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NRE Discussion Papers No. 2026-03

July 2026

Division of Natural Resource Economics, Graduate School of Agriculture, Kyoto University

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Evidence from SPS and TBT Provisions

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July, 2026

Discussion Papers

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Regulatory Cooperation, Agricultural Trade Costs, and Heterogeneous Effects across Member and Non-member Countries: Evidence from SPS and TBT Provisions

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Abstract

The literature on regulatory cooperation in Regional Trade Agreements (RTAs) has overlooked two issues: the effects on non-member countries and the potential heterogeneity between the areas of Sanitary and Phytosanitary (SPS) and Technical Barriers to Trade (TBT). This study investigates how regulatory cooperation affects trade costs in the agriculture sector for both member and non-member countries using data on SPS and TBT provisions. The results reveal systematic heterogeneity across policy areas in three dimensions: the magnitude of effects for member countries, the direction of spillover effects on non-member countries, and the sensitivity to institutional distance.

Keywords: Regional trade agreements, regulatory cooperation, trade costs, gravity model

JEL classification: F13, F15

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1 Introduction

Regional Trade Agreements (RTAs) have proliferated rapidly around the world since the early 1990s.² Both the number of RTAs and countries' participation increased dramatically (World Trade Organization, 2011, p. 6). Alongside this expansion, the content of RTAs has also become enriched. While earlier agreements concentrated on tariff reduction and market access, recent RTAs also encompass cooperation on non-tariff measures (NTMs). In particular, cooperation on Sanitary and Phytosanitary (SPS) regulations and Technical Barriers to Trade (TBT), collectively referred to as "regulatory cooperation," has become the central areas of cooperation on NTMs.³

The majority of regulatory cooperation consists of provisions on harmonization of standards and transparency requirements. Standards constitute the basis for technical regulations; cooperation on standards is adopted in RTAs via forms such as equivalence, mutual recognition, and harmonization (Stone and Casalini, 2020, p. 374).⁴ Such provisions facilitate regulatory alignment and help reduce compliance costs for exporters. Transparency provisions aim to mitigate uncertainty and information asymmetries by requiring electronic publication, prior notification, and consultation regarding new or amended regulations, among other issues. Some of these provisions go beyond World Trade Organization (WTO) requirements, further reducing NTM-related obstacles. Recent empirical evidence shows that regulatory cooperation can facilitate trade among RTA members. For example, Disdier et al. (2015) suggest that provisions related to technical regulations expand Southern partners' trade with the North. Similarly, Santeramo and Lamonaca (2022) examine how regulatory cooperation in SPS affects trade between RTA signatories and find that SPS-specific commitments tend to create the conditions required to meet regulatory requirements and thereby promote trade flows.

However, the fact that these studies do not properly consider the potential impact of RTAs on non-member countries is a major problem. Although the primary aim of RTAs is to facilitate cooperation in trade and investments between signatories, several provisions in certain policy areas have a non-discriminatory nature that may also benefit non-member countries (Hofmann et al., 2017).⁵ For example, transparency requirements in the

² Following the WTO, this study defines RTAs as reciprocal trade agreements between two or more partners, not necessarily belonging to the same region. These agreements include Free Trade Agreements (FTAs) and customs unions (CUs), as well as more advanced schemes such as the EU single market and Economic Integration Agreements (EIAs). Partial Scope Agreements (PSAs) such as Global System of Trade Preferences among Developing Countries (GSTP) are not included in this study.

³ Regulatory cooperation is a very broad concept and can be defined as cooperation between securities regulators (Silvers, 2021) or cooperation on SPS/TBT within an RTA framework (Hooker, 1999; Santeramo and Lamonaca, 2022). This study follows the latter definition.

⁴ Different forms of harmonization of standards in RTAs can lead to the same regulatory outcome.

⁵ Hofmann et al. (2017) divide the content of RTAs into 52 policy areas, each of which contains several provisions. There are 12 non-discriminatory policy areas: customs administration, SPS, TBT, Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIMs), General Agreement on Trade in Services (GATS), Trade-

SPS and TBT domains reduce information asymmetry for all trading partners, and the digitalization of custom procedures enhances the efficiency of custom clearance regardless of membership status. Such commitments improve the overall trading environment and therefore generate positive spillover effects on non-member countries. The empirical evidence of such spillovers is limited but growing; for instance, Mattoo et al. (2022) and Lee et al. (2023) show that RTAs can increase trade with non-member countries. Nevertheless, the mechanisms through which RTAs affect non-member countries have yet to be examined.

In addition, studies on NTMs and cooperation on NTMs within RTAs have commonly treated SPS and TBT provisions as a unified category, implicitly assuming that they operate through similar economic channels (e.g., Disdier et al., 2008; Cadot and Gourdon, 2016; Mattoo et al., 2022). Although SPS and TBT measures are jointly considered as technical regulations, they differ substantially in their regulatory objectives and enforcement logics. SPS measures comprise health protection measures related to humans and plants, whereas TBT measures involve technical requirements, voluntary standards, and conformity assessment procedures, excluding measures covered by SPS measures (United Nations Conference on Trade and Development, 2019, pp. 1, 10). Therefore, considering cooperation on SPS and TBT as a joint dimension of integration may not enable a full understanding of whether and how these areas, with distinctive regulatory objectives differ in their economic effects.

This study investigates how regulatory cooperation in agriculture sector impacts not only member countries but also non-member countries, with clear distinction of cooperation on SPS and TBT. We focus on the effects on trade costs, comprising all costs incurred in getting a good to a final user other than the cost of supplying the good itself, including transportation costs, costs arising from policy barriers (both tariffs and NTMs), information costs, contract enforcement costs, costs associated with the use of different currencies, legal and regulatory costs, and local distribution costs (Anderson and Van Wincoop, 2004, p. 691). This focus is motivated by the expectation that regulatory cooperation will affect trade most directly through the influence on regulatory and compliance-related frictions, such as the costs of meeting standards, information asymmetries, and procedural uncertainty. By contrast, trade flows are jointly determined by many factors beyond regulatory cooperation. By focusing on trade costs, this study identifies the specific mechanisms through which RTAs affect trade, which are underexamined in the discussion of regulatory cooperation. This perspective is especially relevant in the agriculture sector. Data from UN-ESCAP indicate trade costs in the agriculture sector are higher than those in the manufacturing sector and across all sectors overall due to the prevalence of NTMs (especially SPS and TBT) in this sector (Arvis et al., 2016). Empirical studies have shown that agricultural trade is frequently impeded by such technical regulations (e.g., Wilson and Otsuki, 2004; Li and Beghin, 2012; Ferro et al., 2015; Santeramo and Lamonaca, 2019; Beghin and Schweizer, 2021). These factors amplify the importance of focusing on this sector

related Intellectual Properties (TRIPs), movement of capital, state-owned enterprises, state aid, competition policy, Intellectual Property Rights (IPR), and investment.

when assessing the role of regulatory cooperation.

This study also addresses two limitations in recent literature. First, studies on the impact of regulatory cooperation suffer from endogeneity problems. Countries that have already experienced lower trade costs may be more likely to facilitate the negotiation and adoption of RTAs. This means that the estimated effect of regulatory cooperation may partly capture reverse causality: countries with lower trade costs may be more likely to adopt deep integration. To address this concern, this study adopts an instrumental variable (IV) approach. The instrument is constructed as the interaction term of the exporter's and importer's highest provision count with third countries and the RTA dummy. The intuition is that countries may replicate SPS and TBT provisions that have already been adopted in their existing RTAs with third countries. The second relates to the evaluation of the content of RTAs. While early studies such as Grant (2013) and Baier et al. (2014), confirmed that the types of RTAs (e.g., FTA, EIA, and CU) would affect their effectiveness, the studies do not discuss the heterogeneity in their content across agreements. Moreover, the legal enforceability of those policy areas may also be somewhat heterogeneous and may further influence their effectiveness (Raimondi and Scoppola, 2024). To address those issues, this study uses provision counts to capture the heterogeneity in content of regulatory cooperation and considers legal enforceability.

The major findings of this study are as follows. First, regulatory cooperation reduces NTM-related trade costs among member countries, though the effects differ markedly across policy areas. The effect is stronger for TBT provisions and both weaker and more conditional for SPS provisions. Second, the relative divergence in governance quality and regulatory environments, as measured by institutional distance, moderates these relationships significantly. Greater institutional distance undermines the cost-reducing potential of SPS provisions, while the impact of TBT provisions is either reinforced or remains unaffected by institutional distance depending on the provision categories. Moreover, the results reveal asymmetric spillovers: cooperation on TBT decreases trade costs for non-member countries, whereas cooperation on SPS leads to higher trade costs, suggesting exclusionary effects.

The remainder of this study is organized as follows. Section 2 demonstrates the theoretical framework, empirical specifications, and estimation methods. Section 3 presents the major data sources and summary statistics. Section 4 discusses the overall impact of regulatory cooperation on agricultural trade costs and the heterogeneity across regulatory provision categories. Finally, Section 5 concludes the paper by discussing the study's major findings and policy implications.

2 Methodology

2.1 Theoretical framework

The concept of *trade costs* originates from *bilateral trade costs* t_{ij} in the structural gravity model

developed by Anderson and van Wincoop (2003), where t_{ij} is modeled as a price wedge that raises the delivered price of exports from country i to country j in ad-valorem form, as presented in Equation (1),

$$t_{ij} = b_{ij}d_{ij}, \quad (1)$$

where b_{ij} and d_{ij} denote border barriers and geographical distance, respectively. In this model, they define trade costs as the function of border barriers and geographic distance, assuming that domestic trade is frictionless and bilateral trade costs are symmetric (i.e., $t_{ij} = t_{ji}$) and time-invariant. However, these assumptions have two drawbacks. First, this function may omit critical factors influencing trade costs, such as tariffs. Second, bilateral trade costs should be asymmetric and time-varying.

To address these drawbacks, Novy (2013) proposes a new method and derives the new expression of trade costs τ_{ij} based on the observed pattern of trade and production. The new function is shown in Equation (2),

$$\tau_{ij} = \left(\frac{t_{ij}t_{ji}}{t_{ii}t_{jj}} \right)^{1/2} - 1, \quad (2)$$

where t_{ij} and t_{ji} denote the *international* trade costs of exports from country i to j and from country j to i , respectively (e.g., tariffs, international transportation costs), and t_{ii} and t_{jj} denote *domestic* trade costs in country i and country j (e.g., local distribution costs), respectively (time indices are ignored for simplicity). Since t_{ij} , t_{ji} , t_{ii} , and t_{jj} are defined as ad-valorem price wedges, the expression in Equation (2) directly yields a tariff-equivalent measure of bilateral trade costs rather than the absolute monetary costs. Thus, τ_{ij} indicates the geometric average of international trade costs relative to domestic trade costs in both directions, which covers costs arising from tariffs, border barriers, transportation, and other unobservable factors.

Building on Novy's improved measurement of trade costs, we incorporate the multiplicative functional form developed by Anderson and van Wincoop (2004), as expressed in Equation (3).⁶

$$\tau_{ij} = \prod_{m=1}^M (z_{ij}^m)^{\gamma_m} \quad (3)$$

This equation allows us to decompose trade costs into components z_{ij}^m (where m indexes trade barrier types),

⁶ Multiplicative form is the most common setup in the structural gravity literature (Anderson and van Wincoop, 2004, p. 711) for two reasons. First, under the CES–iceberg structure of the gravity model (Anderson and van Wincoop, 2003), trade costs enter consumer prices as an ad-valorem wedge (i.e., $p_{ij} = p_i t_{ij}$), and the CES price index incorporates this wedge multiplicatively (i.e., $P_j = \left(\sum_i (p_i t_{ij})^{1-\sigma} \right)^{\frac{1}{1-\sigma}}$), implying that trade frictions operate multiplicatively. Second, individual barriers are treated as proportional cost components; thus, their effects compound on the delivered price, implying a multiplicative accumulation of frictions.

linking these components to observable proxies such as geographical distance, tariffs, and (most importantly) RTAs, thereby making it possible to empirically examine how specific policy instruments shape trade costs. τ_{ij} can be decomposed into two broad categories of trade barrier, i.e., tariffs and NTMs.⁷ Accordingly, Equation (4) expresses total trade costs as the product of tariff- and NTM-related components.

$$\tau_{ij} = \tau_{ij}^{Tariff} \times \tau_{ij}^{NTM} \quad (4)$$

This study focuses on trade costs related to NTMs. Following the multiplicative functional form, the impact of regulatory cooperation, which is the core interest of this study, could be taken into account as presented in Equation (5),

$$\begin{aligned} \tau_{ij}^{NTM} &= RTA^{NTM} \times T_{ij} \\ &= RTA_{ij}^{NTM} \times RTA_{kj}^{NTM} \times T_{ij}, \end{aligned} \quad (5)$$

where RTA^{NTM} denotes content relating to cooperation on NTMs, T_{ij} is a vector of other bilateral trade-promoting or cost-related variables (e.g., geographical distance, common language, common colonial history).⁸ As mentioned in the preceding section, RTAs may affect the trade costs of non-member countries for which recent studies have failed to control. Thus, RTA^{NTM} is further decomposed to RTA_{ij}^{NTM} and RTA_{kj}^{NTM} to distinguish effects between RTA signatories and non-member countries, where k denotes any third country that is not a party to RTA between i and j . These countries represent j 's other trading partners; this allows us to capture the spillover effects of regulatory cooperation on non-member countries. This equation implies that NTM-related trade costs between country i and j are shaped not only by their own cooperation (as captured by RTA_{ij}^{NTM}) but also by j 's cooperation with third countries (as captured by RTA_{kj}^{NTM}).

We assume that RTAs would reduce trade costs for member countries. For non-member countries, the conventional mechanism is trade diversion (Viner, 1950): by fostering trade among member countries and reducing it with non-member countries, trade flows are diverted toward the signatories. This explanation is convincing in the context of tariff elimination, since it reduces trade costs of member countries, making products from non-member countries less competitive (Fugazza and Nicita, 2013; Saggi et al., 2018). However, this point of view is less applicable to cooperation on NTMs, given that some of them are non-discriminatory.⁹ Therefore, we posit that country j 's RTA with country i will generate positive spillover effects, where “positive” refers to reduced trade costs between country k and j .

⁷ The rationale for this decomposition is that, although NTM-related trade costs are not directly observable, both total trade costs and tariff-related trade costs can be calculated. Hence, NTM-related trade costs can be inferred as the residual component once tariff-related costs are extracted from total trade costs.

⁸ For simplicity, we assume that the transportation costs do not change over time.

⁹ See Footnote 4 for detailed information about policy areas with a non-discriminatory nature.

2.2 Empirical specification

Building on Equation (5), Equation (6) translates the theoretical framework into an empirical specification,

$$\ln(\tau_{ijt}^{NTM}) = \sum (\beta_1 RTA prov_{ijt}^X + \beta_2 RTA prov_{kjt}^X) + \gamma \ln(controls_{ijt}) + \delta_{it} + \theta_{jt} + \pi_{ij} + u_{ijt} \quad (6)$$

where $X \in \{SPS, TBT\}$

where the dependent variable τ_{ijt}^{NTM} denotes trade costs related to NTMs. δ_{it} , θ_{jt} , and π_{ij} denote exporter-year, importer-year, and pair-specific fixed effects, respectively. The rich setting of fixed effects not only solves omitted variable bias but also mitigates the endogeneity issue raised by time-invariant factors (Baier and Bergstrand, 2007; Yotov et al., 2016).¹⁰

We address the potential heterogeneity of regulatory cooperation in each policy area and the limitations of conventional RTA indicators by applying two methodological refinements. First, as mentioned, the effects of regulatory cooperation in each policy area may differ substantially given the distinctive regulatory objectives of SPS and TBT. To capture this potential heterogeneity, this study evaluates the impact of regulatory cooperation on SPS and TBT separately. This distinction is reflected in the setting of superscript X ($X \in \{SPS, TBT\}$) in Equation (6).

