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Regionalism in Standards: Good or Bad for Trade?

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In their recently launched trade talks, the European Union and the Association of South-east Asian Nations (ASEAN) agreed to focus not on tariffs and quotas but on what Pascal Lamy, the EU trade commissioner, called "the real 21st century trade issues": harmonizing standards.[1] This is the latest episode in a process of deep integration that is most advanced within the European Union but also underway in many other regions. Two factors explain in trade between participating countries? And what happens to trade with those that are left out?

Agreements on standards raise issues that are both politically and analytically challenging. Unlike tariffs, standards cannot be simply negotiated away because the original reason for their existence is not trade protection but the enhancement of welfare by remedying market failure - arising, for example, from invisible safety attributes of products, negative environmental externalities, or product incompatibility due to the producers' failure to coordinate. Agreements on standards must therefore secure the gains from integrated markets without unduly compromising the role of standards as remedies for market failure. Not only are the motives for standards ostensibly honourable, so in principle is their implementation: unlike tariffs, the same standards are imposed on both foreign and domestic firms. However, in spite of the supposed symmetry of treatment, the impact on trade may turn out highly asymmetric because the costs of compliance are likely to differ across countries.

There are in fact three main types of agreements dealing with technical barriers to trade. The simplest, and potentially most powerful is the mutual recognition of existing standards, whereby a country grants unrestricted access of its market to products that meet any participating country's standards. This was the approach taken in principle by the European Union, with the spur of the Cassis de Dijon judgement of the European Court of Justice. Mutual recognition agreements (MRAs) are, however, not likely to be an option if there is a significant difference in the initial standards of the countries, as became evident in the context of the European Union.[4]

In such cases, a certain degree of harmonization is a precondition for countries to allow products of other countries to access their markets. The most important example of such harmonization is the New Approach of the European Union, which resulted in a set of directives from the European Commission setting out essential health and safety re-

[4] The central problem in the EU mutual recognition approach is the overarching exemption contained in Article 36 of the EC treaty. This provision preserves the member countries' rights to restrict or prohibit imports on grounds of health and safety and other policy objectives, as long as this is not "a means of

quirements for most regulated products.[5]

policy measures include each harmonization directive and MRA concluded between the countries in the set. We concord the policy measures, which often pertain to a specific attribute (e.g. safety) of a variety of products, with trade data at the SITC (revision 2) 3-digit industry level. We then estimate the significance of the impacts of these measures on bilateral trade across countries and over time, controlling for other influences.

Our evidence broadly confirms the conclusions drawn from the model. Regional harmonization significantly increases intra-regional trade in affected industries. Exports to the region of excluded developed countries also increase, but exports of excluded developing countries decline. These asymmetric effects may arise because developing country firms are hurt more by an increase in the stringency of standards and benefit less from economies of scale in integrated markets. Mutual Recognition Agreements (MRAs) promote trade both within the region and with the rest of the world. But when they contain restrictive rules of origin, then intra-regional trade increases at the expense of trade with other, especially developing, countries.

To place our contribution in the context of the existing literature,[9] the analytical section builds on the work of Baldwin (2000) and Ganslandt and Markusen (2001). In particular, Baldwin (2000) anticipated some of the results of this paper on MRAs, but assumed identical countries with identical fixed costs of complying with standards. So the implications of harmonization and asymmetric effects on excluded countries were beyond of relying on approximate measures of shared standards, we directly identify harmonization directives and mutual recognition initiatives in specific industries across countries, and also distinguish between the impacts of these two types of measures. Second, we examine not only the effect on trade between participating countries, but also on trade with excluded countries. Finally, we allow for differing impacts of harmonization across destination markets, depending on whether they previously had more or less stringent standards, and across source countries, depending on the level of development.

The rest of this paper is organized as follows. In Section 2, we present the analytical model and identify the main implications for trade of different types of initiatives. We discuss the data in Section 3, and present the empirical evidence in Section 4. In Section 5, we examine the robustness of our estimates. Section 6 concludes the paper and draws out the implications for the design of international trade rules.

