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# Single Market Enlargement and Technical Barriers to Trade: Revisiting the Evidence

**Abstract**
EU enlargements have given new EU member states access to the European Single Market. While tariff liberalisation was already completed at the time of enlargement, technical regulations were subject to different sectoral approaches, including harmonisation and mutual recognition. We employ a structural gravity model estimated using sectoral trade data from 1987 to 2020 to assess the trade effects of these measures. We find that trade expansion, particularly exports of the NMS to the incumbent EU members, has been stronger in the sectors covered either by the Old Approach (full harmonisation) or the New Approach (essential requirements) than in sectors covered by mutual recognition. The New Approach has been more effective when coupled with mutual recognition at the sector level than with either approach alone. Our results imply that the TBT harmonisation has had a heterogenous impact on different sectors (the most important for low-tech industries was the Old Approach, while for high-tech, it was the New Approach).

**Keywords**
European integration | EU enlargement | gravity model | technical barriers to trade

**JEL Codes**
F13, F02, F52

## 1. Introduction

In this study, we examine the impact of the European Union (EU) enlargement on trade, specifically in relation to technical barriers to trade (TBT). The enlargement ushered in a new era of economic integration, uniting diverse member states with unique economic structures and regulatory frameworks into a unified, cohesive market. For the new member states of the EU (NMS), joining the Single Market coincided with their economic transition and provided unprecedented opportunities for economic growth and prosperity (Hagemejer & Mućk, 2019). Although tariff barriers were largely eliminated by the time the NMS acceded, the removal of technical barriers to trade (TBT) through full membership in the Single Market was anticipated to yield additional trade benefits.

Technical barriers to trade (TBT) include a broad array of regulatory measures that aim to protect public health, consumer safety, and the environment. These measures can manifest as either regulations or standards (Disdier et al., 2018). De jure technical regulations or de facto standards may necessitate product modifications for a producer to gain market access. Such regulations or standards are considered TBTs when they potentially restrict trade (e.g., Brenton & Manzohi, 2002; Fischer & Serra, 2000) and can serve as protectionist measures, as evidenced by recent research (Grundke & Moser, 2019). The associated costs can be variable—fluctuating with production volume and requiring adjustments to each unit sold—or fixed, involving sunk investments to align production processes with the importing country's regulations (Yang, 2020; Fischer & Serra, 2000). While standards are intended to mitigate market failures and limit the consumption of harmful goods or

information asymmetry about product characteristics (Fernandez, 2021), they must not create unnecessary obstacles to trade. The World Trade Organization's (WTO) TBT Agreement stipulates that technical regulations should not be excessively trade-restrictive and allows members to raise specific trade concerns (STCs) related to TBTs. An increase in STCs suggests a trend of replacing declining tariffs with TBTs (Orefice, 2016).

The EU has implemented various approaches to manage TBT to complete the internal market strategy. These include the full harmonisation of technical regulations or the so-called Old Approach, harmonisation of only the essential requirements (New Approach), and Mutual Recognition, where the national regulations of individual member states are recognised as equivalent to those in other member states. These approaches can have varying effects on trade; for example, full harmonisation is cumbersome but complete, and it fully eliminates barriers from the incompatibility of national regulations. At the same time, it may be preferential for internal union trade; that is, EU firms complying with those regulations operate in completely harmonised regulatory environments. However, third-country firms may need to adjust the products to be able to export to the Single Market. In the case of Mutual Recognition, there are no costs related to harmonisation. However, national regulations may differ; therefore, some internal market barriers may remain. Moreover, while mutual recognition can be regarded as the preferred approach because of its cost-effectiveness (Felbermayr & Jung, 2011), the practical implementation of mutual recognition in the EU is not as effective as initially perceived (Ilzkovitz et al., 2007).

Harmonisation, or in other words, regulation unification within the EU, takes the form of a standardisation union that is preferential in nature; that is, the costs of adjustment to the Single Market Standards are lower for the members of the Union. Some theoretical insights on this issue are provided by Gandal and Shy (1996), who show that standardisation unions are trade-creating relative to the world with no mutual recognition of standards; however, full global mutual recognition of standards is preferred from a welfare standpoint. Hence, we could expect that the EU, in general, and the 1992 Single Market Programme should enhance the EU's internal trade while the barriers toward third countries remain high.