Second, to address limitations on the evaluation of RTA content, we move beyond the conventional use of dummy indicators and construct a continuous variable that captures the substantive scope of regulatory cooperation within the agreements. Specifically, for each RTA between countries i and j , we count the provisions in the given policy area X , which yields $RTA prov_{ijt}^X$. Since the importing country j may be party to multiple RTAs, we follow the approach of Mattoo et al. (2022) and Lee et al. (2023) and take the maximum provision count among all RTAs signed by country j to construct $RTA prov_{kjt}^X$.¹¹ A higher provision count reflects more detailed and specific policies as committed by RTA signatories. In addition, we account for heterogeneity in legal enforceability by distinguishing between enforceable and non-enforceable provisions when constructing the

¹⁰ This study adopts importer-time fixed effects to absorb the costs arising from various NTMs imposed by national regulations, which is a critical component of trade costs. According to TRAINS, most NTMs are multilateral in nature (they apply uniformly to all trading partners). Therefore, their impacts are absorbed by importer-time fixed effects.

¹¹ Lee et al. (2023, p. 140) construct their third-country RTA variables using the maximum depth across partner agreements, arguing that spillover effects are not cumulative across multiple agreements but are instead driven by the deepest commitments with which firms have experience. Similarly, Mattoo et al. (2022) show that an importer's deepest trade agreement is particularly informative about the strength of its regulatory commitments and can therefore play a decisive role in shaping trade effects for non-member countries.

measures.¹² All variables are normalized to the range of [0, 1] for comparability.¹³ Beyond all provisions, this study further examines the heterogenous effects across categories of provisions in the policy areas of SPS and TBT. In particular, we focus on essential provisions, which comprise the core dimensions of regulatory cooperation and are most relevant for reducing NTM-related trade costs. Essential provisions include those for reference to WTO agreements, harmonization of standards, and transparency requirements.¹⁴ Figure 1 presents the classification of provision categories.

The study also includes a set of bilateral and country-specific control variables to account for other factors that may influence trade costs related to NTMs. First, an RTA dummy is added to control for impacts from policy areas other than SPS and TBT that affect trade costs related to NTMs, such as trade facilitation and competition policy. Second, WTO membership is included as a binary variable, taking a value of one when both trading partners are WTO members, to capture the trade-promoting effects of participation in multilateral trade rules. Third, a food production index (base period: 2014–2016) is included to proxy for agricultural production capacity. This variable reflects agricultural performance and supply potential, which may influence trade costs through market competitiveness.¹⁵ Finally, institutional distance is constructed using the Worldwide Governance Indicators (WGI), which reports six dimensions of governance indicators: voice and accountability, political stability and absence of violence/terrorism, government effectiveness, regulatory quality, rule of law, and control of corruption (Kaufmann and Kraay, 2024). Following Liu et al., (2020), institutional distance is measured as the Euclidean distance between trading partners across the six governance dimensions (as denoted by s), as shown in Equation (7).

$$Institutional\ Dist_{ijt} = \sqrt{\sum_{s=1}^6 (WGI_{ist} - WGI_{jst})^2} \quad (7)$$

This bilateral perspective is consistent with the interpretation in Francois and Manchin (2013), who emphasize that the institutional quality of both exporters and importers shapes trade outcomes. A higher level of institutional distance indicates greater divergence in governance quality and regulatory environments, which may increase

¹² An area is considered legally enforceable if the language used is sufficiently precise and committing and if it has not been excluded from dispute settlement procedures under the RTA (Hofmann et al., 2017, p. 7).

¹³ The normalization process can be expressed as $\frac{RTA\ prov_{max} - RTA\ prov}{RTA\ prov_{max} - RTA\ prov_{min}}$.

¹⁴ The classification of provision categories is defined by Stone and Casalini (2020) and Espitia et al. (2020).

¹⁵ Because exporter-time and importer-time fixed effects absorb country-specific time-varying characteristics, food production index (FPI) is expressed in relative terms between given trading partners:

$$FPI_{ijt} = \frac{FPI_{it} - FPI_{jt}}{FPI_{it}}$$

This specification captures the bilateral differences in food production capacity over time and preserves the variation necessary for identification.

compliance uncertainty and is expected to increase bilateral trade costs.

2.3 Solving for endogeneity issues: IV strategy

The most common estimation methods used in international trade are Ordinary Least Squares (OLS) and Poisson Pseudo Maximum Likelihood (PPML; e.g., Chen and Mattoo, 2008; Grant, 2013; Disdier et al., 2015).¹⁶ PPML estimation solves the inherent heteroscedasticity issue in the OLS estimation and is thus recommended even when the dependent variable is strictly positive (Silva and Tenreyro, 2006; Yotov et al., 2016). However, the endogeneity issue raised by RTAs remains a major concern. Regarding trade costs, countries that have already experienced lower costs (due to geographic proximity, cultural ties, or other unobserved factors) are more likely to facilitate the negotiation and adoption of RTAs. Consequently, the observed correlation between RTA provisions (denoted by $RTA\ prov_{ijt}^X$ in the empirical specifications) and trade costs may reflect reverse causality rather than the causal impact of RTAs on trade costs. Although the inclusion of pair-specific fixed effects suggested by Baier and Bergstrand (2007) helps absorb time-invariant heterogeneity, it may not fully eliminate the bias arising from dynamic complementarities and third-country linkages.

To mitigate this concern, this study adopts the IV strategy inspired by Orefice and Rocha (2014), Osnago et al. (2020), and Mattoo et al. (2022). Specifically, RTA provisions between country i and j in policy area X (where $X \in \{SPS, TBT\}$) are instrumented with an interaction term capturing the third-country network structure:

$$IV_{ijt}^X = RTA\ prov_{ikt}^X \times RTA\ prov_{kjt}^X \times RTA_{ijt} \quad (8)$$

$$X \in \{SPS, TBT\},$$

where $RTA\ prov_{ikt}^X$ and $RTA\ prov_{kjt}^X$ denote the highest count of provisions in the given policy area X that country i and country j have adopted in their RTAs with a third country k ($k \neq i, j$, k is not a party to the RTA between i and j). Both variables are normalized to ensure comparability across country pairs and over time. The interaction therefore serves as a proxy for the intensity of shared regulatory commitments with third countries, capturing the extent to which countries i and j have adopted similar levels of regulatory commitments through their earlier agreements with third countries.

The validity of this instrument is supported by both relevance and exclusion conditions. The relevance condition is supported by the fact that the formation of RTA provisions exhibits strong third-country diffusion and template effects. Country i and j are more likely to replicate provisions already embedded in their respective RTAs with a common third country k , leading to convergence in the design of their bilateral RTA. This mechanism is consistent with the domino theory of regional integration (Baldwin and Jaimovich, 2012; Chen and Joshi, 2010) and recent evidence of regulatory convergence driven by shared RTA networks (Lee et al., 2023). The exclusion

¹⁶ In the PPML estimation, the dependent variable is τ_{ijt}^{NTM} .

restriction of this instrument is satisfied by the assumption that, after controlling for exporter-year, importer-year, pair-specific fixed effects, and other observable factors, provisions embedded in RTAs between country i and k , and between country j and k , do not directly affect bilateral trade costs between i and j in the absence of an RTA between them. Instead, their influence operates indirectly by increasing the probability and regulatory depth of an RTA between i and j .

3 Data sources

3.1 ESCAP-World Bank trade cost database

Data on trade costs are obtained from the ESCAP-World Bank trade cost database. Trade costs are derived from the structural gravity framework, following Novy (2013), capturing both observable and unobservable barriers to trade. The dataset provides annual observations for a wide range of economies and sectors over the period 1995 to 2023.

In general, total trade costs exhibited an upward trend until the mid-2010s. Figure 2 presents trade costs in the form of ad-valorem equivalent indices, as constructed by the ESCAP.¹⁷ As the figure shows, the agriculture sector consistently faced trade costs that were higher than those in the manufacturing sector and the overall level. This is due primarily to the prevalence of SPS and TBT requirements in the agriculture sector (Beghin and Schweizer, 2021). Beyond these sectoral differences, Figure 3 further decomposes total trade costs into tariff- and NTM-related components, revealing a clear divergence in their evolution over time. As shown in the left panel, tariff-related trade costs steadily declined across all sectors, reflecting progress in global trade liberalization. By contrast, the right panel shows that NTM-related costs continued to increase until the mid-2010s. This divergence highlights the growing role of NTMs as a key driver of total trade costs.

Several structural factors underlie these patterns. At a global level, WTO membership expansion made the global trading system more unified and transparent by promoting common rules and disciplines. Nevertheless, international differences in trade regimes and governance performance persist, reflecting the varying institutional capacities of national systems. Such institutional distance may increase the costs of transaction and compliance, particularly for developing countries. At a regional level, the proliferation of RTAs has strengthened regulatory cooperation among member countries. Figure 4 illustrates trade costs between RTA signatories and non-member countries. The left panel presents the annual average of total trade costs, while the right panel reports the annual average of NTM-related trade costs. Across the sample period, trade costs in both panels are consistently lower for RTA signatories than for non-member countries. Together, these trends underscore the growing importance of

¹⁷ As discussed in the Methodology section, trade costs are defined as the geometric average of international trade costs relative to domestic trade costs and is expressed in ad-valorem equivalent terms (Novy, 2013). Higher values indicate higher bilateral trade costs.

non-tariff and institutional factors in determining trade costs, motivating the empirical analysis below of how regulatory cooperation embedded in RTAs affects such costs.

3.2 Deep Trade Agreements database

Information on the content of RTAs is collected from the World Bank's Deep Trade Agreements database. The content of RTAs is assessed by two datasets: horizontal depth and vertical depth. Horizontal depth maps the coverage of 52 selected policy areas in 400 RTAs notified to the WTO signed between 1958 and 2023. It also includes information about legal enforceability for each policy area (Hofmann et al., 2017). Vertical depth provides detailed information on the content of a sub-sample of the 18 policy areas most frequently covered in a set of 400 agreements notified to the WTO between 1958 and 2023. For each agreement, the database covers the stated objectives and substantive commitments, as well as aspects relating to transparency, procedures, and enforcement. This database offers the most comprehensive coverage of policy areas and the highest granularity of information within each area (Mattoo et al., 2020).

Several trends emerge from the data. First, regulatory cooperation has become a common feature of recent RTAs. Out of 400 agreements recorded, 249 include policy area of SPS, and 286 include policy area of TBT. Figure 5 illustrates the evolution of new RTAs in terms of the inclusion of SPS and/or TBT chapters. The vertical axis reports the number of new RTAs implemented in each period, and the bars are further disaggregated into three categories: RTAs with legally enforceable SPS and/or TBT chapters, RTAs with non-legally enforceable SPS and/or TBT chapters, and RTAs without SPS or TBT chapters. Agreements implemented in the 1980s and early 1990s rarely addressed regulatory issues, whereas the coverage of SPS and/or TBT chapters increased markedly after the mid-1990s and accelerated in the 2000s. Moreover, the share of legally enforceable regulatory cooperation in new RTAs continued to grow, as seen in the increasing share of dark blue bars in Figure 5. This pattern indicates that regulatory cooperation in RTAs has progressively become more binding over time. Third, the number of SPS and TBT provisions included in new RTAs increased steadily over time. On average, SPS chapters contain 11.97 provisions (57 provisions in total), and TBT chapters contain 8.92 provisions (34 provisions in total).¹⁸ As Figure 6 shows, SPS and TBT provisions both exhibit a clear upward trend (despite a few outliers in the early stage), indicating that regulatory cooperation intensified over the past decades. Furthermore, essential provisions constitute a larger proportion of provisions in SPS chapters than in TBT chapters, as reflected by a narrower gap between the solid and dashed lines in the upper panel than in the lower panel. This implies that cooperation on SPS is centered on core regulatory disciplines, while TBT chapters display a broader and more diversified coverage of regulatory areas.

¹⁸ It should be noted that the provision counts of SPS and TBT chapters are not directly comparable in absolute terms because the chapters differ in textual scope and coding structure.

The long-term increase in both the coverage and number of regulatory cooperation provisions reflects a broader evolution in the role of RTAs. While early agreements focused on tariff elimination (Beghin and Schweizer, 2021), more recent RTAs increasingly emphasize regulatory cooperation. This evolution is consistent with the tendency highlighted above, wherein NTM-related trade costs continued to increase over time. Taken together, these tendencies underscore the importance of understanding how regulatory cooperation may influence NTM-related trade costs, the central motivation of this study.

3.3 Other data sources

The rest of data sources are as follows. Data on WTO membership (166 members since 1995) are collected from the WTO. The food production index, comprising a sample of 195 economies since 1960, is collected from the Food and Agriculture Organization of the United Nations (FAO). Data on institutional distance are drawn from Worldwide Governance Indicators (Kaufmann and Kraay, 2024). These cover a sample of 214 economies from 1996 to 2023, each ranging from approximately -2.5 to 2.5, with higher values corresponding to better outcomes. A full statistical description is presented in Appendix Table A.1 and Table A.2.

4 Results and discussion

4.1 Overall estimation

Table 1 reports the baseline estimates of the impact of regulatory cooperation on trade costs associated with NTMs. The analysis distinguishes between two categories of provisions: all provisions (corresponding to the results in columns [1] to [4]) and essential provisions (corresponding to the results in columns [5] to [8]). In addition, as Raimondi and Scoppola (2024) emphasize, the legal enforceability of policy areas may affect the effectiveness of regulatory cooperation; therefore, the specifications differentiate between provisions without legal enforceability (columns [1], [2], [5], and [6]) and those with it (columns [3], [4], [7], and [8]). The estimations are conducted using Two-stage Least Squares (2SLS) for linear specifications and Two-stage Residue Inclusion (2SRI) for non-linear specifications. The 2SRI approach follows the control function methodology for non-linear models as developed by Wooldridge (2010, 2015). First-stage results are presented in the Appendix Table A.4.¹⁹

¹⁹ We report OLS and PPML estimates in the Appendix Table A.3. The results differ from the 2SLS and 2SRI estimates mainly for SPS provisions. In the OLS/PPML specifications, SPS estimates are more sensitive to endogeneity and differ more substantially from the corresponding 2SLS and 2SRI estimates, whereas the negative effects of TBT provisions are more stable across estimation methods. These differences suggest that the OLS/PPML estimates may be affected by endogeneity and should therefore be interpreted with caution. One possible explanation for the difference is that country pairs with lower trade costs and greater regulatory compatibility may be more likely to adopt regulatory cooperation. Such reverse causality may make the OLS/PPML estimates partly reflect favorable pre-existing bilateral conditions rather than the effect of regulatory

The results show systematic differences between the effects of regulatory cooperation under SPS and TBT provisions. We discuss the effects of SPS provisions first, followed by those of TBT provisions. For member countries, the estimated coefficients of SPS provisions exhibit a heterogeneous pattern that varies across estimation methods and provision categories. When regulatory cooperation is measured by all provisions in SPS area, 2SLS estimations yield negative and statistically significant coefficients, whereas the 2SRI counterparts are small and insignificant. By contrast, when regulatory cooperation is measured by essential provisions, the estimated coefficients for SPS cooperation in the 2SRI turn positive and significant, while those in the 2SLS remain close to zero and insignificant. Taken together, the member-country effects of SPS cooperation are not robust in aggregate and are highly sensitive to both estimation choices and provision categories, motivating the more granular heterogeneity analysis conducted in the next section. Regarding cooperation on TBT area, the estimated coefficients are considerably more stable across specifications. Except for specifications using all provisions in TBT area estimated by the 2SLS, the rest of the coefficients for TBT provisions show a clear and robust cost-reducing effect for member countries, indicating more uniform benefits from technical cooperation in this area. The 2SRI estimate in column (2) implies that a one-standard-deviation increase in TBT provisions reduces expected trade costs by approximately 0.33%.²⁰

Regarding non-member countries, the estimates display different spillover effects between cooperation on SPS and TBT. SPS provisions tend to increase trade costs for non-members, implying that SPS cooperation among RTA members may generate exclusionary effects or regulatory divergence for outsiders. The 2SLS estimate in column (1) implies that a one-standard-deviation increase in SPS provision increases trade costs by approximately 0.48%. By contrast, TBT provisions generate negative and statistically significant spillovers, indicating that improvements in transparency, conformity assessment, and regulatory information sharing may extend beyond RTA members and reduce trade frictions for non-member countries. The estimated coefficient in column (1) corresponds to a 0.70% decrease in trade costs for a one-standard-deviation increase in TBT provisions. These contrasting effects between SPS and TBT highlight that the economic implications of regulatory cooperation differ across policy areas and cooperation channels, motivating the more detailed heterogeneity analysis conducted in the next section.