We construct a model that enables us to capture the essence of regional initiatives on standards while allowing affected countries to be heterogeneous. Each country imposes a mandatory standard s_j, which a firm must meet in order to sell its goods to the country's consumers.[10] To keep the model fairly general, we do not specify a particular rationale for the standard. However, to motivate the analysis, it is convenient to think of a safety standard which pertains to a product attribute (e.g. inflammability) that cannot be independently observed by consumers.[11] But the assurance that a particular product meets a higher standard has a positive impact on consumer demand for the product and thus a firm's revenue.[12]

Compliance with the standard is assumed to affect both the marginal and fixed costs

[10] We take s_j as given in this paper, even though the level of s_j in each country could be treated as endogenously determined, based on factors such as preferences, market siv4frr si.asdde-514(e)-4(c)-17(e)-133on u d

of firms. We assume that the marginal cost of production is identical for all firms in a particular country i and proportional to the level of the standard in the destination market j, s_j, i.e. $c_i(s_j) \equiv c_i s_j$. Furthermore, a firm (denoted by a) in country i must incur a fixed cost of production, denoted by F_i^a, to meet each distinct standard in the destination markets to which it sells. There is a continuum of n potential firms in each country i with their fixed cost, F_i^a, uniformly distributed between F_i and $F_i + \Delta F$, i.e. $F_i^a \sim UNIF[F_i; F_i + \Delta F]$.[13] F_i^a is assumed to be independent of the level of the standard in the destination market, s_j.

First, we consider the firms' behavior. We assume that firms treat markets with different standards as segmented, i.e. a firm will not find it worthwhile to supply multiple markets by complying with the most stringent standard.[14] In contrast, firms treat markets with the same standard as a single market when making entry decisions and subsequently competing in quantities. Solving backwards, a representative firm (firm a) that is located in country i and sells in all markets with the same standard at s_j, chooses its output q_{ij} to solve the following profit-maximization problem:

$$\max_{q_{ij}} \sum_j \pi_{ij}^a = \sum_j R_{ij}\left(s_j; \sum_z q_{zj}; q_{ij}\right) - \sum_j c_i s_j q_{ij} - F_i^a; \tag{1}$$

where j represents any market that sets the standard at s_j, and R_{ij} denotes the revenue that is a function of s_i. Note that firms only need to incur a single fixed cost to serve all the markets with the standard set at s_j. The first-order condition is:

$$\frac{\partial R_{ij}\left(s_j; \sum_z q_{zj}; q_{ij}\right)}{\partial q_{ij}} - c_i s_j = 0; \tag{2}$$

which yields the profit-maximizing reaction function, i.e. $q_{ij} = q_{ij}(q_{zj})$ where $z \neq i$. By the number of firms from country z selling in market j. Denote $V_{ij} = R_{ij}\left(s_j; \sum_z q_{zj}; q_{ij}\right) - c_i s_j q_{ij}$ as the revenue less the variable cost realized in market j at the profit maximum.

Suppose N_j number of markets set the same standard as country j.[15] A firm would choose to enter these N_j markets simultaneously only if the nonnegative total profit condition holds: $\sum_j \pi_{ij}^a = N_j V_{ij} - F_i^a \geqslant 0$.

Next consider importing country markets. The number of firms from country i that supply each of these N_j markets, denoted by n_{ij}, can be found by solving the following equation:

$$n_{ij} = n \cdot \frac{N_j V_{ij} - F_i}{\Delta F}; \tag{3}$$

because, in each country i, there is a continuum of n firms with their fixed cost uniformly distributed between F_i and $F_i + \Delta F$. Rewriting the above equation, we get n_{ij} as a reaction function of the number of rival firms from every other country z ($z \neq i$), i.e. $n_{ij} = n_{ij}(n_{zj})$. Solving the reaction functions simultaneously for all j, we obtain the equilibrium number of firms in any market j from each source country, i.e. n_{ij}. Hence, the total imports of market j from country i is given by $Q_{ij} = n_{ij} q_{ij}$.