This study endeavours to revisit the topic of European integration by analysing the trade implications associated with the New Approach, Old Approach, and Mutual Recognition within the Single Market context (see Hagemejer & Michałek, 2007, for an early analysis that this paper revisits). We employ a modern structural gravity model and sectoral trade data from 1995 to 2020 to assess the trade effects of EU expansion over a long horizon. We examine the effectiveness of the aforementioned EU policies in expanding trade.

This study contributes to the literature in two ways. First, it provides new insights into the process of EU integration in general and EU enlargement in particular. This is a gigantic strand, with early ex-ante papers relying on computable simulations, such as Harisson et al. (1996). Smith and Venables (1988) and newer ex-post papers using a more sophisticated methodology to inquire about the trade and welfare effects of integration (e.g., Felbermayr et al., 2022 using the structural gravity framework and Campos et al., 2016 using the synthetic control method as well as Spornberger, 2021 using a structural gravity model). The second strand is the literature on measuring TBTs and their effects on international trade nested within a broader strand of quantifying non-tariff measures (e.g., Ferrantino, 2006; Kee et al., 2009). A review of early work in that strand, together with a meta-analysis, is presented in Li and Beghin (2012), including mainly the papers that employ the gravity literature, while the framework for measurement is outlined in Maskus et al. (2000). The empirical models typically include some quantitative measures of TBT as explanatory variables, such as the regulation stringency, as in Otsuki et al. (2001), or a result of an earlier frequency analysis – a coverage ratio of TBT in trade or number of measures applied (see, e.g., Disdier et al., 2008), number of TBT notifications (e.g., Bao & Qiu, 2012), or the number of trade concerns (e.g., Ghodsi, 2016; Orefice, 2016). In our study, we attempt to identify the differences in the evolution of relative internal to external EU trade in sectors subject to different EU approaches to remove TBT around the periods of EU enlargement. The paper provides estimates of the trade expansion of merchandise trade in sectors covered by various EU approaches to TBT, therefore evaluating the performance of those approaches in removing the technical barriers to trade.

The remainder of this paper is organised as follows. Section two describes the dataset, empirical model, and identification strategy. Section three presents our estimation results. Section four concludes.

## 2. Data and methods

The primary data source is UN Comtrade. The dataset contains information on bilateral merchandise trade expressed in thousands of dollars. The dataset covers sectoral bilateral trade between 198 countries over the period of 1988-2020. This resulted in 12,355,183 units of observations.

Our variables of interest are discrete variables that describe EU approaches to TBT removal. There are four major TBT categories: Harmonization (HR), Mutual Recognition Arrangement (MRA), Mutual Recognition Principle (MRP), and New Approach (NA). These data are available in the three-digit NACE (activity) classification. In the case of some sectors, more than one TBT can be observed (e.g., HR+MRA, HR+MRP, NA+MRA, and NA+MRP). These particular cases appeared in 9.9% of the sample (the number of observations in mixed TBT cases increased with time and reached a maximum of 9.86% in 2017). For sectors in which no TBT was introduced, we created the bilateral variable "None". Overall, this accounted for 24.6% of the global observations. These dummy variables are fixed over time, coming from the European Commission's (1998) publication, and are based on a detailed sectoral survey at the 3-digit NACE rev. 1 classification level.

Merging trade data with NACE-based indicators presents a challenge. Initially, bulk-extracted products in the UN Comtrade were grouped according to HS 1988/1992 (H0). We purposely maintain a fixed product concordance to eliminate problems related to HS classifications changing over time. We use the product concordance obtained from Worldbank's WITS database to convert the trade flows from the H0 classification to the SITC3 classification. Finally, we transformed the observations from SITC3 to NACE rev. 1. For some observations, we could not link H0 and NACE rev. 1, which seems to be a standard challenge when attempting to match product classifications to activity classifications. Therefore, these observations were eliminated (such eliminations were concentrated in only a few product categories and had no significant impact on the coverage of sectors or trade value). In our empirical model, the level of bilateral trade value is the dependent variable in all estimations. The unit of observation is a country-pair, a 3-digit NACE sector observed in a single period of time.