The results for the control variables are largely consistent with expectations, with one notable exception: The coefficients of the RTA dummy are positive and statistically significant across all specifications. This result implies that, after the effects of cooperation on SPS and TBT are controlled for, the remaining areas in the agreements may increase trade costs associated with NTMs. A plausible explanation for this result is that some

provisions themselves. For this reason, the 2SLS and 2SRI estimates are used as the baseline estimates for causal interpretation.

²⁰ Because the SPS and TBT provision variables are normalized between zero and one, we evaluate economic magnitude using the implied effect of a one-standard-deviation increase rather than a one-unit increase.

policy areas in the agreements may impose additional compliance burdens, thereby increasing trade costs. This interpretation is supported by Estevadeordal and Suominen (2006) and Conconi et al. (2018), who find that complex rules of origin embedded in RTAs may introduce additional institutional costs rather than facilitate trade. Specifically, complex rules of origin can generate substantial compliance burdens and restrict market access, leading to higher trade costs despite the broader liberalization objectives of RTAs. It should be noted that the overall effects of RTAs in this study remain cost-reducing, suggesting that the cost-enhancing effects from specific policy areas do not contradict the overall cost-reducing impact of regulatory cooperation, but rather point to heterogeneity among the mechanisms through which different policy areas operate.

4.2 Heterogeneity analysis

This section discusses the heterogenous impact of regulatory cooperation within policy areas of SPS and TBT. We focus on heterogeneity in essential provisions by distinguishing between two categories of regulatory cooperation. The first category concerns provisions on harmonization of standards, including harmonization, equivalence, and mutual recognition, which aim to reduce regulatory divergence by aligning or mutually recognizing technical requirements across countries (see Table 2). The second category relates to provisions on transparency requirements, which facilitate information exchange and procedural clarity by enhancing notification, consultation, and disclosure mechanisms in the implementation of SPS and TBT measures (see Table 3). Due to the high correlation between provisions on harmonization of standards and transparency requirements, their effects are estimated separately. Moreover, institutional distance not only shapes bilateral trade costs but also increases the coordination barriers associated with cooperative arrangements, as greater institutional distance exacerbates transaction friction and increases uncertainty between trading partners (Liu et al., 2020). This may further influence the extent to which regulatory cooperation alleviates NTM-related trade costs. To capture this moderating effect, we interact institutional distance with each category of essential provisions and examine the heterogenous impact on trade costs.

Table 2 reports the heterogeneous effects of provisions on harmonization of standards, estimated using both 2SLS and 2SRI methods. First-stage results are presented in Appendix Table A.5. Columns (1) and (2) in Table 2 present the baseline estimates of provisions on harmonization of standards. Columns (3) and (4) extend the specification by including interactions with institutional distance to examine whether the effectiveness of these provisions varies as institutional distance increases. Columns (5) to (8) consider the legal enforceability of provisions, reporting corresponding specifications with and without interaction terms.

Most of the variables presented in columns (1) and (2) are statistically significant, indicating that these provisions significantly reduce NTM-related trade costs among member countries. For harmonization provisions, cooperation on TBT has a stronger impact than cooperation on SPS, a one-standard-deviation increase in SPS provisions lowers trade costs by approximately 0.087%, while the corresponding increase in TBT provisions

reduces trade costs by about 0.102%, according to the estimates in column (1). This pattern remains robust after accounting for the legal enforceability of the provisions, as presented in columns (5) and (6). This finding highlights the importance of treating cooperation on SPS and TBT as distinct policy areas. Pooling them may obscure meaningful heterogeneity in how regulatory cooperation operates across policy areas, even within member countries.

The results also reveal heterogeneous spillover effects on non-member countries. Consistent with previous findings, provisions on harmonization of standards produce opposite effects across policy areas: such provisions increase trade costs in the policy area of SPS, but lower them in the policy area of TBT. The cost-raising spillovers in the policy area of SPS can be explained by two related mechanisms. First, the main benefits of cooperation on SPS are likely to be confined to RTA members. Compliance with SPS measures often requires exporters to prove conformity with health and safety requirements, which may involve costly procedures such as certification, inspection, testing, and documentation (World Bank, 2026). When cooperation on SPS introduces preferential arrangements among RTA members, such as mutual recognition, equivalence, or streamlined inspection procedures, these benefits are not necessarily extended to non-member countries. As a result, member countries may experience lower compliance costs through reduced duplication of procedures, while non-member exporters continue to face conformity assessment requirements. Chen and Mattoo (2008) provide another explanation for this pattern. They argue that harmonization of standards may reduce the exports of excluded countries because harmonized standards are often stricter than existing national requirements. As a result, non-member exporters face higher adaptation and certification costs to access integrated markets, while member countries benefit from a reduced duplication of compliance efforts. This mechanism implies that regulatory cooperation on SPS is inward-oriented, and thus reinforces cost reductions within the RTA membership without extending benefits to outsiders.

By contrast, cooperation on TBT generates negative spillover effects for non-members, suggesting that the benefits of regulatory cooperation extend beyond RTA borders. These provisions may promote outward regulatory diffusion in TBT: once member countries harmonize technical specifications or mutually recognize conformity assessment procedures, external exporters often unilaterally adopt these practices to maintain market access. More broadly, the evidence shows that firms operating within global production networks frequently adopt externally defined standards to address supply-chain governance challenges, with direct implications for market access (WTO, 2012, p. 11). Such adaptive behavior can reduce compliance frictions arising from regulatory divergence and contribute to outward spillover effects in TBT. This mechanism is consistent with Baldwin's (2013) argument that deep provisions can generate external effects extending beyond member countries.

Besides the baseline and spillover effects, the results of the interaction terms in Table 2 reveal the role of institutional distance as a third source of heterogeneity. The results suggest that the moderating effect of institutional distance is not homogeneous across policy areas. As columns (3) and (4) show, institutional distance

weakens the cost-reducing effect of provisions on harmonization of standards in the SPS area but strengthens it in the TBT area. This pattern is consistent across specifications with legal enforceability, as shown in columns (7) and (8). In the SPS context, greater institutional distance amplifies coordination frictions because the implementation of risk-management regulations relies on trusted conformity assessment procedures and credible regulatory enforcement. This result is consistent with Francois and Manchin (2013), who show that cross-country differences in institutional quality increase coordination and compliance costs in trade relationships, particularly when regulatory alignment is required. However, this logic does not extend to cooperation on TBT. Unlike SPS measures, which require institutional compatibility in risk regulation, TBT disciplines primarily target product design and technical specifications. Consequently, compliance with TBT measures can be achieved through firm-level adaptation rather than institutional-level regulatory alignment, making them less sensitive to institutional divergence. Compliance costs rise when regulatory environments differ substantially (higher institutional distance), which in turn increases the marginal benefits of adopting shared standards under RTAs.

Table 3 reports the results for provisions on transparency requirements, estimated using the same model specification as that shown in Table 2. Columns (1) and (2) report the baseline estimates of provisions on transparency requirements, while columns (3) and (4) incorporate interactions with institutional distance. The provisions' legal enforceability is taken into account in columns (5) to (8). Both the 2SLS and 2SRI are adopted (first-stage results are presented in Appendix Table A.6).

The results are broadly consistent with the previous findings but also feature several notable differences across policy areas. For SPS transparency provisions, the estimated coefficients are insignificant in the baseline (corresponding to the results in columns [1], [2], [5], and [6]) but become statistically significant once interaction terms with institutional distance are included (corresponding to the results in columns [3], [4], [7], and [8]). This pattern suggests that the cost-reducing effects of SPS transparency provisions for member countries are conditional on institutional distance, with their effectiveness declining as institutional distance increases. As emphasized by Helble et al. (2009), the effectiveness of transparency-enhancing measures depends critically on the presence of credible regulatory systems and predictable administrative procedures. When institutional environments differ substantially, enhancing the transparency of SPS regulations is insufficient to offset the higher compliance and coordination costs faced by exporters. By contrast, TBT transparency provisions consistently reduce NTM-related trade costs for member countries, and their interaction terms with institutional distance remain insignificant across all specifications. This result suggests that the effectiveness of transparency requirements in TBT is not conditioned by institutional distance. As documented by Lejárraga and Shepherd (2013), TBT transparency provisions operate through standardized notification and information-exchange mechanisms, which enhance predictability and reduce information asymmetries. Since these mechanisms are built on public notification and consultation systems rather than exclusive institutional alignment, their trade-cost-

reducing effects for member countries do not appear to be conditioned by institutional similarities between trading partners.

The spillover effects on non-member countries are similar to those reported in Table 2. The estimates indicate that SPS transparency provisions increase trade costs for non-member countries, whereas TBT transparency provisions have no significant effect. A plausible interpretation of this result is that transparency requirements in the policy area of SPS do not necessarily translate into less burdensome procedures for external trading partners. Instead, enhanced transparency may be accompanied by more formalized approval processes, stricter documentation requirements, and more frequent notifications, which can increase compliance and administrative costs for non-member exporters, resulting in higher observed trade costs.

Taken together, these findings highlight the importance of analyzing SPS and TBT cooperation separately rather than treating them as a unified category of NTMs, as much of the empirical literature does, under the assumption that they operate through similar economic channels (e.g., Disdier et al., 2008; Cadot and Gourdon, 2016). Recent studies on the effects of RTAs also follow this aggregate approach, combining SPS and TBT provisions into composite indicators of regulatory depth without differentiating their mechanisms (e.g., Mattoo et al, 2022; Lee et al., 2023). In addition to the importance of distinguishing between SPS and TBT, our results also reveal systematic heterogeneity across SPS and TBT cooperation in three dimensions: the magnitude of member-country effects across various provision categories, the direction of spillovers to non-member countries, and the sensitivity of cooperation to institutional distance. These heterogeneous effects reflect the fundamentally different regulatory logics of the two policy areas, revealing the limitations of empirical strategies that overlook this distinction.

4.3 Robustness check

This study conducts two robustness checks. First, we examine whether our findings are driven by a small number of large-scale agreements. Specifically, we exclude the European Union (EU) and the NAFTA/USMCA agreements from the dataset because of their exceptional scale and scope of regulatory cooperation relative to other RTAs. The results are reported in Tables 4 to 6, corresponding to the specifications in Tables 1 to 3, respectively. Consistent with the previous results, most coefficients remain stable in sign and magnitude. However, the effects of transparency provisions on RTA signatories become statistically insignificant (see Table 6). This suggests that the observed effects shown in Table 3 are driven mainly by the mega-regional agreements such as the EU and NAFTA/USMCA, where transparency provisions are backed by stronger legal enforceability. After these agreements are removed, the transparency provisions in the remaining RTAs appear to be weaker in practice, which may explain why the estimated effects are no longer statistically significant.

Second, we exclude observations after 2020 to account for potential distortions arising from the Covid-19 pandemic. The results are presented in Tables 7 to 9, corresponding to the specifications in Tables 1 to 3,

respectively. Overall, the estimates indicate an improvement in statistical precision, with stronger significance for several coefficients. Nevertheless, the effects on non-member countries become insignificant once the legal enforceability of SPS standard harmonization provisions is controlled for (corresponding to columns [5] to [8] in Table 8). This result may occur because those legally enforceable harmonization provisions are concentrated in newer agreements and require time to translate into observable changes in trade costs. After post-2020 observations are excluded, less variation is available by which to identify their independent effects, making them harder to identify.

5 Concluding remarks

This study investigates how regulatory cooperation in the agriculture sector impacts not only member countries but also non-member countries. Specifically, we examine the impact on trade costs, distinguishing between cooperation on SPS and on TBT. The results indicate that regulatory cooperation affects trade costs for both member and non-member countries. In particular, cooperation on TBT consistently reduces bilateral trade costs regardless of membership, whereas the effects of cooperation on SPS are weaker and more conditional and may generate cost-increasing spillovers for excluded countries. The results also reveal systematic heterogeneity across policy areas in three dimensions: the magnitude of effects for member countries, the direction of spillover effects on non-member countries, and the sensitivity to institutional distance. These patterns reflect the fundamentally distinct regulatory logic of SPS and TBT provisions. In clarifying these differences, this study contributes to the literature on RTAs and NTMs by providing new evidence on how regulatory cooperation reshapes trade costs within and beyond membership boundaries.

The findings suggest that the effectiveness of regulatory cooperation depends critically on institutional compatibility and agreement design. Agreements that incorporate binding commitments and operational implementation mechanisms tend to achieve more substantial reductions in trade costs than do those based on declaratory or symbolic commitments. Hence, future trade negotiations should place greater emphasis on the enforceability of provisions and practical implementation mechanisms, as these features are more likely to reduce trade barriers. Moreover, the observed spillover effects on non-members vary across policy areas. Empirical evidence indicates that cost-reducing spillovers arise primarily from standard harmonization provisions in the policy area of TBT, which foster greater convergence of technical requirements and mitigate regulatory heterogeneity across markets, even in the absence of formal agreement-based cooperation. This finding confirms the non-discriminatory nature of provisions in the area of TBT.

One limitation of this study is that the trade costs index is constructed from observed bilateral trade flows. Therefore, the analysis cannot identify the potential impact of regulatory cooperation on market access. Future research could build on this perspective by examining whether regulatory cooperation facilitates access to new markets.