The goal of our model is to analyze the impact on bilateral trade of a policy initiative that deals with standards. For this purpose, we first characterize the impact on the imports of market j from country i by totally differentiating Q_{ij}:

$$dQ_{ij} = n_{ij} dq_{ij} + q_{ij} dn_{ij} + \sum_z \left(\frac{\partial q_{ij}}{\partial n_{zj}} \cdot n_{ij} \cdot dn_{zj} \right). \tag{4}$$

On the right hand side of the above equation, the first argument shows the direct effect on Q_{ij} of a change in the individual firm's output; the second argument represents the direct effect on Q_{ij} of a change in the number of firms from country i; the third argument reflects the indirect effect of a change in the number of firms from each source country through its influence on an individual firm's output.

Let's take a closer look at the elements of equation (4). First of all, a change in the

[15] In this model, we assume that destinations markets only differ in the level of the standard.

level of the standard has a direct impact on an individual firm's output, indicated by:

$$dq_{ij} = \left(\partial q_{ij}/\partial s_j\right) ds_j : \tag{5}$$

Furthermore, based on equation (3), both N_j and s_j determine the number of firms from each source country supplying market j. Thus, at equilibrium, dn_{ij} can be defined as:

$$dn_{ij} = \sum_z \frac{\partial n_{ij}}{\partial n_{zj}} \cdot dn_{zj} = \sum_z \frac{\partial n_{ij}}{\partial n_{zj}} \cdot \frac{1}{{}_{zj}} \left(V_{zj} \cdot dN_j + N_j \cdot \frac{\partial V_{zj}}{\partial s_j} \cdot ds_j \right) ; \tag{6}$$

where ${}_{ij} \equiv -N_i(\partial V_{ij}/\partial n_{ij}) + F/n > 0$. Note that in this paper we assume $c_i > \max\{\partial R_{ij}/\partial s_j ; \}$, which indicates $\partial V_{ij}/\partial s_j$, $\partial Q_{ij}/\partial s_j < 0$, i.e. firms would not voluntarily produce a quality that exceeds the level of the standard when the standard pertains to some unobserved attribute of a product.[16]

Taking into account equations (5) and (6), equation (4) can be rewritten as:

$$\begin{aligned} dQ_{ij} = {} & \frac{1}{{}_{ij}} \sum_z \left[{}_{ij} \sum_m \frac{\partial n_{zj}}{\partial n_{mj}} V_{mj} + \#_{ij} V_{mj} \right] dN_j + \\ & \left[\frac{N_j}{{}_{ij}} \left[{}_{ij} \sum_m \frac{\partial n_{zj}}{\partial n_{mj}} \frac{\partial V_{mj}}{\partial s_j} + \#_{ij} \frac{\partial V_{zj}}{\partial s_j} \right] + \frac{\partial q_{ij}}{\partial s_j} n_{ij} \right] ds_j ; \end{aligned} \tag{7}$$

where ${}_{ij}$

e¤ects of a change in the level of the standard, respectively, on the number of …rms and …rms' output. Assessing the relative strengths of these two e¤ects helps us determine the overall impact on imports of any regional initiatives that deal with standards.

We are particularly interested in exploring the possible asymmetric e¤ects of regional agreements on standards in a heterogeneous world. We assume that the world consists of two types of countries: type K and type L, which di¤er in terms of their …rms' costs of complying with standards, i.e. c_i and F_i. Two broad cases are possible: (i) $c_K < c_L$ and $F_K > F_L$ or (ii) $c_K < c_L$ and $F_K \leqslant F_L$. Our analysis focuses on case (i) for several reasons. First of all, case (i) is more analytically challenging, and once the implications in this case are established, those in case (ii) can be worked out quite straightforwardly. More importantly, case (i)

H $\max\{s_j : j \in H\}$

imports of harmonizing markets with $ds_j = 0$ from type K countries increase, whereas those from type L countries increase if $c_l < g(c_k)$;

imports of harmonizing markets with $ds_j > 0$ from type K countries increase if $ds_j <$ s, whereas those from type L countries decrease if $c_l >$ (c_k).