We follow Baier and Bergstrand (2007) and use panel data to estimate three-way gravity models, including origin-time-industry, destination-time-industry, and pair-industry fixed effects. Our model is estimated with both time-varying exporter-sector and importer-sector fixed effects as well as exporter-importer-sector-pair fixed effects, and therefore, it can identify only the variables that are bilateral in nature and variable over time. This means that fixed effects are absorbed by the effects of all time-varying country-specific variables and time-invariant "gravity" variables. Therefore, the only gravity variable included in the estimations is the regional trade agreement (RTA) membership dummy, which we borrow from the CEPII gravity database (Conte, 2022). While we are unable to control for the level of MFN tariffs (they are absorbed by time-varying fixed effects), the RTA-related dummies control for preferential tariff liberalisation. We distinguish a few categories of RTA (RTA among CEE countries, RTA between CEE and EU MS, and other RTA's).

Our main variables of interest reflecting the EU approaches to TBT, which are initially time-invariant, interacted with the EU dummy to account for the time variation. Therefore, the estimates on those variables are going to reflect the within-variation of trade within the TBT categories post-EU accession. This makes our empirical approach similar to a difference-in-differences framework where we additionally control for all the sector-specific, exporter and importer time-varying developments as well as pair-specific effects.

We are interested not only in the impact of TBT on overall EU bilateral trade value but also in assessing the impact of trade liberalisation among country groups, specifically EU-15 ("old" EU member states) and NMS ("new" member states to which we classified: CYP, LVA, LTU, HUN, MLT, POL, SVK, SVN, EST from 2004, BGR, ROU from 2007 and HRV from 2013). For this purpose, instead of a common EU dummy for each of the TBT types, we have three different variants of the variables: 1) when both parties are members of the NMS, 2) when the exporter is NMS, and the importer is part of the EU-15, and 3) when the importer is NMS and exporter is part of the EU-15.

The trade values are taken from the interval $[0,+\infty)$. The lower bound value, zero, is interpreted as a lack of exports in a given period t for exporter i of a good from sector k and cannot be removed from the dataset. Standard linear panel data estimators are inapplicable because the dependent variable is limited to the interval $[0,+\infty)$. Silva and Tenreyro (2006) showed that the estimator of choice is pseudo-maximum likelihood estimation (PPML).

Although the dependent variable, the trade value, is a quasi-continuous variable, the application of count data regression enables consistent estimates. The significant advantage of the estimator is that it is still consistent under heteroscedasticity.

It is a known fact that in the case of PPML, the estimator does not suffer from the incidental parameter problem (this concerns the fact that there is no possibility of finding consistent estimates when the number of parameters depends on the sample size, for example, (Lancaster, 2000) or for models with single fixed effect (Wooldridge, 1999). In the case of three-way gravity models, Weidner and Zylkin (2021) showed that PPML is the only member of a family of pseudo-maximum likelihood estimators that is robust to incidental parameter problems.

The baseline model used in the analysis is as follows:

$$Trade_{ijk,t} = \alpha + RTA'_{ijk,t}\boldsymbol{\beta} + TBT'_{ijk,t}\gamma + \theta_{ijk,t} + \delta_{i,k,t} + \pi_{j,k,t} + \varepsilon_{ijk,t}, \quad (1)$$

where: $Trade_{ijk,t}$ is the value of bilateral trade in goods of sector $k$ at time $t$; $RTA'_{ijk,t}$ stand for a vector of different types of relative trade agreement RTA dummies; $TBT_{ijk,t}$ is a vector of TBT of interest interacted with EU15 or NMS participation; $\theta_{ijk,t}$; $\delta_{i,k,t}$; $\pi_{j,k,t}$ are fixed effects; and $\varepsilon_{ijk,t}$ is an error term. The overview of all the variables included in the regression is given in Table 1.

# 3. Results

Table 2 presents the first set of empirical results. Our analysis covers several separate models to assess the effect of trade liberalisation on EU member states. In the first column, we estimate trade liberalisation among all EU member states with the distinction of all available TBT. The second specification assesses the impact of trade liberalisation in the context of TBT among the aforementioned groups of countries. In columns three to six, we provide results of a specific technological breakdown (high-technology, medium-high-technology, medium-low-technology, low-technology). The biggest population in a tested sample represents low-tech industries. The last column contains the results for additional V4 countries breakdown (Poland, Czech Republic, Slovakia, Hungary).