References

- Anderson, J. E., and van Wincoop, E. (2003). Gravity with gravitas: A solution to the border puzzle. *American Economic Review*, 93(1), 170-192.
- Anderson, J. E., and van Wincoop, E. (2004). Trade costs. *Journal of Economic Literature*, 42(3), 691-751.
- Arvis, J. F., Duval, Y., Shepherd, B., Utoktham, C., and Raj, A. (2016). Trade costs in the developing world: 1996–2010. *World Trade Review*, 15(3), 451-474.
- Baier, S. L., and Bergstrand, J. H. (2007). Do free trade agreements actually increase members' international trade?. *Journal of International Economics*, 71(1), 72-95.
- Baier, S. L., Bergstrand, J. H., and Feng, M. (2014). Economic integration agreements and the margins of international trade. *Journal of International Economics*, 93(2), 339-350.
- Baldwin, R. (2013). Multilateralising 21st century regionalism, global forum on trade reconciling regionalism and multilateralism in a post-Bali world. OECD Publishing, Paris.
- Baldwin, R., and Jaimovich, D. (2012). Are free trade agreements contagious?. *Journal of International Economics*, 88(1), 1-16.
- Beghin, J. C., and Schweizer, H. (2021). Agricultural trade costs. *Applied Economic Perspectives and Policy*, 43(2), 500-530.
- Cadot, O., and Gourdon, J. (2016). Non-tariff measures, preferential trade agreements, and prices: new evidence. *Review of World Economics*, 152(2), 227-249.
- Chen, M. X., and Joshi, S. (2010). Third-country effects on the formation of free trade agreements. *Journal of International Economics*, 82(2), 238-248.
- Chen, M. X., and Mattoo, A. (2008). Regionalism in standards: good or bad for trade?. *Canadian Journal of Economics/Revue canadienne d'économique*, 41(3), 838-863.
- Conconi, P., García-Santana, M., Puccio, L., and Venturini, R. (2018). From final goods to inputs: the protectionist effect of rules of origin. *American Economic Review*, 108(8), 2335-2365.
- Disdier, A. C., Fontagné, L., and Cadot, O. (2015). North-South standards harmonization and international trade. *The World Bank Economic Review*, 29(2), 327-352.
- Disdier, A. C., Fontagné, L., and Mimouni, M. (2008). The impact of regulations on agricultural trade: Evidence from the SPS and TBT agreements. *American Journal of Agricultural Economics*, 90(2), 336-350.
- Espitia A., Pardo, S., Piermartini, R., and Rocha, N. (2020). Technical barriers to trade. In *Handbook of Deep Trade Agreements*, 343-366. World Bank publication, Washington, DC.

- Estevadeordal, A., and Suominen, K. (2006). Mapping and measuring rules of origin around the world. In *The origin of goods: rules of origin in regional trade agreements*, 69-114.
- Ferro, E., Otsuki, T., and Wilson, J. S. (2015). The effect of product standards on agricultural exports. *Food Policy*, 50, 68-79.
- Francois, J., and Manchin, M. (2013). Institutions, infrastructure, and trade. *World Development*, 46, 165-175.
- Fugazza, M., and Nicita, A. (2013). The direct and relative effects of preferential market access. *Journal of International Economics*, 89(2), 357-368.
- Grant, J. H. (2013). Is the growth of regionalism as significant as the headlines suggest? Lessons from agricultural trade. *Agricultural Economics*, 44(1), 93-109.
- Helble, M., Shepherd, B., and Wilson, J. S. (2009). Transparency and regional integration in the Asia Pacific. *The World Economy*, 32(3), 479-508.
- Hofmann, C., Osnago, A., and Ruta, M. (2017). Horizontal depth: a new database on the content of preferential trade agreements. *World Bank Policy Research Working Paper*, No.7981, World Bank publication, Washington, DC.
- Hooker, N. H. (1999). Food safety regulation and trade in food products. *Food Policy*, 24(6), 653-668.
- Kaufmann, D., and Kraay, A. (2024). The worldwide governance indicators: Methodology and 2024 update. *World Bank Policy Research Working Paper*, No. 10952, World Bank publication, Washington, DC.
- Lee, W., Mulabdic, A., and Ruta, M. (2023). Third-country effects of regional trade agreements: A firm-level analysis. *Journal of International Economics*, 140, 103688.
- Lejárraga, I. and Shepherd, B. (2013). Quantitative Evidence on Transparency in Regional Trade Agreements, *OECD Trade Policy Papers*, No. 153, OECD Publishing, Paris.
- Liu, A., Lu, C., and Wang, Z. (2020). The roles of cultural and institutional distance in international trade: Evidence from China's trade with the Belt and Road countries. *China Economic Review*, 61, 101234.
- Li, Y., and Beghin, J. C. (2012). A meta-analysis of estimates of the impact of technical barriers to trade. *Journal of Policy Modeling*, 34(3), 497-511.
- Mattoo, A., Mulabdic, A., and Ruta, M. (2022). Trade creation and trade diversion in deep agreements. *Canadian Journal of Economics/Revue canadienne d'économie*, 55(3), 1598-1637.
- Mattoo, A., Rocha, N., and Ruta, M. (2020). *Handbook of Deep Trade Agreements*. World Bank publication, Washington, DC.

- Novy, D. (2013). Gravity redux: measuring international trade costs with panel data. *Economic Inquiry*, 51(1), 101-121.
- Orefice, G., and Rocha, N. (2014). Deep integration and production networks: An empirical analysis. *The World Economy*, 37(1), 106-136.
- Osnago, A., Rocha, N., and Ruta, M. (2019). Deep trade agreements and vertical FDI: The devil is in the details. *Canadian Journal of Economics/Revue canadienne d'économique*, 52(4), 1558-1599.
- Raimondi, V., and Scoppola, M. (2024). Liberalising non-tariff measures through regional trade agreements: The impact on multinational production. *The World Economy*, 47(8), 3308-3338.
- Saggi, K., Stoyanov, A., and Yildiz, H. M. (2018). Do free trade agreements affect tariffs of nonmember countries? A theoretical and empirical investigation. *American Economic Journal: Applied Economics*, 10(3), 128-170.
- Santeramo, F. G., and Lamonaca, E. (2019). The effects of non-tariff measures on agri-food trade: A review and meta-analysis of empirical evidence. *Journal of Agricultural Economics*, 70(3), 595-617.
- Santeramo, F. G., and Lamonaca, E. (2022). Standards and regulatory cooperation in regional trade agreements: What the effects on trade?. *Applied Economic Perspectives and Policy*, 44(4), 1682-1701.
- Silva, J. S., and Tenreyro, S. (2006). The log of gravity. *The Review of Economics and Statistics*, 88(4), 641-658.
- Silvers, R. (2021). Does regulatory cooperation help integrate equity markets?. *Journal of Financial Economics*, 142(3), 1275-1300.
- Stone, S., and Casalini, F. (2020). Sanitary and phytosanitary measures. In *Handbook of Deep Trade Agreements*, 367-390. World Bank publication, Washington, DC.
- UNCTAD. (2019). *International Classification of Non-tariff Measures*. UN Publications, New York.
- Viner, J. (1950). *The Customs Union Issue*. New York: Carnegie Endowment for International Peace.
- Wilson, J. S., and Otsuki, T. (2004). To spray or not to spray: pesticides, banana exports, and food safety. *Food Policy*, 29(2), 131-146.
- World Bank. (2026). *World Development Report 2025: Standards for Development*. World Bank publication, Washington, DC.
- Wooldridge, J. M. (2010). *Econometric Analysis of Cross Section and Panel Data*. MIT press.
- Wooldridge, J. M. (2015). Control function methods in applied econometrics. *Journal of Human Resources*, 50(2), 420-445.
- WTO. (2011). *World Trade Report 2011: The WTO and preferential trade agreements – From co-existence to coherence*. WTO publication, Geneva.

- WTO. (2012). *World Trade Report 2012: Trade and public policies: A closer look at non-tariff measures in the 21st century*. WTO publication, Geneva.
- Yotov, Y. V., Piermartini, R., José-Antonio, M., and Larch, M. (2016). *An advanced guide to trade policy analysis: The structural gravity model*. WTO publication, Geneva.



Figure 1 The classification of provision categories in regulatory cooperation

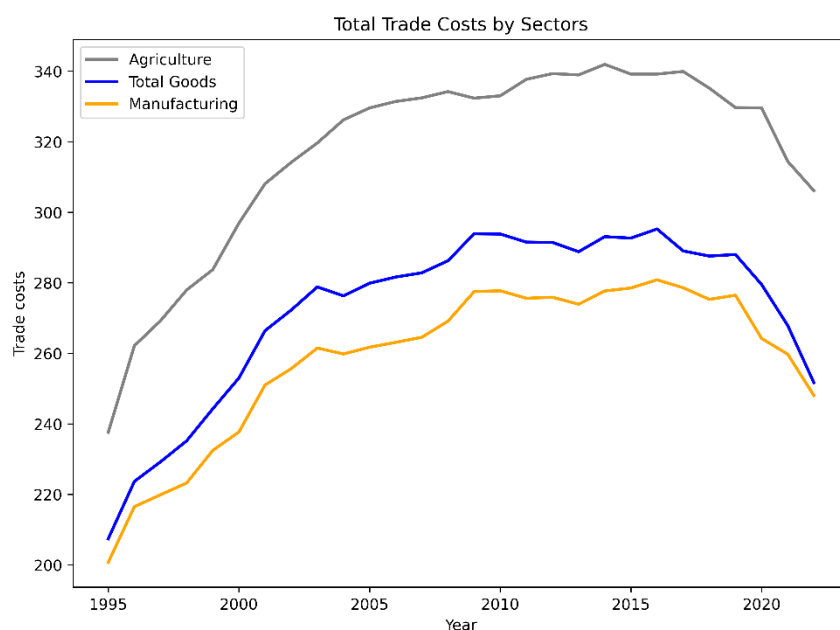


Figure 2 Total trade costs by different sectors, 1995-2022

Data source: the ESCAP-World Bank trade cost database

Note: Trade costs include all costs incurred in getting a good to a final user other than cost of producing the good itself, including transportation costs, policy barriers (tariffs and NTMs), information costs, contract enforcement costs, costs associated with the use of different currencies, and local distribution costs (Anderson and Van Wincoop, 2004).

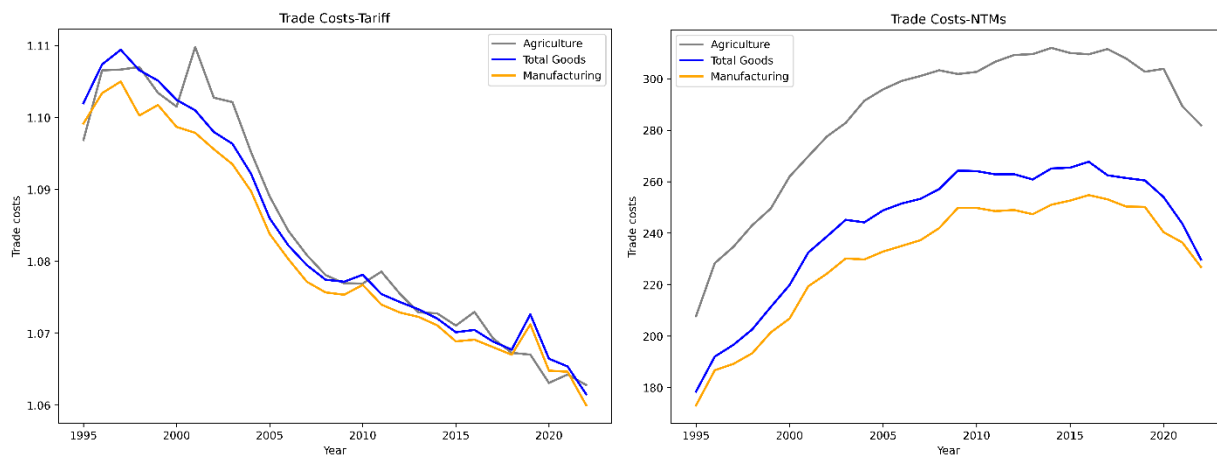


Figure 3 The evolution of trade costs related to tariff and NTMs, 1995-2022

Data source: the ESCAP-World Bank trade cost database

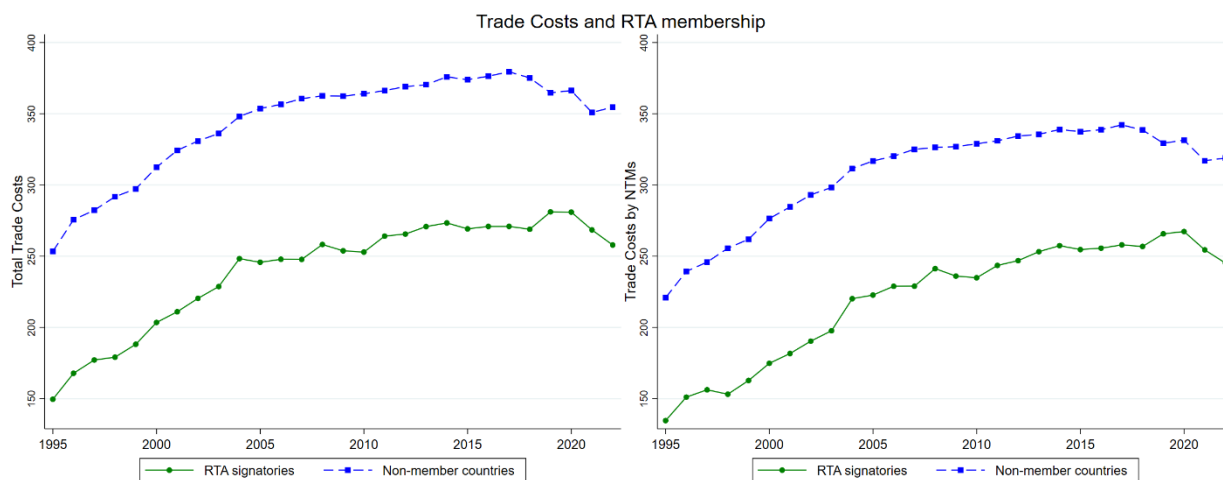


Figure 4 Trade costs and RTA memberships, 1995-2022

Data source: ESCAP-World Bank trade cost database

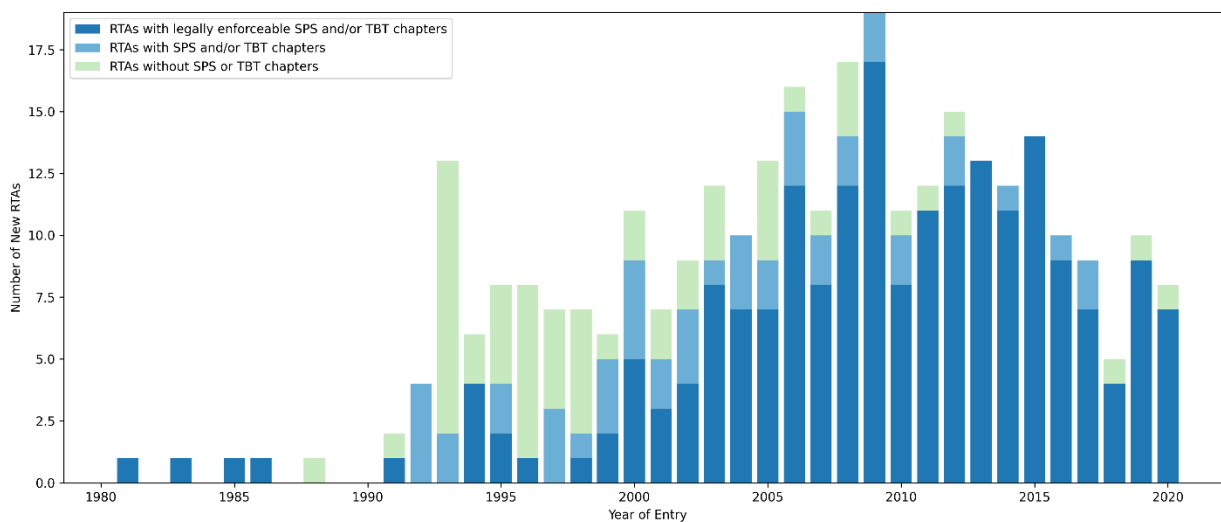


Figure 5 The evolution of new RTAs by the inclusion of SPS/TBT chapters, 1980-2020

Data source: Deep Trade Agreements database, World Bank



Figure 6 Average count of provisions in new RTAs, 1980-2020

Data source: Deep Trade Agreements database, World Bank

Note: Panel A reports the annual average of SPS provisions in new RTAs, and Panel B reports the corresponding average of TBT provisions. Essential provisions represent the core dimension of regulatory cooperation, including provisions on reference to the WTO agreements, harmonization of standards, and transparency requirements.