See Appendix B.1. ■

Moreover, we compare the impacts of upward harmonization across destination markets and …nd:

j dQ_{ij}

i ds_j

See Appendix B.2. ■

The intuition is obvious: the higher ds_j, the more the scale economy boost to imports is diluted by the higher costs of compliance with standards.

Consider now the impact on trade when the countries of region H decide to mutually recognize (MR) one another's standards. In other words, products that comply with a standard set by any participating country can be freely sold in the entire region. It is straightforward to establish that such mutual recognition is equivalent in e¤ect to the downward harmonizing of standards at the level of $\min\{s_j : j \in H\}$, since …rms are free to comply with the least strict standard in the region.

The impact on trade with third countries turns out to depend on whether the bene…ts of MR are extended to third country …rms. When the bene…ts of mutual recognition are restricted to …rms within region H, the markets of individual countries in this region remain segmented, with the same initial standards, to …rms outside the region. Although the absolute conditions of access remain unchanged, …rms of excluded countries face a decline in relative competitiveness because …rms of participating countries not only realize

Table 1: Notations in estimation

Regressand	
$\ln(import_{ijrt})$	the natural logarithm of the imports of country j from country i in industry r and year t
Fixed e¤ects	
$_{irt}$	exporter-industry-year
$_{jrt}$	importer-industry-year
$_{ijr}$	exporter-importer-industry
Regressors	
HAR_{ijrt}	the number of harmonization directives between i and j in industry r and year t
HAR_M_{ijrt}	the number of harmonization directives between j and any country other than i in industry r and year t
HAR_E_{ijrt}	the number of harmonization directives between i and any country other than j in industry r and year t
MRA_RO_{ijrt}	1 if an MRA with rules of origin exists between i and j in industry r and year t, and 0 otherwise
$MRA\_RO\_M_{ijrt}$	1 if an MRA with rules of origin exists between j and any country other than i in industry r and year t, and 0 otherwise
$MRA\_RO\_E_{ijrt}$	1 if an MRA with rules of origin exists between i and any country other than j in industry r and year t, and 0 otherwise
MRA_NRO_{ijrt}	1 if an MRA without rules of origin exists between i and j in industry r and year t, and 0 otherwise
$MRA\_NRO\_M_{ijrt}$	1 if an MRA without rules of origin exists between j and any country other than i in industry r and year t, and 0 otherwise
$MRA\_NRO\_E_{ijrt}$	1 if an MRA without rules of origin exists between i and any country other than i in industry r and year t, and 0 otherwise
RTA_{ijt}	1 if an RTA exists between i and j, and 0 otherwise
RTA_M_{ijt}	1 if an RTA exists between j and any country other than i, and 0 otherwise
RTA_E_{ijt}	1 if an RTA exists between i and any country other than j, and 0 otherwise

MRA_RO_{ijrt} and MRA_NRO_{ijrt} are dummy variables that reflect the existence of an MRA, respectively, with or without the rules of origin between exporter i and importer j in industry r in year t. The cases where importer j reaches an MRA with or without the rules of origin with any country other than exporter i are respectively represented by $MRA\_RO\_M_{ijrt}$ and $MRA\_NRO\_M_{ijrt}$. The same definitions apply to $MRA\_RO\_E_{ijrt}$ and $MRA\_NRO\_E_{ijrt}$ except that the party involved in an MRA is the exporter. The rest of the regressors are dummy variables constructed in a similar ments such as distance. The use of these extensive fixed effects enables us to isolate the role of agreements on technical regulations in explaining the changes in the pattern of trade over time.