As reported by column (1), being in common RTA is statistically significant for our sample and augments the value of bilateral trade. The positive impact is estimated to be approximately 2% of the bilateral sectoral trade value. Surprisingly, the impact of RTA between CEE and EU MS is negative and approximated 8%, suggesting that the sizeable expansion of trade of the CEE in the pre-accession period was universal and not necessarily EU-focused (and in our regression captured by country-specific time-varying fixed-effects). This result was found in models reported in Columns (1) and (2), while the only visible trade expansion due to FTA between EU and CEE was found in the case of low-tech goods. The positive effect of the CEE EU RTA also emerges when we control for the heterogeneity of the effects of the EU accession (column 7).

The New Approach (NA) and Harmonization (HR) were positively and statistically significantly related to sectoral bilateral trade (column 1). In the case of NA, the impact was estimated to be a 1.4% increase in bilateral goods trade between EU member states. Compared to harmonisation, the innovation of the New Approach lies in harmonising national regulations, which are limited to a product's most critical requirements to be released for free trade in a Single Market. An essential aspect of the New Approach is that using harmonised standards is voluntary, as they are not technical regulations. Products manufactured following harmonised standards are assumed to meet the most critical requirements and are automatically allowed to trade in the common market. However, if manufacturers can demonstrate that their products meet the essential requirements of the directives, they do not have to demonstrate compliance with the harmonised standard.

Harmonising national regulations with standards supported by the European Commission is one of the most effective ways to liberalise non-tariff trade barriers. This stems from the fact that if countries have uniform regulations and the product gains access to one market, access is granted automatically to all other markets. Our results suggest that the impact of accession in sectors covered by HR is statistically significant and the highest among the obtained estimates. Full implementation of harmonised relationships among EU member states leads to a 1.4% increase in sectoral goods trade.

It has to be said that sectors where none of the EU approaches applied experienced an almost 1.5% increase in goods trade value among the EU member states. This may mean that, in those sectors, the levels of technical barriers to trade were initially low, and

**Table 1.** Variables used in the empirical analysis

| Variable | Description |
|---|---|
| Trade value | The dependent variable. The value of bilateral trade in goods. The value is expressed in thousands of USD. |
| RTA | The vector of discrete variables takes the value of 1 when both trade partners are in the same RTA and 0 otherwise (e.g. RTA among CEE countries; RTA between CEE and EU; other RTA combinations). |
| NA-EU | Discrete variables take the value of 1 when a New Approach in sector *k* occurs in trade between country *j* and country *i* in time *t.* Both partner countries should be EU member states. Otherwise, the variable takes the value of 0. |
| MR-EU | Discrete variables take a value of 1 when there is a Mutual Recognition in sector *k* occurring in trade between country *j* and country *i* in time *t.* Both partner countries should be EU member states. Otherwise, the variable takes the value of 0. |
| HR-EU | Discrete variables take a value of 1 when there are Harmonization Regulations in sector k occurring in trade between country *j* and country *i* in time *t.* Both partner countries should be EU member states. Otherwise, the variable takes the value of 0. |
| None-EU | Discrete variables take the value of 1 when no TBT is imposed in sector *k* in trade between country *j* and country *i* in time *t.* Both partner countries should be EU member states. Otherwise, the variable takes the value of 0. |
| NA-EU15-NMS | Discrete variables take a value of 1 when there is a New Approach in sector *k* occurring in trade between country *j* and country *i* in time *t.* The good originated from EU15, and the trading partner is a new EU member state. Otherwise, the variable takes the value of 0. |
| NA-NMS-EU15 | Discrete variables take the value of 1 when a New Approach in sector *k* occurs in trade between country *j* and country *i* in time *t.* The good originates from a New member state, and the trading partner is an EU15 member state. Otherwise, the variable takes the value of 0. |
| NA-NMS-NMS | Discrete variables take the value of 1 when a New Approach in sector *k* occurs in trade between country *j* and country *i* in time *t.* Otherwise, the variable is taking the value of 0. |
| MR-EU15-NMS | Discrete variables take a value of 1 when there is a Mutual Recognition in sector *k* occurring in trade between country *j* and country *i* in time *t.* The good originated from EU15, and the trading partner is a new EU member state. Otherwise, the variable takes the value of 0. |
| MR-NMS-EU15 | Discrete variables take a value of 1 when there is a Mutual Recognition in sector k occurring in trade between country j and country i in time t. The good originates from a New member state, and the trading partner is an EU15 member state. Otherwise, the variable takes the value of 0. |
| MR-NMS-NMS | Discrete variables take a value of 1 when there is a Mutual Recognition in sector *k* occurring in trade between country *j* and country *i* in time *t.* Both trade partners are New EU member states. Otherwise, the variable takes the value of 0. |
| HR-EU15-NMS | Discrete variables take a value of 1 when there are Harmonization Regulations in sector *k* occurring in trade between country *j* and country *i* in time *t.* The good originated from EU15, and the trading partner is a new EU member state. Otherwise, the variable takes the value of 0. |
| HR-NMS-EU15 | Discrete variables take a value of 1 when there are Harmonization Regulations in sector k occurring in trade between country j and country i in time t. The good originates from a New member state, and the trading partner is an EU15 member state. Otherwise, the variable takes the value of 0. |
| HR-NMS-NMS | Discrete variables take a value of 1 when there are Harmonization Regulations in sector *k* occurring in trade between country *j* and country *i* in time *t.* Both trade partners are New EU member states. Otherwise, the variable takes the value of 0. |