Table 1 Regression estimates on the effects of regulatory cooperation measured by all provisions and essential provisions

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Estimation method	2SLS	2SRI (PPML)	2SLS	2SRI (PPML)	2SLS	2SRI (PPML)	2SLS	2SRI (PPML)
VARIABLES								
All prov. ^{SPS} †	-0.088*** (0.020)	-0.003 (0.025)						
All prov. ^{TBT} †	-0.026 (0.019)	-0.136*** (0.024)						
All prov. _k ^{SPS}	0.136*** (0.035)	0.139*** (0.043)						
All prov. _k ^{TBT}	-0.140*** (0.050)	-0.128** (0.057)						
All prov. (le) ^{SPS} †			-0.062*** (0.022)	0.023 (0.028)				
All prov. (le) ^{TBT} †			-0.021 (0.017)	-0.116*** (0.021)				
All prov. (le) _k ^{SPS}			0.114*** (0.034)	0.111*** (0.042)				
All prov. (le) _k ^{TBT}			-0.147*** (0.049)	-0.119** (0.056)				
Essential prov. ^{SPS} †					-0.017 (0.020)	0.072*** (0.025)		
Essential prov. ^{TBT} †					-0.087*** (0.018)	-0.188*** (0.023)		
Essential prov. _k ^{SPS}					0.180*** (0.037)	0.193*** (0.046)		
Essential prov. _k ^{TBT}					-0.171*** (0.055)	-0.181*** (0.060)		
Essential prov. (le) ^{SPS} †							-0.010 (0.020)	0.071*** (0.026)
Essential prov. (le) ^{TBT} †							-0.074*** (0.017)	-0.171*** (0.022)
Essential prov. (le) _k ^{SPS}							0.135*** (0.037)	0.144*** (0.045)
Essential prov. (le) _k ^{TBT}							-0.158*** (0.057)	-0.157** (0.063)
RTA	0.069*** (0.009)	0.084*** (0.011)	0.055*** (0.007)	0.062*** (0.008)	0.058*** (0.007)	0.058*** (0.009)	0.050*** (0.006)	0.052*** (0.008)
WTO membership	-0.061*** (0.012)	-0.084*** (0.013)	-0.061*** (0.012)	-0.084*** (0.013)	-0.063*** (0.012)	-0.085*** (0.013)	-0.063*** (0.012)	-0.084*** (0.013)
Institutional dist.	0.008*** (0.002)	0.010*** (0.002)	0.008*** (0.002)	0.010*** (0.002)	0.009*** (0.002)	0.010*** (0.002)	0.009*** (0.002)	0.010*** (0.002)
Food production index	-0.132*** (0.020)	-0.099*** (0.023)	-0.127*** (0.021)	-0.090*** (0.023)	-0.121*** (0.021)	-0.085*** (0.023)	-0.119*** (0.021)	-0.082*** (0.023)
First-stage Residues								
SPS prov.		0.085*** (0.028)		0.067** (0.031)		-0.016 (0.027)		-0.009 (0.028)
TBT prov.		-0.008 (0.027)		-0.016 (0.024)		0.063** (0.026)		0.057** (0.025)
Observations	192,498	192,498	192,498	192,498	192,498	192,498	192,498	192,498
Fixed Effects	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>
Kleibergen-Paap Wald F stat.	4026		3208		5010		4325	

Note: This table reports second-stage results in the IV estimations. Variables marked with † are instrumented variables (first-stage results are summarized in Table A.4). Robust standard errors are reported in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

Table 2 Regression estimates on the effects of provisions on harmonization of standards

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Estimation method	2SLS	2SRI (PPML)	2SLS	2SRI (PPML)	2SLS	2SRI (PPML)	2SLS	2SRI (PPML)
VARIABLES								
Standard prov. ^{SPS} †	-0.051*** (0.017)	0.018 (0.021)	-0.206*** (0.023)	-0.155*** (0.028)				
Standard prov. ^{TBT} †	-0.085*** (0.012)	-0.149*** (0.015)	-0.049*** (0.017)	-0.078*** (0.022)				
Standard prov. _k ^{SPS}	0.164*** (0.040)	0.181*** (0.051)	0.148*** (0.040)	0.165*** (0.052)				
Standard prov. _k ^{TBT}	-0.202*** (0.050)	-0.177*** (0.053)	-0.198*** (0.053)	-0.195*** (0.055)				
Standard prov. (le) ^{SPS} †					-0.040** (0.017)	0.015 (0.021)	-0.170*** (0.024)	-0.133*** (0.030)
Standard prov. (le) ^{TBT} †					-0.074*** (0.012)	-0.141*** (0.014)	-0.051*** (0.018)	-0.085*** (0.022)
Standard prov. (le) _k ^{SPS}					0.112*** (0.039)	0.125** (0.049)	0.110*** (0.038)	0.120** (0.049)
Standard prov. (le) _k ^{TBT}					-0.197*** (0.051)	-0.178*** (0.054)	-0.192*** (0.054)	-0.189*** (0.057)
Institutional dist.	0.009*** (0.002)	0.010*** (0.002)	0.007*** (0.002)	0.010*** (0.002)	0.009*** (0.002)	0.010*** (0.002)	0.007*** (0.002)	0.009*** (0.002)
Institutional dist. × Standard prov. ^{SPS} †			0.060*** (0.007)	0.064*** (0.008)				
Institutional dist. × Standard prov. ^{TBT} †			-0.016** (0.006)	-0.031*** (0.008)				
Institutional dist. × Standard prov. (le) ^{SPS} †							0.053*** (0.009)	0.057*** (0.010)
Institutional dist. × Standard prov. (le) ^{TBT} †							-0.012 (0.008)	-0.025*** (0.010)
First-stage Residues								
Standard prov. ^{SPS}		-0.010 (0.024)		0.142*** (0.035)				
Standard prov. ^{TBT}		0.025 (0.018)		-0.081*** (0.029)				
Standard prov. (le) ^{SPS}						0.012 (0.024)		0.109*** (0.037)
Standard prov. (le) ^{TBT}						0.022 (0.018)		-0.075** (0.030)
Institutional dist. × Standard prov. ^{SPS}				-0.056*** (0.011)				
Institutional dist. × Standard prov. ^{TBT}				0.048*** (0.010)				
Institutional dist. × Standard prov. (le) ^{SPS}								-0.037*** (0.013)
Institutional dist. × Standard prov. (le) _k ^{TBT}								0.043*** (0.012)
Observations	192,498	192,498	192,498	192,498	192,498	192,498	192,498	192,498
Fixed Effects	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Kleibergen-Paap Wald F stat.	4129		1896		4642		1772	

Note: This table reports second-stage results in the IV estimations. Variables marked with † are instrumented variables (first-stage results are summarized in Table A.5). The dependent variable is trade costs associated with NTMs. *le* refers to provisions that are legally enforceable. Variables with *k* corresponds to *RTA prov_{kjt}* in the model specification, which measures the effects on non-member countries. Robust standard errors are reported in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

Table 3 Regression estimates on the effects of provisions on transparency requirements

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Estimation method	2SLS	2SRI (PPML)	2SLS	2SRI (PPML)	2SLS	2SRI (PPML)	2SLS	2SRI (PPML)
VARIABLES								
Transparency prov. ^{SPS} †	-0.008 (0.022)	-0.017 (0.028)	-0.103*** (0.029)	-0.140*** (0.037)				
Transparency prov. ^{TBT} †	-0.073*** (0.014)	-0.083*** (0.016)	-0.086*** (0.022)	-0.082*** (0.027)				
Transparency prov. _k ^{SPS}	0.104*** (0.037)	0.080* (0.047)	0.120*** (0.036)	0.092* (0.048)				
Transparency prov. _k ^{TBT}	-0.019 (0.039)	0.044 (0.045)	-0.017 (0.040)	0.047 (0.046)				
Transparency prov.(le) ^{SPS} †					-0.023 (0.021)	-0.036 (0.026)	-0.131*** (0.029)	-0.178*** (0.038)
Transparency prov.(le) ^{TBT} †					-0.058*** (0.014)	-0.066*** (0.017)	-0.070*** (0.021)	-0.062** (0.026)
Transparency prov.(le) _k ^{SPS}					0.067** (0.031)	0.052 (0.039)	0.091*** (0.031)	0.075* (0.040)
Transparency prov.(le) _k ^{TBT}					0.014 (0.039)	0.066 (0.045)	0.010 (0.039)	0.062 (0.046)
Institutional dist.	0.008*** (0.002)	0.009*** (0.002)	0.006*** (0.002)	0.006*** (0.002)	0.008*** (0.002)	0.009*** (0.002)	0.006*** (0.002)	0.007*** (0.002)
Institutional dist. × Transparency prov. ^{SPS} †			0.039*** (0.011)	0.047*** (0.015)				
Institutional dist. × Transparency prov. ^{TBT} †			0.004 (0.007)	-0.001 (0.009)				
Institutional dist. × Transparency prov.(le) ^{SPS} †							0.045*** (0.012)	0.055*** (0.015)
Institutional dist. × Transparency prov. ^{TBT} †							0.002 (0.008)	-0.004 (0.009)
First-stage Residues Transparency prov. ^{SPS}		0.062** (0.031)		0.248*** (0.043)				
Transparency prov. ^{TBT}		0.051*** (0.019)		0.002 (0.033)				
Transparency prov.(le) ^{SPS}						0.083*** (0.029)		0.280*** (0.044)
Transparency prov.(le) ^{TBT}						0.032* (0.020)		-0.029 (0.033)
Institutional dist. × Transparency prov. ^{SPS}				-0.069*** (0.017)				
Institutional dist. × Transparency prov. ^{TBT}				0.021* (0.011)				
Institutional dist. × Transparency prov.(le) ^{SPS}								-0.074*** (0.017)
Institutional dist. × Transparency prov.(le) ^{TBT}								0.026** (0.011)
Observations	192,498	192,498	192,498	192,498	192,498	192,498	192,498	192,498
Fixed Effects	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Kleibergen-Paap Wald F stat.	2935		550.6		3069		579.4	

Note: This table reports second-stage results in the IV estimations. Variables marked with † are instrumented variables (first-stage results are summarized in Table A.6). The dependent variable is trade costs associated with NTMs. *le* refers to provisions that are legally enforceable. Variables with *k* corresponds to *RTA prov_{kjt}* in the model specification, which measures the effects on non-member countries. Robust standard errors are reported in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

Table 4 Regression estimates on the effects of regulatory cooperation (excluding EU and NAFTA/USMCA)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Estimation method	2SLS	2SRI (PPML)	2SLS	2SRI (PPML)	2SLS	2SRI (PPML)	2SLS	2SRI (PPML)
VARIABLES								
All prov. ^{SPS} †	-0.073*** (0.016)	-0.054*** (0.019)						
All prov. ^{TBT} †	-0.008 (0.009)	-0.069*** (0.012)						
All prov. _k ^{SPS}	0.112*** (0.031)	0.077** (0.038)						
All prov. _k ^{TBT}	-0.117** (0.047)	-0.085 (0.054)						
All prov. (le) ^{SPS} †			-0.049*** (0.016)	-0.028 (0.019)				
All prov. (le) ^{TBT} †			-0.011 (0.009)	-0.064*** (0.011)				
All prov. (le) _k ^{SPS}			0.106*** (0.030)	0.065* (0.036)				
All prov. (le) _k ^{TBT}			-0.158*** (0.044)	-0.100* (0.052)				
Essential prov. ^{SPS} †					-0.027* (0.016)	0.004 (0.020)		
Essential prov. ^{TBT} †					-0.040*** (0.010)	-0.103*** (0.013)		
Essential prov. _k ^{SPS}					0.138*** (0.033)	0.114*** (0.042)		
Essential prov. _k ^{TBT}					-0.145*** (0.052)	-0.118** (0.057)		
Essential prov. (le) ^{SPS} †							-0.018 (0.015)	0.007 (0.019)
Essential prov. (le) ^{TBT} †							-0.038*** (0.010)	-0.098*** (0.013)
Essential prov. (le) _k ^{SPS}							0.108*** (0.032)	0.077* (0.040)
Essential prov. (le) _k ^{TBT}							-0.145*** (0.053)	-0.103* (0.059)
First-stage Residues								
SPS prov.		0.150*** (0.022)		0.135*** (0.022)		0.068*** (0.022)		0.070*** (0.022)
TBT prov.		-0.068*** (0.015)		-0.081*** (0.015)		-0.024 (0.016)		-0.026 (0.016)
Observations	192,498	192,498	192,498	192,498	192,498	192,498	192,498	192,498
Fixed Effects	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Kleibergen-Paap Wald F stat.	5785		5670		5348		5694	

Note: This table reports second-stage results in the IV estimations. Variables marked with † are instrumented variables (first-stage results are summarized in Table A.7(A)). The dependent variable is trade costs associated with Non-Tariff Measures (NTMs). *le* refers to provisions that are legally enforceable. Variables with *k* corresponds to *RTA prov_{kjt}* in the model specification, which measures the effects on non-member countries. Robust standard errors are reported in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

Table 5 Regression analysis on the effects of provisions on harmonization of standards (excluding EU and NAFTA/USMCA)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Estimation method	2SLS	2SRI (PPML)	2SLS	2SRI (PPML)	2SLS	2SRI (PPML)	2SLS	2SRI (PPML)
VARIABLES								
Standard prov. ^{SPS} †	-0.040*** (0.015)	0.015 (0.018)	-0.188*** (0.021)	-0.144*** (0.026)				
Standard prov. ^{TBT} †	-0.058*** (0.009)	-0.118*** (0.011)	-0.016 (0.013)	-0.040** (0.016)				
Standard prov. ^{SPS} _k	0.102*** (0.037)	0.099** (0.047)	0.095*** (0.037)	0.095** (0.047)				
Standard prov. ^{TBT} _k	-0.121*** (0.044)	-0.123*** (0.047)	-0.122*** (0.046)	-0.150*** (0.049)				
Standard prov.(le) ^{SPS} †					-0.030** (0.015)	0.013 (0.018)	-0.151*** (0.021)	-0.121*** (0.026)
Standard prov.(le) ^{TBT} †					-0.056*** (0.009)	-0.117*** (0.011)	-0.027** (0.014)	-0.055*** (0.018)
Standard prov.(le) _k ^{SPS}					0.064* (0.033)	0.065 (0.043)	0.066** (0.033)	0.066 (0.043)
Standard prov.(le) _k ^{TBT}					-0.105*** (0.040)	-0.173*** (0.045)	-0.096** (0.041)	-0.166*** (0.046)
Institutional dist.	0.010*** (0.002)	0.013*** (0.002)	0.008*** (0.002)	0.011*** (0.002)	0.010*** (0.002)	0.013 (0.018)	0.008*** (0.002)	0.052*** (0.009)
Institutional dist. × Standard prov. ^{SPS} †			0.057*** (0.006)	0.060*** (0.007)				
Institutional dist. × Standard prov. ^{TBT} †			-0.019*** (0.006)	-0.035*** (0.007)				
Institutional dist. × Standard prov.(le) ^{SPS} †							0.049*** (0.007)	-0.029*** (0.009)
Institutional dist. × Standard prov.(le) ^{TBT} †							-0.013** (0.007)	-0.121*** (0.026)
First-stage Residues								
Standard prov. ^{SPS}		0.011 (0.021)		0.160*** (0.033)				
Standard prov. ^{TBT}		0.010 (0.014)		-0.109*** (0.022)				
Standard prov.(le) ^{SPS}						0.028 (0.021)		0.122*** (0.033)
Standard prov.(le) ^{TBT}						0.009 (0.014)		-0.096*** (0.024)
Institutional dist. × Standard prov. ^{SPS}				-0.056*** (0.010)				
Institutional dist. × Standard prov. ^{TBT}				0.054*** (0.009)				
Institutional dist. × Standard prov.(le) ^{SPS}								-0.037*** (0.012)
Institutional dist. × Standard prov.(le) _k ^{TBT}								0.048*** (0.010)
Observations	192,498	192,498	192,498	192,498	192,498	192,498	192,498	192,498
Fixed Effects	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Kleibergen-Paap Wald F stat.	6004		2892		5896		2425	