Table 2 reports the estimation results using the Tobit model. Coefficients on all variables are statistically significant at the 1% level and exhibit the signs predicted in Section 2. Column I reveals that the harmonization directives unambiguously stimulate intra-regional trade, as well as trade with excluded countries. In fact, the magnitudes of the estimated impacts are quite large. It would appear that a directive implemented in an industry between two countries on average raises their imports from each other by 32% ($e^{0.2749} = 1.32$), and imports from a country outside the harmonizing region by nearly 10% ($e^{0.0950} = 1.096$). The boost to trade is attributable to the positive impact of increased scale economies which outweighs, on average, the possible negative effect on trade of increased stringency in some countries' standards.

The impact of an .e of

Table 2: Estimated effects of harmonization and MRAs

Regressand: ln(import)	I	II
Harmonization on intra-regional trade	0.2749***	0.2562***
(HAR)	(0.010)	(0.011)
importers with stricter initial standards		0.0989***
(HAR $\times$ strictness)		(0.022)
Harmonization on imports from the ROW	0.0950***	0.0310***
(HAR_M)	(0.005)	(0.005)
importers with stricter initial standards		0.2477***
(HAR_M $\times$ strictness)		(0.011)
Harmonization on exports to the ROW	0.6438***	0.6393***
(HAR_E)	(0.005)	(0.005)
MRAs with rules of origin on intra-regional trade	2.3540***	2.3589***
(MRA_RO)	(0.031)	(0.031)
MRAs with rules of origin on imports from the ROW	-0.4768***	-0.4799***
(MRA_RO_M)	(0.037)	(0.037)
MRAs with rules of origin on exports to the ROW	0.3956***	0.3963***
(MRA_RO_E)	(0.036)	(0.036)
MRAs without rules of origin on intra-regional trade	0.6362***	0.6390***
(MRA_NRO)	(0.074)	(0.074)
MRAs without rules of origin on imports from the ROW	0.7794***	0.7950***
(MRA_NRO_M)	(0.037)	(0.037)
MRAs without rules of origin on exports to the ROW	1.6235***	1.6154***
(MRA_NRO_E)	(0.037)	(0.037)
RTA on intra-regional trade	1.7225***	1.7266***
(RTA)	(0.011)	(0.011)
RTA on imports from the ROW	0.0458***	0.0404***
(RTA_M)	(0.005)	(0.005)
RTA on exports to the ROW	0.0309**	0.0292***
(RTA_E)	(0.005)	(0.005)
Number of observations	4160352	4160352
Log likelihood	-7840111	-7839841

Standard errors are reported in parentheses.

Exporter/Importer-industry-year, pair-industry fixed effects are controlled.

***, **, and * represent 1%, 5%, and 10% significance levels, respectively.

In Section 2, Proposition 2 predicted that trade stimulus is negatively correlated with the extent by which the importing country raises its standard - because an increase in the stringency of the standard may partially or completely offset the benefit from market integration and dampens imports. As noted in the introduction, the European Union's richest members generally imposed the most stringent standards, and used their influence to ensure that the EU's harmonized standards were set close to their own levels. The available evidence suggests that the core set of countries with relatively strict initial standards consists of Germany, Denmark, and the Netherlands (Vogel, 1995). We also considered alternative definitions, e.g. the top third of EC and EFTA countries ranked by GDP per capita in 2001, and the results were similar.

An additional interactive term, strictness, is generated to test Proposition 2. For the to lead to quite di¤erent e¤ects on exporters in di¤erent origins.

As we suggested in Section 2, the distinction between countries according the level of development may correspond to the analytical distinction we make between countries on the basis of their costs of meeting standards. We generate a dummy variable, i.e. developing, which is equal to 1 for a developing country exporter and 0 for a developed country exporter. We consider all OECD countries as developed and the rest of the sample countries as developing. This dummy variable is used to interact with the three variables which capture the impact on imports from third countries: HAR_M, MRA_RO_M, and MRA_NRO_M. The regression results are reported in column I of Table 3.