EU accession has automatically ensured market access to exporters in the single market.

As mentioned before, due to the number of fixed effects, particularly the time-varying country-sector-specific fixed effects, these should not be understood as absolute increases in trade but rather as an increase in trade relative to other (non-EU) trade flows. While we cannot say for certain that the level of TBT in extra-EU trade is the highest in the HR-covered sectors, the EU accession boosts relative intra-to extra-trade the most in these sectors, which shows that either the level of TBT outside the EU is very high or that accession reduces the TBTs most effectively for the acceding countries.

Column (2) of Table 2 shows that the above results must be cautiously considered. There is a great deal of heterogeneity in the effects of EU accession when the direction of trade is considered among different country groups (NMS versus the EU-15 and exports versus imports). The highest effects of EU accession are present in sectors covered by harmonisation. The most significant beneficiaries of HR were exporters

**Table 2.** Estimates of trade liberalisation in TBT among EU Member States

| VARIABLES | All sectors | All sectors | High-tech | Medium-high tech | Medium-low tech | Low tech | All sectors |
|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| RTA | 0.0188*** | 0.0189*** | -.012465 | .0329128*** | .0017943 | .0252775*** | 0.0188*** |
| | (0.00472) | (0.00472) | .0083309 | .0107669 | .0056227 | .0084095 | (0.00472) |
| RTA CEE | -0.0223 | 0.0783*** | .0649999* | .1408041*** | .0972213*** | -.0167929 | -0.0379* |
| | (0.0146) | (0.0199) | .0342033 | .0292653 | .0358558 | .0409532 | (0.0195) |
| RTA CEE UE | -0.0735*** | -0.0409*** | -.1129603*** | .0039924 | -.117901*** | .0503106*** | -0.0386*** |
| | (0.00830) | (0.0100) | .0149379 | .0157854 | .0179346 | .0187081 | (0.00960) |
| NA_EU | 0.0136*** | | | | | | |
| | (0.00460) | | | | | | |
| MR_EU | -0.00768 | | | | | | |
| | (0.00816) | | | | | | |
| HR_EU | 0.0140*** | | | | | | |
| | (0.00543) | | | | | | |
| none_EU | 0.0148*** | | | | | | |
| | (0.00525) | | | | | | |
| NA-EU15-NMS | | -0.0534*** | .0526952 | -.0269492 | .0155141 | -.1057659** | 0.0831*** |
| | | (0.0160) | .0504126 | .0199265 | .0364956 | .049518 | (0.0190) |
| NA-NMS-EU15 | | 0.145*** | .2508488*** | .1775791*** | .097095*** | .2936307*** | 0.0895*** |
| | | (0.0188) | .0413104 | .0251493 | .0453394 | .0539502 | (0.0287) |
| NA-NMS-NMS | | 0.0942*** | .3505328*** | .200204*** | -.1348145** | -.022882 | 0.356*** |
| | | (0.0248) | .0632008 | .0332285 | .0598275 | .0734733 | (0.0356) |
| MR-EU15-NMS | | 0.0651*** | (omitted) | .0071325 | .0985143*** | .0923532** | 0.148*** |
| | | (0.0234) | | .0496438 | .0290378 | .0399543 | (0.0316) |
