prod-year FE | YES | YES | YES | YES | YES | YES | YES | YES |
| Dest-prod-year FE | YES | YES | YES | YES | YES | YES | YES | YES |
| Firm-prod-dest FE | YES | YES | YES | YES | YES | YES | YES | YES |

Robust standard errors, clustered at the firm-product level, are in parentheses. The dependent variable $y_{ijp,t}$ is a dummy variable equal to 1 if firm $i$ exported (or started exporting) product $p$ to country $j$ in year $t$. FDA (cnt) is the number of HS6 products within the HS4 category that requires submission to FDA for prior notice to be imported into the United States, normalized between 0 and 1. *** p<0.01, ** p<0.05, * p<0.1