Table 3: The divergent impact on imports from third countries

Regressand: ln(import)	I	II
Harmonization on intra-regional trade	0.3002***	0.2825***
(HAR)	(0.010)	(0.011)
importers with stricter initial standards		0.0951***
(HAR × strictness)		(0.023)
Harmonization on imports from the ROW	0.2912***	
(HAR_M)	(0.007)	
from developing countries	-0.4587***	
(HAR_M × developing)	(0.012)	
from developed countries to importers with stricter initial standards		0.4491***
(HAR_M with developing = 0 & strictness = 1)		(0.014)
from developing countries to importers with stricter initial standards		0.0458***
(HAR_M with developing = 1 & strictness = 1)		(0.017)
from developed countries to importers with less strict initial standards		0.2369***
(HAR_M with developing = 0 & strictness = 0)		(0.008)
from developing countries to importers with less strict initial standards		-0.2421***
(HAR_M with developing = 1 & strictness = 0)		(0.010)
Harmonization on exports to the ROW	0.6357***	0.6315***
(HAR_E)	(0.005)	(0.005)
MRAs with rules of origin on intra-regional trade	2.3185***	2.3233***
× Developing) (0.044)iiiii*)		

(MR-45(R.)-7(3)-14(2)-14(3)-13(3)-14(*)-14(*)2(M)-26(R)-20(A)-21(s)-
(MR-45(R.)-7(3)-14(2)-14(3)-131(l4(*E)-19())-255844(*)-14(*)]TJ0-13.5
× Developing)

dards also rise (by 27%), but developing countries' exports decline by 22%. These results are consistent with the predictions in Proposition 1, and the assumption that developing countries benefit less from economies of scale, and thus see a smaller increase in exports to the market that does not increase the stringency of its standard and are hurt more by an increase in the stringency of the standards in other markets to which their exports decline.

These findings suggest that harmonization of standards is generally advantageous to participating and excluded developed countries that have similar cost structures, but could hurt the exports of developing countries. In the case of mutual recognition agreements, excluded developed and developing countries have greater commonness of cause: absent rules of origin both gain, with rules of origin both lose, with a larger impact on developing countries in each case.

consist of time-variant bilateral factors such as the preferential political or economic relations between two countries that might be correlated with the explanatory variables of interest.

Following the approach suggested in Baltagi (2001) and originally due to Mundlak (1978) on individual effects, we attempt to test and capture this time-variant bilateral effect, denoted by $_{ijt}$, by assuming $_{ijt}$ is a linear function of the averages of all the existing explanatory variables (measures of regional initiatives) across industries:

$$_{ijt} = X_{ijt:} \quad + v_{ijt}; \tag{8}$$

where $X_{ijt:}$ is a $1 \times R$ vector of observations on the explanatory variables averaged across industries. This effect is uncorrelated with the explanatory variables if and only if $= 0$. As Mundlak (1978) assumed, without loss of generality, the X

Table 4: Robustness analysis: unobserved e¤ects

Regressand: ln(import)	I
Harmonization on intra-regional trade	0.4561***
(HAR)	(0.010)
Harmonization on imports from the ROW	0.0515***
(HAR_M)	(0.005)
Harmonization on exports to the ROW	0.6046***
(HAR_E)	(0.005)
MRAs with rules of origin on intra-regional trade	2.4154***
(MRA_RO)	(0.031)
MRAs with rules of origin on imports from the ROW	-0.7087***
(MRA_RO_M)	(0.037)
MRAs with rules of origin on exports to the ROW	0.1738***
(MRA_RO_E)	(0.036)
MRAs without rules of origin on intra-regional trade	0.3197***
(MRA_NRO)	(0.074)
MRAs without rules of origin on imports from the ROW	0.2512***
(MRA_NRO_M)	(0.037)
MRAs without rules of origin on exports to the ROW	1.1430***
(MRA_NRO_E)	(0.037)
RTA on intra-regional trade	0.0539***
(RTA)	(0.019)
RTA on imports from the ROW	-1.2349***
(RTA_M)	(0.012)
RTA on exports to the ROW	-1.2540**
(RTA_E)	(0.012)
Time-variant bilateral e¤ect (PX)	11.2570***
Number of observations	4160352
Log likelihood	-7834125