| MR-NMS-EU15 | | 0.0377 | (omitted) | -.0343424 | .3994119*** | -.1333244*** | 0.0560 |
| | | (0.0275) | | .0616616 | .039404 | .0400508 | (0.0374) |
| MR-NMS-NMS | | 0.145*** | (omitted) | .0789878 | .2778632*** | .0426703 | -0.0996 |
| | | (0.0338) | | .0579968 | .046876 | .0603844 | (0.0608) |
| HR-EU15-NMS | | 0.128*** | .0170128 | (omitted) | .0411172 | .2959768*** | 0.257*** |
| | | (0.0295) | .0270469 | | .0499832 | .0442682 | (0.0318) |
| HR-NMS-EU15 | | 0.276*** | .3145475*** | (omitted) | -.064045 | .8265343*** | 0.551*** |
| | | (0.0367) | .0311062 | | .059602 | .0494348 | (0.0401) |
| HR-NMS-NMS | | 0.209*** | -.0845362* | (omitted) | .0838884 | .4971171*** | 0.575*** |
| | | (0.0371) | .0438424 | | .0673421 | .0511993 | (0.0380) |
| None-EU15-NMS | | 0.166*** | -.1212058*** | .1458626*** | .2292322*** | -.0202643 | 0.144* |
| | | (0.0505) | .0472334 | .0405111 | .076868 | .0351835 | (0.0834) |
| None-NMS-EU15 | | -0.122*** | -.316273*** | .0968501*** | -.2923275*** | .3317987*** | -0.211*** |

Continued **Table 2.** Estimates of trade liberalisation in TBT among EU Member States

| VARIABLES | All sectors | All sectors | High-tech | Medium-high tech | Medium-low tech | Low tech | All sectors |
|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| | | (0.0223) | .0605635 | .0360711 | .0332407 | .0500403 | (0.0290) |
| None-NMS-NMS | | 0.431*** | -.1457483** | .147424*** | .6738975 | .2335274*** | 0.357*** |
| | | (0.0587) | .0711817 | .052262 | .0969544*** | .0610534 | (0.0721) |
| NA-EU15-V4 | | | | | | | -0.184*** |
| | | | | | | | (0.0207) |
| NA-V4-EU15 | | | | | | | 0.133*** |
| | | | | | | | (0.0190) |
| NA-V4-V4 | | | | | | | -0.153*** |
| | | | | | | | (0.0315) |
| NA-V4-NMS | | | | | | | -0.113*** |
| | | | | | | | (0.0287) |
| MR-EU15-V4 | | | | | | | 0.0136 |
| | | | | | | | (0.0278) |
| MR-V4-EU15 | | | | | | | 0.0293 |
| | | | | | | | (0.0311) |
| MR-V4-V4 | | | | | | | 0.0405 |
| | | | | | | | (0.0418) |
| MR-V4-NMS | | | | | | | 0.169*** |
| | | | | | | | (0.0393) |
| HR-EU15-V4 | | | | | | | -0.0323 |
| | | | | | | | (0.0397) |
| HR-V4-EU15 | | | | | | | 0.160*** |
| | | | | | | | (0.0407) |
| HR-V4-V4 | | | | | | | -0.178*** |
| | | | | | | | (0.0613) |
| HR-V4-NMS | | | | | | | 0.146*** |
| | | | | | | | (0.0403) |
| None-EU15-V4 | | | | | | | 0.115*** |
| | | | | | | | (0.0409) |
| None-V4-EU15 | | | | | | | -0.151*** |
| | | | | | | | (0.0260) |
| None-V4-V4 | | | | | | | 0.125** |
| | | | | | | | (0.0614) |
| None-V4-NMS | | | | | | | 0.412*** |
| Constant | 13.52*** | 13.51*** | 11.84421*** | 13.28023*** | 13.63611*** | 13.6876*** | 13.51*** |
| | (0.00157) | (0.00158) | .0027644 | .0034178 | .0022599 | .0028308 | (0.00155) |
| | | | | | | | (0.102) |
| N of obs. | 12,355,183 | 12,355,183 | 1,271,213 | 2,834,200 | 3,376,816 | 4,872,954 | |

Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

from the NMS, whose trade directed to old EU member states increased by 32% (exp(0.276)-1). A similar magnitude of trade expansion was reported among NMS and was estimated to be 23% of the value of trade. The estimated parameters are even higher when we separately analyse the V4 countries group (Column (7)).

The effects of EU accession on NA-covered sectors differ among country groups. From the NMS perspective, liberalisation played a significant and positive role in sectoral trade, increasing exports to the EU-15 by almost 16%. Looking at trade between the NMS, we can observe a 9.4% increase in trade value. It is also apparent that exports from EU-15 to the NMS did not experience an expansion of trade after the EU accession, as the estimated coefficient is negative.

Turning to the effects of mutual recognition, unlike in Column (1), the effects of MR are significant and positive in this more detailed analysis, and the estimated trade effects are certainly lower than those of HR in all analysed cases. The effects of EU expansion in NA-covered sectors are found to be positive for all three cases (EU15-NMS, NMS-EU15 and NMS-NMS). The biggest beneficiaries turned out to be NMS countries trading among themselves. The positive effect was reported as 43% of the sectoral trade increase.

Moving to the last reported model in Column (7), we excluded the effect of V4 countries to analyse it separately. In this context, the most essential and trade-augmenting effect was HR liberalisation. The positive effect was visible in trade from V4 countries directed to EU15 and other NMS. The influence was the opposite in the case of trade among V4 countries.

In the case of NA, the effect of EU accession was positive and significant only for the case of V4-EU15 exports. The effect of MR turned out to be insignificant when V4 in the case of the V4 countries, with the only exception of the exports from V4 to the remaining NMS.

Following the suggestion of the anonymous referee, we also re-run our regressions on sub-samples based on the level of technology of the sectors (based on a NACE rev. 1 technology groupings). Our results from Columns (3)-(6) suggest that the impact of trade liberalisation due to EU accession is, to a large extent, technology-specific. For high-tech industries, harmonisation in the form of NA and HR brought the largest trade benefits. The estimated impact of EU accession on the trade between NMS was 42% and between NMS-EU15, 29%. At the same time, HR in the trade of high-tech sectors among NMS-EU15 shows an export expansion of 37%. In those sectors, the technical barriers to trade could have been relatively high, as mutual recognition was absent, and there was no visible trade expansion in the high-tech sectors where no EU approach was present. For the medium-high-tech, the only significant trade effects occurred in NA-covered sectors and only when the country of origin was the NMS. Large, across-the-board trade expansions were observed in medium-low-tech industries in the NA and MR-covered sectors. This applies, in particular, to the exports of the NMS. In low-tech industries, the most significant effect was obtained for HR-covered sectors, in particular in exports from NMS to the EU-15, where trade has doubled. Similar but less pronounced effects were found for NA.

For further robustness testing, we aggregated the trade flows according to the coverage of the EU TBT policy and performed gravity simulations for each policy separately, including cases of mixed coverage. We expect the results of these additional estimations to differ quantitatively as a result of different treatments of the intensive and extensive margins of trade at the sector level versus aggregated analysis.

Qualitatively, the additional analysis results in Table 3 confirm our initial conclusions. In this case, the most significant impact on trade liberalisation among NA is when we combine it with Mutual Recognition (MR). This is true in the case of trade between NMS and EU15, estimated as (when trade is directed from NMS to EU15) 101% and was also significant when accounting for trade directed from EU15 to NMS. The most significant difference can be seen in trade between NMS and equals about 36% of the trade value increase. This particular estimated effect is over three times higher than that in Column (2) of Table 2.