Note: This table reports second-stage results in the IV estimations. Variables marked with † are instrumented variables (first-stage results are summarized in Table A.7(B) and Table A.7(C)). The dependent variable is trade costs associated with NTMs. *le* refers to provisions that are legally enforceable. Variables with *k* corresponds to *RTA prov_{kjt}* in the model specification, which measures the effects on non-member countries. Robust standard errors are reported in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

Table 6 Regression analysis on the effects of provisions on transparency requirements (excluding EU and NAFTA/USMCA)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Estimation method	2SLS	2SRI (PPML)	2SLS	2SRI (PPML)	2SLS	2SRI (PPML)	2SLS	2SRI (PPML)
VARIABLES								
Transparency prov. ^{SPS} †	0.076** (0.031)	0.062 (0.038)	0.026 (0.058)	-0.052 (0.073)				
Transparency prov. ^{TBT} †	-0.088*** (0.022)	-0.100*** (0.026)	-0.112*** (0.041)	-0.083 (0.051)				
Transparency prov. _k ^{SPS}	0.127*** (0.037)	0.097** (0.048)	0.144*** (0.037)	0.107** (0.048)				
Transparency prov. _k ^{TBT}	-0.064 (0.043)	0.000 (0.050)	-0.068 (0.043)	-0.006 (0.049)				
Transparency prov.(le) ^{SPS} †					0.051 (0.032)	0.039 (0.040)	-0.012 (0.061)	-0.107 (0.076)
Transparency prov.(le) ^{TBT} †					-0.078*** (0.026)	-0.090*** (0.030)	-0.102** (0.044)	-0.062 (0.054)
Transparency prov.(le) _k ^{SPS}					0.091*** (0.032)	0.072* (0.040)	0.114*** (0.031)	0.091** (0.040)
Transparency prov.(le) _k ^{TBT}					-0.038 (0.042)	0.013 (0.049)	-0.050 (0.041)	-0.001 (0.049)
Institutional dist.	0.010*** (0.002)	0.011*** (0.002)	0.009*** (0.002)	0.009*** (0.002)	0.010*** (0.002)	0.011*** (0.002)	0.009*** (0.002)	0.009*** (0.002)
Institutional dist. × Transparency prov. ^{SPS} †			0.026 (0.018)	0.044* (0.023)				
Institutional dist. × Transparency prov. ^{TBT} †			0.006 (0.012)	-0.008 (0.015)				
Institutional dist. × Transparency prov.(le) ^{SPS} †							0.033* (0.018)	0.057** (0.022)
Institutional dist. × Transparency prov. ^{TBT} †							0.004 (0.012)	-0.015 (0.015)
First-stage Residues Transparency prov. ^{SPS}		-0.016 (0.040)		0.137* (0.077)				
Transparency prov. ^{TBT}		0.046* (0.027)		-0.030 (0.052)				
Transparency prov.(le) ^{SPS}						0.010 (0.042)		0.187** (0.080)
Transparency prov.(le) ^{TBT}						0.037 (0.031)		-0.052 (0.055)
Institutional dist. × Transparency prov. ^{SPS}				-0.059** (0.024)				
Institutional dist. × Transparency prov. ^{TBT}				0.036** (0.016)				
Institutional dist. × Transparency prov.(le) ^{SPS}								-0.068*** (0.024)
Institutional dist. × Transparency prov.(le) ^{TBT}								0.044*** (0.016)
Observations	192,498	192,498	192,498	192,498	192,498	192,498	192,498	192,498
Fixed Effects	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Kleibergen-Paap Wald F stat.	1496		482.4		1281		437	

Note: This table reports second-stage results in the IV estimations. Variables marked with † are instrumented variables (first-stage results are summarized in Table A.7(D) and Table A.7(E)). The dependent variable is trade costs associated with NTMs. *le* refers to provisions that are legally enforceable. Variables with *k* corresponds to $RTA\ prov_{kjt}$ in the model specification, which measures the effects on non-member countries. Robust standard errors are reported in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

Table 7 Regression estimates on the effects of regulatory cooperation (using only pre-2020 sample)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Estimation method	2SLS	2SRI (PPML)	2SLS	2SRI (PPML)	2SLS	2SRI (PPML)	2SLS	2SRI (PPML)
VARIABLES								
All prov. ^{SPS} †	-0.175*** (0.022)	-0.112*** (0.027)						
All prov. ^{TBT} †	-0.026 (0.020)	-0.097*** (0.025)						
All prov. _k ^{SPS}	0.099*** (0.037)	0.103** (0.045)						
All prov. _k ^{TBT}	-0.160*** (0.056)	-0.125* (0.064)						
All prov. (le) ^{SPS} †			-0.145*** (0.024)	-0.070** (0.031)				
All prov. (le) ^{TBT} †			-0.013 (0.017)	-0.087*** (0.022)				
All prov. (le) _k ^{SPS}			0.074** (0.036)	0.074* (0.044)				
All prov. (le) _k ^{TBT}			-0.158*** (0.055)	-0.107* (0.062)				
Essential prov. ^{SPS} †					-0.114*** (0.020)	-0.057** (0.025)		
Essential prov. ^{TBT} †					-0.057*** (0.018)	-0.111*** (0.022)		
Essential prov. _k ^{SPS}					0.133*** (0.040)	0.142*** (0.049)		
Essential prov. _k ^{TBT}					-0.131** (0.063)	-0.077 (0.067)		
Essential prov. (le) ^{SPS} †							-0.098*** (0.021)	-0.035 (0.027)
Essential prov. (le) ^{TBT} †							-0.046*** (0.017)	-0.112*** (0.021)
Essential prov. (le) _k ^{SPS}							0.085** (0.039)	0.094** (0.047)
Essential prov. (le) _k ^{TBT}							-0.121* (0.067)	-0.064 (0.071)
First-stage Residues								
SPS prov.		0.197*** (0.030)		0.168*** (0.033)		0.116*** (0.029)		0.101*** (0.030)
TBT prov.		-0.101*** (0.029)		-0.100*** (0.026)		-0.102*** (0.027)		-0.095*** (0.027)
Observations	170,368	170,368	170,368	170,368	170,368	170,368	170,368	170,368
Fixed Effects	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Kleibergen-Paap Wald F stat.	3207		2408		4188		3453	

Note: This table reports second-stage results in the IV estimations. Variables marked with † are instrumented variables (first-stage results are summarized in Table A.8(A)). The dependent variable is trade costs associated with Non-Tariff Measures (NTMs). *le* refers to provisions that are legally enforceable. Variables with *k* corresponds to *RTA prov_{kjt}* in the model specification, which measures the effects on non-member countries. Robust standard errors are reported in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

Table 8 Regression analysis on the effects of provisions on harmonization of standards (using only pre-2020 sample)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Estimation method	2SLS	2SRI (PPML)	2SLS	2SRI (PPML)	2SLS	2SRI (PPML)	2SLS	2SRI (PPML)
VARIABLES								
Standard prov. ^{SPS} †	-0.108*** (0.018)	-0.050** (0.022)	-0.286*** (0.024)	-0.248*** (0.030)				
Standard prov. ^{TBT} †	-0.091*** (0.013)	-0.123*** (0.016)	-0.049*** (0.018)	-0.055*** (0.021)				
Standard prov. _k ^{SPS}	0.117*** (0.045)	0.136** (0.056)	0.098** (0.045)	0.114** (0.057)				
Standard prov. _k ^{TBT}	-0.197*** (0.061)	-0.124** (0.062)	-0.212*** (0.063)	-0.145** (0.063)				
Standard prov. (le) ^{SPS} †					-0.086*** (0.018)	-0.034 (0.022)	-0.245*** (0.026)	-0.219*** (0.031)
Standard prov. (le) ^{TBT} †					-0.092*** (0.012)	-0.138*** (0.014)	-0.050*** (0.018)	-0.066*** (0.021)
Standard prov. (le) _k ^{SPS}					0.066 (0.042)	0.084 (0.053)	0.066 (0.042)	0.077 (0.053)
Standard prov. (le) _k ^{TBT}					-0.217*** (0.063)	-0.158** (0.063)	-0.240*** (0.065)	-0.185*** (0.065)
Institutional dist.	0.013*** (0.002)	0.015*** (0.002)	0.011*** (0.002)	0.014*** (0.002)	0.013*** (0.002)	0.015*** (0.002)	0.012*** (0.002)	0.015*** (0.002)
Institutional dist. × Standard prov. ^{SPS} †			0.069*** (0.007)	0.075*** (0.009)				
Institutional dist. × Standard prov. ^{TBT} †			-0.019*** (0.006)	-0.030*** (0.008)				
Institutional dist. × Standard prov. (le) ^{SPS} †							0.066*** (0.010)	0.072*** (0.011)
Institutional dist. × Standard prov. (le) ^{TBT} †							-0.021*** (0.007)	-0.033*** (0.009)
First-stage Residues								
Standard prov. ^{SPS}		0.053** (0.026)		0.234*** (0.039)				
Standard prov. ^{TBT}		-0.076*** (0.021)		-0.215*** (0.032)				
Standard prov. (le) ^{SPS}						0.048* (0.027)		0.181*** (0.040)
Standard prov. (le) ^{TBT}						-0.061*** (0.020)		-0.223*** (0.033)
Institutional dist. × Standard prov. ^{SPS}				-0.069*** (0.013)				
Institutional dist. × Standard prov. ^{TBT}				0.060*** (0.011)				
Institutional dist. × Standard prov. (le) ^{SPS}								-0.050*** (0.015)
Institutional dist. × Standard prov. (le) _k ^{TBT}								0.070*** (0.012)
Observations	170,368	170,368	170,368	170,368	170,368	170,368	170,368	170,368
Fixed Effects	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Kleibergen-Paap Wald F stat.	4073		1892		4158		1049	

Note: This table reports second-stage results in the IV estimations. Variables marked with † are instrumented variables (first-stage results are summarized in Table A.8(B) and Table A.8(C)). The dependent variable is trade costs associated with NTMs. *le* refers to provisions that are legally enforceable. Variables with *k* corresponds to *RTA prov_{kjt}* in the model specification, which measures the effects on non-member countries. Robust standard errors are reported in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

Table 9 Regression analysis on the effects of provisions on transparency requirements (using only pre-2020 sample)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Estimation method	2SLS	2SRI (PPML)	2SLS	2SRI (PPML)	2SLS	2SRI (PPML)	2SLS	2SRI (PPML)
VARIABLES								
Transparency prov. ^{SPS} †	-0.017 (0.025)	-0.001 (0.033)	-0.175*** (0.034)	-0.208*** (0.044)				
Transparency prov. ^{TBT} †	-0.107*** (0.014)	-0.121*** (0.017)	-0.082*** (0.023)	-0.073** (0.028)				
Transparency prov. _k ^{SPS}	0.100** (0.041)	0.113** (0.050)	0.111*** (0.039)	0.115** (0.051)				
Transparency prov. _k ^{TBT}	-0.049 (0.043)	-0.001 (0.050)	-0.060 (0.044)	-0.010 (0.050)				
Transparency prov.(le) ^{SPS} †					-0.037 (0.024)	-0.019 (0.031)	-0.211*** (0.035)	-0.250*** (0.045)
Transparency prov.(le) ^{TBT} †					-0.090*** (0.015)	-0.103*** (0.017)	-0.066*** (0.022)	-0.056** (0.027)
Transparency prov.(le) _k ^{SPS}					0.054 (0.035)	0.068 (0.043)	0.072** (0.034)	0.080* (0.044)
Transparency prov.(le) _k ^{TBT}					-0.007 (0.042)	0.026 (0.050)	-0.024 (0.043)	0.011 (0.050)
Institutional dist.	0.013*** (0.002)	0.014*** (0.002)	0.011*** (0.002)	0.013*** (0.002)	0.013*** (0.002)	0.014*** (0.002)	0.011*** (0.002)	0.013*** (0.002)
Institutional dist. × Transparency prov. ^{SPS} †			0.065*** (0.014)	0.080*** (0.018)				
Institutional dist. × Transparency prov. ^{TBT} †			-0.010 (0.008)	-0.018* (0.010)				
Institutional dist. × Transparency prov.(le) ^{SPS} †							0.071*** (0.014)	0.088*** (0.017)
Institutional dist. × Transparency prov. ^{TBT} †							-0.012 (0.008)	-0.020** (0.010)
First-stage Residues Transparency prov. ^{SPS}		0.035 (0.036)		0.295*** (0.052)				
Transparency prov. ^{TBT}		0.078*** (0.020)		-0.003 (0.037)				
Transparency prov.(le) ^{SPS}						0.057* (0.034)		0.334*** (0.053)
Transparency prov.(le) ^{TBT}						0.057*** (0.021)		-0.031 (0.036)
Institutional dist. × Transparency prov. ^{SPS}				-0.097*** (0.021)				
Institutional dist. × Transparency prov. ^{TBT}				0.031** (0.012)				
Institutional dist. × Transparency prov.(le) ^{SPS}								-0.102*** (0.020)
Institutional dist. × Transparency prov.(le) ^{TBT}								0.036*** (0.012)
Observations	170,368	170,368	170,368	170,368	170,368	170,368	170,368	170,368
Fixed Effects	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Kleibergen-Paap Wald F stat.	2215		383.8		2289		423.9	

Note: This table reports second-stage results in the IV estimations. Variables marked with † are instrumented variables (first-stage results are summarized in Table A.8(D) and Table A.8(E)). The dependent variable is trade costs associated with NTMs. *le* refers to provisions that are legally enforceable. Variables with *k* corresponds to $RTA\ prov_{kjt}$ in the model specification, which measures the effects on non-member countries. Robust standard errors are reported in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

Appendix

Table A.1 Variable Description

Variable	Description
τ_{ijt}^{NTM}	Trade costs related to NTM
$RTA\ prov_{ijt}^X$	The variable measures the number of provisions in a given policy area X ($X \in \{SPS, TBT\}$) included in the agreement between country i and j. Provisions are classified into four categories: (i) all provisions, (ii) essential provisions, (iii) provisions on harmonization of standards, and (iv) provisions on transparency requirements. For each category, provisions are further distinguished by their legal enforceability.
$RTA\ prov_{kjt}^X$	The variable measures the highest provision count in a given policy area X ($X \in \{SPS, TBT\}$) in the agreement between country j and other country k ($k \neq i$). Provisions are classified into four categories: (i) all provisions, (ii) essential provisions, (iii) provisions on harmonization of standards, and (iv) provisions on transparency requirements. For each category, provisions are further distinguished by their legal enforceability.
RTA	RTA membership dummy, equals one when the trading partners are RTA signatories.
WTO membership	WTO membership dummy, equals one when both trading partners are WTO members.
Institutional dis.	Institutional distance, the Euclidean distance of six governance indicators.
Food production index	The relative difference in Food production index between trading partners.