The problem of endogenous regressors would lead to an overestimation of the trade-enhancing e¤ect of initiatives on standards if the initiatives were implemented where trade was already growing rapidly. Formally, this concern can be expressed as

$$x = 1 \text{ if } x > 0 \tag{10}$$
$$x = 0 \text{ otherwise,}$$

where x

Table 5: Robustness analysis: endogenous regressors

	I	II	III
Stage 1:			
Initiative on lagged three-year average trade growth	–	-0.1583***	-0.1583***
Stage 2: Regressand: ln(imports)			
Initiative on intra-regional trade /	1.4821***	1.5544*** /	1.5010***
Probability of the initiative on intra-regional trade		5.6690***	
(INI / INI_PROB)	(0.021)	(0.021)	(0.020)
Initiative on imports from the ROW	-0.0193*	0.3020***	0.0618***
(INI_M)	(0.010)	(0.010)	(0.010)
Initiative on exports to the ROW	1.1464***	1.3365***	1.07***
(INI_E)	(0.010)	(0.009)	(0.010)
RTA on intra-regional trade	1.8908***	2.1206***	1.6474***
(RTA)	(0.013)	(0.012)	(0.013)
RTA on imports from the ROW	0.0911***	-0.0450***	-0.0471***
(RTA_M)	(0.006)	(0.006)	(0.006)
RTA on exports to the ROW	-0.0091	-0.0919***	-0.0787***
(RTA_E)	(0.006)	(0.006)	(0.006)
Generalized residual	–	–	6.4712***
Number of observations	1804781	1804781	1804781
Log likelihood	-4598521	-4566748	-4536913

Vella (1993) which deals with censored endogenous regressors.[24] As in the previous IV approach, we first estimate the effect of the lagged three-year average trade growth on standards-related initiatives. Then we compute the generalized residual from the first stage, i.e. $E(\hat{\vartheta}|x)$, to be included as an additional regressor in our original estimating equation in column I. The original equation can be rewritten in terms of its conditional expectation as follows:

$$E(y|x) = X \quad + \quad E(\hat{\vartheta}|x): \tag{11}$$

The two-step estimators are reported in column III of Table 5. The estimates obtained in the second stage again confirm that correcting for endogeneity associated with the prior trade growth rates leads to a slight upward revision of the impact of initiatives.

of the world, in particular, developing countries. When MRAs are open to firms regardless of origins, both intra-regional trade and trade with the rest of the world, especially with

Table A.1: The New Approach Directives

Directives	Reference
Low voltage equipment	73/23/EEC
Simple pressure vessels	97/23/EC
Toys	88/378/EEC
Construction products	89/106/EEC
Electromagnetic compatibility	89/336/EEC
Machinery	98/37/EC
Personal protective equipment	89/686/EEC
Non-automatic weighing instruments	90/384/EEC
Active implantable medical devices	90/385/EEC
Gas appliances	90/396/EEC
Hot water boilers	92/42/EEC
Civil explosives	93/15/EEC
Medical devices	93/42/EEC
Potentially explosive atmospheres	94/9/EEC
Recreational craft	94/25/EC
Lifts	95/16/EC
Refrigeration appliances	96/57/EC
Pressure equipment	97/23/EC
In vitro diagnostic medical devices	98/79/EC
Radio and telecommunications terminal equipment	99/5/EC
Cable installation designed to carry person	00/9/EC
Packaging and packaging waste	94/62/EC
High speed rail systems	96/48/EC
Marine equipment	96/98/EC

Table A.2: The MRAs of Conformity Assessment

MRA of Conformity Assessment	Rules of Origin
EU and Australia	Yes
EU and New Zealand	Yes
EFTA and Australia	Yes
EFTA and New Zealand	Yes
INTRA EU	Yes
EU and USA	No
EU and Canada	No
Australia and New Zealand	No
Canada and Korea	No
Canada and Swiss	No