TableA.2 Statistical Description of variables in this study

Variable	Observations	Mean	SD	Min	Max
Trade costs related to NTM	211040	295.246	161.389	7.362	2350.268
All prov. ^{SPS}	244282	0.062	0.176	0	1
All prov. (le) ^{SPS}	244282	0.056	0.172	0	1
Essential prov. ^{SPS}	244282	0.055	0.161	0	1
Essential prov. (le) ^{SPS}	244282	0.050	0.156	0	1
Standard prov. ^{SPS}	244282	0.053	0.161	0	1
Standard prov. (le) ^{SPS}	244282	0.048	0.154	0	1
Transparency prov. ^{SPS}	244282	0.039	0.123	0	1
Transparency prov. (le) ^{SPS}	244282	0.034	0.118	0	1
All prov. ^{TBT}	244282	0.114	0.239	0	1
All prov. (le) ^{TBT}	244282	0.095	0.233	0	1
Essential prov. ^{TBT}	244282	0.084	0.200	0	1
Essential prov. (le) ^{TBT}	244282	0.075	0.198	0	1
Standard prov. ^{TBT}	244282	0.083	0.226	0	1
Standard prov. (le) ^{TBT}	244282	0.073	0.220	0	1
Transparency prov. ^{TBT}	244282	0.081	0.216	0	1
Transparency prov. (le) ^{TBT}	244282	0.080	0.215	0	1
All prov. _k ^{SPS}	244282	0.460	0.300	0	1
All prov. (le) _k ^{SPS}	244282	0.436	0.313	0	1
Essential prov. _k ^{SPS}	244282	0.428	0.281	0	1
Essential prov. (le) _k ^{SPS}	244282	0.404	0.294	0	1
Standard prov. _k ^{SPS}	244282	0.435	0.304	0	1
Standard prov. (le) _k ^{SPS}	244282	0.405	0.309	0	1
Transparency prov. _k ^{SPS}	244282	0.348	0.272	0	1
Transparency prov. (le) _k ^{SPS}	244282	0.326	0.282	0	1
All prov. _k ^{TBT}	244282	0.512	0.306	0	1
All prov. (le) _k ^{TBT}	244282	0.462	0.350	0	1
Essential prov. _k ^{TBT}	244282	0.407	0.311	0	1
Essential prov. (le) _k ^{TBT}	244282	0.376	0.334	0	1
Standard prov. _k ^{TBT}	244282	0.419	0.362	0	1
Standard prov. (le) _k ^{TBT}	244282	0.374	0.381	0	1
Transparency prov. _k ^{TBT}	244282	0.475	0.420	0	1
Transparency prov. (le) _k ^{TBT}	244282	0.466	0.426	0	1
RTA	244282	0.271	0.445	0	1
WTO membership	244282	0.805	0.396	0	1
Institutional distance	217836	3.000	1.694	0.105	9.265
Food production index	241636	0.035	0.294	-0.863	6.315

Note: k denotes third-country group, corresponding to $RTA prov_{kjt}$ in the model specification. le denotes legal enforceability.

Table A.3 (A) Regression estimates on the effects of regulatory cooperation using OLS and PPML methods

Estimation method	(1) OLS	(2) PPML	(3) OLS	(4) PPML	(5) OLS	(6) PPML	(7) OLS	(8) PPML
VARIABLES								
All prov. ^{SPS}	0.056*** (0.008)	0.070*** (0.009)						
All prov. ^{TBT}	-0.102*** (0.008)	-0.145*** (0.010)						
All prov. _k ^{SPS}	0.192*** (0.034)	0.166*** (0.042)						
All prov. _k ^{TBT}	-0.191*** (0.049)	-0.137** (0.056)						
All prov. (le) ^{SPS}			0.068*** (0.008)	0.083*** (0.009)				
All prov. (le) ^{TBT}			-0.094*** (0.008)	-0.132*** (0.009)				
All prov. (le) _k ^{SPS}			0.168*** (0.033)	0.134*** (0.040)				
All prov. (le) _k ^{TBT}			-0.206*** (0.048)	-0.135** (0.054)				
Essential prov. ^{SPS}					0.050*** (0.008)	0.058*** (0.010)		
Essential prov. ^{TBT}					-0.099*** (0.008)	-0.138*** (0.010)		
Essential prov. _k ^{SPS}					0.206*** (0.036)	0.184*** (0.046)		
Essential prov. _k ^{TBT}					-0.184*** (0.053)	-0.134** (0.057)		
Essential prov. (le) ^{SPS}							0.054*** (0.008)	0.063*** (0.009)
Essential prov. (le) ^{TBT}							-0.091*** (0.008)	-0.127*** (0.009)
Essential prov. (le) _k ^{SPS}							0.161*** (0.036)	0.135*** (0.044)
Essential prov. (le) _k ^{TBT}							-0.177*** (0.055)	-0.113* (0.059)
RTA	0.050*** (0.005)	0.061*** (0.006)	0.040*** (0.004)	0.048*** (0.005)	0.040*** (0.004)	0.047*** (0.005)	0.036*** (0.004)	0.041*** (0.005)
WTO membership	-0.068*** (0.012)	-0.087*** (0.013)	-0.068*** (0.012)	-0.087*** (0.013)	-0.066*** (0.012)	-0.084*** (0.013)	-0.066*** (0.012)	-0.084*** (0.013)
Institutional dist.	0.009*** (0.002)	0.010*** (0.002)	0.009*** (0.002)	0.010*** (0.002)	0.009*** (0.002)	0.010*** (0.002)	0.009*** (0.002)	0.010*** (0.002)
Food production index	-0.119*** (0.020)	-0.092*** (0.023)	-0.114*** (0.020)	-0.085*** (0.023)	-0.117*** (0.020)	-0.090*** (0.023)	-0.116*** (0.020)	-0.087*** (0.023)
Observations	192,498	192,498	192,498	192,498	192,498	192,498	192,498	192,498
Fixed Effects	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>

Note: The dependent variable is trade costs associated with Non-Tariff Measures (NTMs). *le* refers to provisions that are legally enforceable. Variables with *k* corresponds to *RTA prov_{kjt}* in the model specification, which measures the effects on non-member countries. Robust standard errors are reported in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

Table A.3 (B) Regression estimates on the effects of provisions on harmonization of standards using OLS and PPML methods

Estimation method	(1) OLS	(2) PPML	(3) OLS	(4) PPML	(5) OLS	(6) PPML	(7) OLS	(8) PPML
VARIABLES								
Standard prov. ^{SPS}	0.009 (0.008)	0.012 (0.009)	-0.052*** (0.012)	-0.061*** (0.015)				
Standard prov. ^{TBT}	-0.099*** (0.007)	-0.131*** (0.008)	-0.109*** (0.011)	-0.136*** (0.012)				
Standard prov. _k ^{SPS}	0.192*** (0.040)	0.175*** (0.051)	0.184*** (0.040)	0.167*** (0.050)				
Standard prov. _k ^{TBT}	-0.213*** (0.049)	-0.155*** (0.050)	-0.188*** (0.050)	-0.126** (0.051)				
Standard prov.(le) ^{SPS}					0.022*** (0.008)	0.026*** (0.009)	-0.039*** (0.013)	-0.050*** (0.015)
Standard prov.(le) ^{TBT}					-0.094*** (0.007)	-0.126*** (0.008)	-0.110*** (0.010)	-0.138*** (0.012)
Standard prov.(le) _k ^{SPS}					0.144*** (0.038)	0.126*** (0.048)	0.139*** (0.038)	0.120** (0.047)
Standard prov.(le) _k ^{TBT}					-0.215*** (0.050)	-0.157*** (0.051)	-0.182*** (0.051)	-0.119** (0.052)
Institutional dist.	0.009*** (0.002)	0.010*** (0.002)	0.007*** (0.002)	0.009*** (0.002)	0.009*** (0.002)	0.010*** (0.002)	0.007*** (0.002)	0.009*** (0.002)
Institutional dist. × Standard prov. ^{SPS}			0.024*** (0.004)	0.028*** (0.005)				
Institutional dist. × Standard prov. ^{TBT}			0.005 (0.004)	0.004 (0.004)				
Institutional dist. × Standard prov.(le) ^{SPS}							0.023*** (0.004)	0.029*** (0.005)
Institutional dist. × Standard prov.(le) ^{TBT}							0.008** (0.004)	0.007 (0.004)
Observations	192,498	192,498	192,498	192,498	192,498	192,498	192,498	192,498
Fixed Effects	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: The dependent variable is trade costs associated with NTMs. *le* refers to provisions that are legally enforceable. Variables with *k* corresponds to *RTA prov_{kjt}* in the model specification, which measures the effects on non-member countries. Robust standard errors are reported in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

Table A.3 (C) Regression estimates on the effects of provisions on transparency requirements using OLS and PPML methods

Estimation method	(1) OLS	(2) PPML	(3) OLS	(4) PPML	(5) OLS	(6) PPML	(7) OLS	(8) PPML
VARIABLES								
Transparency prov. ^{SPS}	0.046*** (0.008)	0.036*** (0.010)	0.056*** (0.013)	0.045*** (0.017)				
Transparency prov. ^{TBT}	-0.042*** (0.007)	-0.048*** (0.009)	-0.107*** (0.012)	-0.107*** (0.014)				
Transparency prov. _k ^{SPS}	0.135*** (0.034)	0.111** (0.044)	0.143*** (0.034)	0.119*** (0.044)				
Transparency prov. _k ^{TBT}	-0.018 (0.039)	0.047 (0.044)	-0.003 (0.038)	0.059 (0.044)				
Transparency prov.(le) ^{SPS}					0.046*** (0.008)	0.035*** (0.010)	0.050*** (0.013)	0.036** (0.017)
Transparency prov.(le) ^{TBT}					-0.041*** (0.007)	-0.047*** (0.009)	-0.106*** (0.012)	-0.106*** (0.014)
Transparency prov.(le) _k ^{SPS}					0.104*** (0.029)	0.090** (0.037)	0.114*** (0.029)	0.100*** (0.037)
Transparency prov.(le) _k ^{TBT}					0.005 (0.038)	0.058 (0.044)	0.021 (0.038)	0.069 (0.044)
Institutional dist.	0.009*** (0.002)	0.009*** (0.002)	0.007*** (0.002)	0.008*** (0.002)	0.009*** (0.002)	0.009*** (0.002)	0.007*** (0.002)	0.008*** (0.002)
Institutional dist. × Transparency prov. ^{SPS}			-0.004 (0.005)	-0.004 (0.006)				
Institutional dist. × Transparency prov. ^{TBT}			0.025*** (0.004)	0.022*** (0.004)				
Institutional dist. × Transparency prov.(le) ^{SPS}							-0.001 (0.005)	-0.000 (0.006)
Institutional dist. × Transparency prov. ^{TBT}							0.025*** (0.004)	0.022*** (0.004)
Observations	192,498	192,498	192,498	192,498	192,498	192,498	192,498	192,498
Fixed Effects	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: The dependent variable is trade costs associated with NTMs. *le* refers to provisions that are legally enforceable. Variables with *k* corresponds to *RTA prov_{kjt}* in the model specification, which measures the effects on non-member countries. Robust standard errors are reported in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

Table A.4 First-stage results in Table 1

Corresponding column	(1) and (2)		(3) and (4)		(5) and (6)		(7) and (8)	
Instrumented variable	SPS-all prov.	TBT-all prov.	SPS-all prov. (le)	TBT-all prov. (le)	SPS-essential prov.	TBT-essential prov.	SPS-essential prov. (le)	TBT-essential prov. (le)
VARIABLES								
IV-SPS	0.527*** (0.006)	0.049*** (0.005)	0.489*** (0.005)	0.085*** (0.005)	0.602*** (0.006)	0.083*** (0.006)	0.589*** (0.007)	0.114*** (0.006)
IV-TBT	-0.099*** (0.005)	0.412*** (0.005)	-0.134*** (0.005)	0.492*** (0.005)	-0.150*** (0.004)	0.415*** (0.005)	-0.090*** (0.004)	0.444*** (0.005)
Observations	192,498	192,498	192,498	192,498	192,498	192,498	192,498	192,498
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fixed Effects	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>
1 st stage F-statistics	4409	4336	6020	5083	4489	6784	5945	8052

Note: The first-stage results in the estimation of 2SLS and 2SRI are identical, thus, each instrument set corresponds to two columns.

Table A.5 (A) First-stage results in Table 2

Corresponding column	(1) and (2)		(3) and (4)			
Instrumented variable	SPS-standard prov.	TBT-standard prov.	SPS-standard prov.	TBT-standard prov.	Institutional dis.× SPS-standard prov	Institutional dist.× TBT-standard prov
VARIABLES						
IV-SPS	0.587*** (0.006)	-0.093*** (0.006)	0.670*** (0.009)	0.017** (0.008)	-0.046** (0.023)	-0.053** (0.022)
IV-TBT	-0.168*** (0.003)	0.578*** (0.005)	-0.220*** (0.006)	0.655*** (0.008)	-0.263*** (0.016)	0.162*** (0.022)
IV-SPS interaction			-0.032*** (0.003)	-0.039*** (0.002)	0.598*** (0.011)	-0.083*** (0.010)
IV-TBT interaction			0.020*** (0.002)	-0.033*** (0.003)	-0.052*** (0.008)	0.454*** (0.011)
Observations	192,498	192,498	192,498	192,498	192,498	192,498
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Fixed Effects	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>
1 st stage F-statistics	5245	6412	2696	3747	2405	1801

Note: The first-stage results in the estimation of 2SLS and 2SRI are identical, thus, each instrument set corresponds to two columns.

Table A.5 (B) First-stage results in Table 2

Corresponding column	(5) and (6)		(7) and (8)			
Instrumented variable	SPS-standard prov. (le)	TBT-standard prov. (le)	SPS-standard prov. (le)	TBT-standard prov. (le)	Institutional dist. × SPS-standard prov. (le)	Institutional dist.× TBT-standard prov. (le)
VARIABLES						
IV-SPS	0.614*** (0.007)	-0.047*** (0.006)	0.711*** (0.010)	0.044*** (0.007)	0.149*** (0.027)	-0.155*** (0.019)
IV-TBT	-0.130*** (0.004)	0.577*** (0.005)	-0.197*** (0.006)	0.675*** (0.007)	-0.305*** (0.019)	0.289*** (0.020)
IV-SPS interaction			-0.039*** (0.003)	-0.034*** (0.002)	0.518*** (0.013)	-0.000 (0.008)
IV-TBT interaction			0.026*** (0.002)	-0.040*** (0.002)	0.027*** (0.009)	0.404*** (0.010)
Observations	192,498	192,498	192,498	192,498	192,498	192,498
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Fixed Effects	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>
1 st stage F-statistics	4661	7849	2440	4578	1818	2330

Note: The first-stage results in the estimation of 2SLS and 2SRI are identical, thus, each instrument set corresponds to two columns.

Table A.6 (A) First-stage results in Table 3

Corresponding column	(1) and (2)		(3) and (4)			
Instrumented variable	SPS-transparency prov.	TBT-transparency prov.	SPS-transparency prov.	TBT-transparency prov.	Institutional dist.× SPS-transparency prov.	Institutional dist.× TBT-transparency prov.
VARIABLES						
IV-SPS	0.496*** (0.006)	0.123*** (0.006)	0.689*** (0.011)	0.161*** (0.010)	0.018 (0.030)	-0.166*** (0.029)
IV-TBT	-0.102*** (0.003)	0.423*** (0.004)	-0.197*** (0.006)	0.409*** (0.007)	-0.447*** (0.014)	-0.184*** (0.018)
IV-SPS interaction			-0.074*** (0.004)	-0.015*** (0.003)	0.439*** (0.015)	0.179*** (0.014)
IV-TBT interaction			0.038*** (0.002)	0.005** (0.002)	0.104*** (0.007)	0.504*** (0.009)
Observations	192,498	192,498	192,498	192,498	192,498	192,498
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Fixed Effects	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>
1 st stage F-statistics	2952	7687	1717	3858	1955	4121

Note: The first-stage results in the estimation of 2SLS and 2SRI are identical, thus, each instrument set corresponds to two columns.

Table A.6 (B) First-stage results in Table 3

Corresponding column	(5) and (6)		(7) and (8)			
Instrumented variable	SPS-transparency prov. (le)	TBT-transparency prov. (le)	SPS-transparency prov. (le)	TBT-transparency prov. (le)	Institutional dist.× SPS-transparency prov. (le)	Institutional dist.× TBT-transparency prov. (le)
VARIABLES						
IV-SPS	0.523*** (0.007)	0.132*** (0.007)	0.712*** (0.011)	0.193*** (0.010)	0.178*** (0.030)	-0.037 (0.029)
IV-TBT	-0.083*** (0.003)	0.407*** (0.004)	-0.171*** (0.006)	0.397*** (0.007)	-0.384*** (0.014)	-0.216*** (0.018)
IV-SPS interaction			-0.074*** (0.004)	-0.023*** (0.003)	0.414*** (0.016)	0.133*** (0.015)
IV-TBT interaction			0.035*** (0.002)	0.004* (0.002)	0.099*** (0.007)	0.494*** (0.009)
Observations	192,498	192,498	192,498	192,498	192,498	192,498
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Fixed Effects	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>
1 st stage F-statistics	3052	8019	1749	3995	3585	1698

Note: The first-stage results in the estimation of 2SLS and 2SRI are identical, thus, each instrument set corresponds to two columns.

Table A.7 (A) First-stage results in Table 4

Corresponding column	(1) and (2)		(3) and (4)		(5) and (6)		(7) and (8)	
Instrumented variable	SPS-all prov.	TBT-all prov.	SPS-all prov. (le)	TBT-all prov. (le)	SPS-essential prov.	TBT-essential prov.	SPS-essential prov. (le)	TBT-essential prov. (le)
VARIABLES								
IV-SPS	0.480*** (0.005)	-0.228*** (0.005)	0.456*** (0.005)	-0.158*** (0.005)	0.549*** (0.006)	-0.143*** (0.005)	0.553*** (0.006)	-0.109*** (0.005)
IV-TBT	0.022*** (0.004)	0.825*** (0.004)	0.078*** (0.004)	0.820*** (0.004)	-0.041*** (0.003)	0.748*** (0.004)	-0.007** (0.004)	0.752*** (0.004)
Observations	192,498	192,498	192,498	192,498	192,498	192,498	192,498	192,498
Fixed Effects	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
1 st stage F-statistics	5969	18056	6276	23186	5332	17442	5626	18618

Note: The first-stage results in the estimation of 2SLS and 2SRI are identical, thus, each instrument set corresponds to two columns.

Table A.7 (B) First-stage results in Table 5

Corresponding column	(1) and (2)		(3) and (4)			
Instrumented variable	SPS-standard prov.	TBT-standard prov.	SPS-standard prov.	TBT-standard prov.	Institutional dis.× SPS-standard prov	Institutional dist.× TBT-standard prov
VARIABLES						
IV-SPS	0.575*** (0.005)	-0.113*** (0.006)	0.605*** (0.008)	-0.084*** (0.008)	-0.011 (0.021)	-0.106*** (0.020)
IV-TBT	-0.093*** (0.003)	0.779*** (0.005)	-0.101*** (0.005)	0.983*** (0.008)	-0.075*** (0.015)	0.618*** (0.020)
IV-SPS interaction			-0.012*** (0.002)	-0.003 (0.002)	0.589*** (0.010)	-0.048*** (0.009)
IV-TBT interaction			0.003 (0.002)	-0.090*** (0.003)	-0.068*** (0.008)	0.400*** (0.010)
Observations	192,498	192,498	192,498	192,498	192,498	192,498
Fixed Effects	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>
Controls	Yes	Yes	Yes	Yes	Yes	Yes
1 st stage F-statistics	6149	12618	3121	6896	2671	3622

Note: The first-stage results in the estimation of 2SLS and 2SRI are identical, thus, each instrument set corresponds to two columns.

Table A.7 (C) First-stage results in Table 5

Corresponding column	(5) and (6)		(7) and (8)			
Instrumented variable	SPS-standard prov. (le)	TBT-standard prov. (le)	SPS-standard prov. (le)	TBT-standard prov. (le)	Institutional dist. × SPS-standard prov. (le)	Institutional dist.× TBT-standard prov. (le)
VARIABLES						
IV-SPS	0.602*** (0.006)	-0.077*** (0.005)	0.650*** (0.008)	-0.054*** (0.007)	0.170*** (0.024)	-0.191*** (0.017)
IV-TBT	-0.071*** (0.004)	0.744*** (0.005)	-0.099*** (0.006)	0.962*** (0.008)	-0.155*** (0.018)	0.674*** (0.019)
IV-SPS interaction			-0.019*** (0.003)	-0.003 (0.002)	0.518*** (0.012)	0.021*** (0.007)
IV-TBT interaction			0.011*** (0.002)	-0.092*** (0.002)	0.015 (0.009)	0.352*** (0.010)
Observations	192,498	192,498	192,498	192,498	192,498	192,498
Fixed Effects	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>
Controls	Yes	Yes	Yes	Yes	Yes	Yes
1 st stage F-statistics	5992	13900	3060	7651	2175	4285

Note: The first-stage results in the estimation of 2SLS and 2SRI are identical, thus, each instrument set corresponds to two columns.

Table A.7 (D) First-stage results in Table 6

Corresponding column	(1) and (2)		(3) and (4)			
Instrumented variable	SPS-transparency prov.	TBT-transparency prov.	SPS-transparency prov.	TBT-transparency prov.	Institutional dist.× SPS-transparency prov.	Institutional dist.× TBT-transparency prov.
VARIABLES						
IV-SPS	0.538*** (0.007)	0.553*** (0.008)	0.730*** (0.011)	0.925*** (0.012)	0.077*** (0.030)	0.534*** (0.031)
IV-TBT	-0.107*** (0.003)	0.176*** (0.004)	-0.212*** (0.005)	0.010 (0.007)	-0.457*** (0.015)	-0.454*** (0.019)
IV-SPS interaction			-0.074*** (0.004)	-0.142*** (0.004)	0.459*** (0.016)	0.204*** (0.015)
IV-TBT interaction			0.042*** (0.002)	0.067*** (0.002)	0.110*** (0.007)	0.450*** (0.010)
Observations	192,498	192,498	192,498	192,498	192,498	192,498
Fixed Effects	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>
Controls	Yes	Yes	Yes	Yes	Yes	Yes
1 st stage F-statistics	3419	6863	2082	3945	2360	3572

Note: The first-stage results in the estimation of 2SLS and 2SRI are identical, thus, each instrument set corresponds to two columns.

Table A.7 (E) First-stage results in Table 6

Corresponding column	(5) and (6)		(7) and (8)			
Instrumented variable	SPS-transparency prov. (le)	TBT-transparency prov. (le)	SPS-transparency prov. (le)	TBT-transparency prov. (le)	Institutional dist.× SPS-transparency prov. (le)	Institutional dist.× TBT-transparency prov. (le)
VARIABLES						
IV-SPS	0.564*** (0.007)	0.520*** (0.008)	0.751*** (0.011)	0.896*** (0.013)	0.227*** (0.031)	0.569*** (0.032)
IV-TBT	-0.087*** (0.003)	0.163*** (0.004)	-0.186*** (0.005)	-0.000 (0.007)	-0.387*** (0.015)	-0.498*** (0.020)
IV-SPS interaction			-0.072*** (0.004)	-0.145*** (0.004)	0.438*** (0.017)	0.160*** (0.016)
IV-TBT interaction			0.040*** (0.002)	0.065*** (0.003)	0.103*** (0.007)	0.446*** (0.010)
Observations	192,498	192,498	192,498	192,498	192,498	192,498
Fixed Effects	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>
Controls	Yes	Yes	Yes	Yes	Yes	Yes
1 st stage F-statistics	3456	6262	2065	3541	2093	3167

Note: The first-stage results in the estimation of 2SLS and 2SRI are identical, thus, each instrument set corresponds to two columns.

Table A.8 (A) First-stage results in Table 7

Corresponding column	(1) and (2)		(3) and (4)		(5) and (6)		(7) and (8)	
Instrumented variable	SPS-all prov.	TBT-all prov.	SPS-all prov. (le)	TBT-all prov. (le)	SPS-essential prov.	TBT-essential prov.	SPS-essential prov. (le)	TBT-essential prov. (le)
VARIABLES								
IV-SPS	0.529*** (0.007)	0.050*** (0.005)	0.486*** (0.007)	0.091*** (0.005)	0.623*** (0.007)	0.052*** (0.006)	0.594*** (0.007)	0.080*** (0.005)
IV-TBT	-0.141*** (0.007)	0.491*** (0.007)	-0.012* (0.007)	0.587*** (0.006)	-0.244*** (0.006)	0.591*** (0.007)	-0.116*** (0.007)	0.627*** (0.007)
Observations	170,368	170,368	170,368	170,368	170,368	170,368	170,368	170,368
Fixed Effects	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
1 st stage F-statistics	3498	3587	3699	5831	3932	3961	3768	5146

Note: The first-stage results in the estimation of 2SLS and 2SRI are identical, thus, each instrument set corresponds to two columns.

Table A.8 (B) First-stage results in Table 8

Corresponding column	(1) and (2)		(3) and (4)			
Instrumented variable	SPS-standard prov.	TBT-standard prov.	SPS-standard prov.	TBT-standard prov.	Institutional dis.× SPS-standard prov	Institutional dist.× TBT-standard prov
VARIABLES						
IV-SPS	0.614*** (0.006)	-0.077*** (0.005)	0.684*** (0.010)	0.002 (0.008)	0.032 (0.025)	0.130*** (0.023)
IV-TBT	-0.254*** (0.005)	0.732*** (0.007)	-0.318*** (0.008)	0.843*** (0.011)	-0.376*** (0.022)	0.149*** (0.031)
IV-SPS interaction			-0.028*** (0.003)	-0.027*** (0.002)	0.603*** (0.012)	-0.141*** (0.011)
IV-TBT interaction			0.026*** (0.003)	-0.048*** (0.004)	-0.093*** (0.012)	0.607*** (0.017)
Observations	170,368	170,368	170,368	170,368	170,368	170,368
Fixed Effects	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>
Controls	Yes	Yes	Yes	Yes	Yes	Yes
1 st stage F-statistics	5061	5591	2563	3145	2363	1653

Note: The first-stage results in the estimation of 2SLS and 2SRI are identical, thus, each instrument set corresponds to two columns.

Table A.8 (C) First-stage results in Table 8

Corresponding column	(5) and (6)		(7) and (8)			
Instrumented variable	SPS-standard prov. (le)	TBT-standard prov. (le)	SPS-standard prov. (le)	TBT-standard prov. (le)	Institutional dist. × SPS-standard prov. (le)	Institutional dist.× TBT-standard prov. (le)
VARIABLES						
IV-SPS	0.624*** (0.007)	-0.042*** (0.005)	0.732*** (0.011)	0.019*** (0.007)	0.319*** (0.029)	-0.040** (0.017)
IV-TBT	-0.167*** (0.005)	0.752*** (0.007)	-0.298*** (0.008)	0.858*** (0.011)	-0.537*** (0.026)	0.209*** (0.030)
IV-SPS interaction			-0.045*** (0.003)	-0.022*** (0.002)	0.459*** (0.015)	-0.041*** (0.008)
IV-TBT interaction			0.052*** (0.003)	-0.046*** (0.004)	0.112*** (0.013)	0.611*** (0.017)
Observations	170,368	170,368	170,368	170,368	170,368	170,368
Fixed Effects	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>
Controls	Yes	Yes	Yes	Yes	Yes	Yes
1 st stage F-statistics	4209	6915	2192	3955	1678	2178

Note: The first-stage results in the estimation of 2SLS and 2SRI are identical, thus, each instrument set corresponds to two columns.

Table A.8 (D) First-stage results in Table 9

Corresponding column	(1) and (2)		(3) and (4)			
Instrumented variable	SPS-transparency prov.	TBT-transparency prov.	SPS-transparency prov.	TBT-transparency prov.	Institutional dist.× SPS-transparency prov.	Institutional dist.× TBT-transparency prov.
VARIABLES						
IV-SPS	0.481*** (0.007)	0.124*** (0.007)	0.636*** (0.012)	0.121*** (0.012)	0.008 (0.031)	-0.190*** (0.032)
IV-TBT	-0.096*** (0.003)	0.443*** (0.004)	-0.173*** (0.005)	0.437*** (0.007)	-0.410*** (0.015)	-0.146*** (0.020)
IV-SPS interaction			-0.061*** (0.004)	0.001 (0.004)	0.444*** (0.017)	0.212*** (0.016)
IV-TBT interaction			0.031*** (0.002)	0.003 (0.002)	0.084*** (0.007)	0.505*** (0.011)
Observations	192,498	192,498	192,498	192,498	192,498	192,498
Fixed Effects	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>
Controls	Yes	Yes	Yes	Yes	Yes	Yes
1 st stage F-statistics	2131	6874	1261	3464	1452	3260

Note: The first-stage results in the estimation of 2SLS and 2SRI are identical, thus, each instrument set corresponds to two columns.

Table A.8 (E) First-stage results in Table 9

Corresponding column	(5) and (6)		(7) and (8)			
Instrumented variable	SPS-transparency prov. (le)	TBT-transparency prov. (le)	SPS-transparency prov. (le)	TBT-transparency prov. (le)	Institutional dist.× SPS-transparency prov. (le)	Institutional dist.× TBT-transparency prov. (le)
VARIABLES						
IV-SPS	0.509*** (0.008)	0.135*** (0.008)	0.650*** (0.012)	0.153*** (0.012)	0.144*** (0.032)	-0.088*** (0.033)
IV-TBT	-0.073*** (0.003)	0.426*** (0.004)	-0.141*** (0.005)	0.423*** (0.007)	-0.329*** (0.015)	-0.178*** (0.021)
IV-SPS interaction			-0.056*** (0.004)	-0.007* (0.004)	0.436*** (0.018)	0.178*** (0.018)
IV-TBT interaction			0.027*** (0.002)	0.001 (0.003)	0.078*** (0.007)	0.492*** (0.011)
Observations	192,498	192,498	192,498	192,498	192,498	192,498
Fixed Effects	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>	<i>it, jt, ij</i>
Controls	Yes	Yes	Yes	Yes	Yes	Yes
1 st stage F-statistics	2201	7250	1259	3624	1222	2876

Note: The first-stage results in the estimation of 2SLS and 2SRI are identical, thus, each instrument set corresponds to two columns.