(i) In markets with strictest initial standards, $ds_j = 0$ and $dN_j > 0$, and thus equation (7) becomes

$$dQ_{ij} = \frac{1}{{}_{ij}} \sum_z \left[{}_{ij} \sum_m \frac{\partial n_{zj}}{\partial n_{mj}} V_{mj} + \vartheta_{ij} V_{zj} \right] dN_j; \tag{a.1}$$

where ${}_{ij} \equiv n_{ij}\partial q_{ij}/\partial n_{iz}$ and $\vartheta_{ij} \equiv q_{ij}\partial n_{ij}/\partial n_{iz}$. Equation (a.1) can be further simplified as

$$dQ_{ij} = \frac{dQ_{ij}}{dn_{ij}} \sum_z \frac{\partial n_{ij}}{\partial n_{zj}} \frac{V_{zj}}{{}_{ij}} dN_j; \tag{a.2}$$

where $dQ_{ij}/dn_{ij} = \partial Q_{ij}/\partial n_{ij} + \sum_z (\partial Q_{ij}/\partial n_{zj})(\partial n_{zj}/\partial n_{ij})$. Denote $\varphi_{ij} \equiv (dQ_{ij}/dn_{ij}) \sum_z (\partial n_{ij}/\partial n_{zj})(V_{zj}/{}_{ij})$.

Provided that $\partial P_j/\partial Q_{ij} > SOC_{ij}/n_{ij}$ ($SOC_{ij} \equiv 2(\partial P_j/\partial Q_{ij})n_{ij}$ denotes the second-order condition to maximize ${}_{ij}$), $-q_{ij}/n_{ij} < \partial q_{ij}/\partial n_{ij} = -q_{ij}(\partial P_j/\partial Q_{ij})/SOC < 0$ and thus $\partial Q_{ij}/\partial n_{ij} = q_{ij} + n_{ij}\partial q_{ij}/\partial n_{ij} > 0$. Furthermore, we find

$$\begin{aligned} \partial V_{zj}/\partial n_{ij} &= \frac{\partial (P_j Q_{zj})}{\partial n_{ij}} - c_z s_j \frac{\partial q_{zj}}{\partial n_{ij}} \\ &= \frac{\partial P_j}{\partial Q_{ij}} \frac{\partial Q_{ij}}{\partial n_{ij}} + \left(Q_{zj} \frac{\partial P_j}{\partial Q_{zj}} + P_j \right) n_{zj} - c_z s_j \frac{\partial q_{zj}}{\partial n_{ij}} \\ &< 0; \end{aligned} \tag{a.3}$$

because $\partial P_j/\partial Q_{mj} < 0 \ \forall m$ (the negative slope of the demand function),

$$\frac{\partial Q_{ij}}{\partial n_{ij}} = q_{ij} + n_{ij}\frac{\partial q_{ij}}{\partial n_{ij}} = q_{ij}\left(1 - \frac{\partial P_j}{\partial Q_{ij}} \frac{n_{ij}}{SOC_{ij}}\right) = \frac{1}{2} q_{ij} > 0; \tag{a.4}$$

$(\partial P_j/\partial Q_{zj})Q_{zj}(\partial \ldots)/(\partial n$ =

In addition, we know $\partial Q_{ij}/\partial n_{zj} = q_{ij}\partial n_{ij}/\partial n_{zj} + n_{ij}\partial q_{ij}/\partial n_{zj} < 0$. Hence, $dQ_{ij}/dn_{ij} > 0$.

Moreover, because $\partial P_j/\partial Q_{kj} = \partial P_j/\partial Q_{lj}$ (products that meet the same standard

ds_j. ■

for exporters of all origins. When the exporter countries are type K (either within the region or in the rest of the world) or type L with $c_l < g(c_k)$, the e¤ects of both $dN_j > 0$ and $ds_j \leqslant 0$ are positive as shown in Appendix B.1. Thus, imports of any harmonizing market from type K

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