In the case of mutual recognition (MR), the estimated effect seems more ambiguous than the results in Column (1) of Table 2. In this case, liberalisation is significant for EU15 countries trading with NMS and between NMS pairs. Merchandise trade expansion between NMS and EU15 is visible and turns out to be statistically significant in the case of weakening technical trade barriers of MR combined with HR, almost one-third of trade (estimated as 30%) reported in Table 3.

In Table 3, columns (1) and (2) report the impact of liberalisation in HR and HR combined with MR. In

**Table 3.** Estimates for trade liberalisation in TBT among EU Member States

| | HR | HR+MR | MR | NA | NA+MR | None |
|---|---|---|---|---|---|---|
| **VARIABLES** | **(1)** | **(2)** | **(3)** | **(4)** | **(5)** | **(6)** |
| RTA | 0.0339* | -0.00423 | 0.0123 | 0.0806*** | 0.0954*** | -0.0163 |
| | (0.0188) | (0.0164) | (0.0183) | (0.0213) | (0.0194) | (0.0201) |
| RTA CEE | 0.404*** | 0.0614 | 0.177*** | -0.0595 | 0.164** | 0.499*** |
| | (0.127) | (0.0580) | (0.0604) | (0.0501) | (0.0785) | (0.0725) |
| RTA CEE UE | 0.395*** | -0.102** | -0.00993 | -0.0208 | 0.271*** | -0.00325 |
| | (0.0789) | (0.0435) | (0.0398) | (0.0348) | (0.0388) | (0.0420) |
| EU15 to NMS | -0.276*** | 0.182*** | 0.258*** | 0.0141 | 0.146*** | -0.0659 |
| | (0.0860) | (0.0393) | (0.0474) | (0.0335) | (0.0491) | (0.0832) |
| NMS to EU15 | 0.578*** | 0.265*** | 0.0101 | 0.141*** | 0.698*** | -0.235*** |
| | (0.134) | (0.0592) | (0.0528) | (0.0376) | (0.0510) | (0.0393) |
| NMS to NMS | 0.562*** | 0.147*** | 0.345*** | -0.0159 | 0.311*** | 0.485*** |
| | (0.134) | (0.0569) | (0.0672) | (0.0514) | (0.0806) | (0.0939) |
| Constant | 13.39*** | 15.03*** | 15.48*** | 15.09*** | 14.74*** | 14.54*** |
| | (0.00944) | (0.00563) | (0.00558) | (0.00661) | (0.00758) | (0.00619) |
| Observations | 221,83 | 354,348 | 355,499 | 342,843 | 259,306 | 353,184 |

Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

this respect, our results suggest that the largest trade increase is enjoyed by NMS exporters trading with EU15 countries, experiencing a 78% increase in trade. In the case of the EU15 trading, NMS liberalisation was successful only when considering HR with MR. An export-augmenting effect was also observed in the trade between NMS pairs (stronger for HR only).

The last result concerns non-TBT liberalisation. In this case, trade from NMS to EU15 fell following EU enlargement. In the other analysed cases, the impact of non-TBT was positively associated with trade value between NMS pairs and negative between NMS and EU15. This observation is supported by Column (6) of Table 3.

As a last step, we perform a counterfactual exercise. Based on the results of column (2) from Table 2, we predict the changes in trade flows under the assumption of replacing the approach to TBT with a single policy in all sectors. The results of this exercise are presented in Figure 1 in log deviations from the model-predicted trade under the actual configuration of policies in all sectors. It confirms our initial conclusions that harmonisation seems to lead to the largest hypothetical trade increase in all analysed cases. However, these results differ by country groups, i.e., the benefits from shifting towards harmonisation in intra-NMS trade are relatively small, while they clearly provide high benefits in terms of trade expansion between NMS and EU-15 and, to a smaller extent, in the opposite direction.

Note: The figure shows log deviations of the prediction from the model with a uniform EU policy applied to all sectors from the reference prediction of the model based on the actual distribution of the EU policies across sectors. This is a snapshot of data from 2019, but the changes over time are minimal.

# 4. Conclusions

The main aim of this study is to assess the impact of TBT trade liberalisation among EU member states. For this purpose, we analyse sectoral data from UN Comtrade from 1988 to 2020 using a structural gravity model estimated using PPML with a large set of fixed effects, controlling for country pairs and country-specific, time-varying developments.

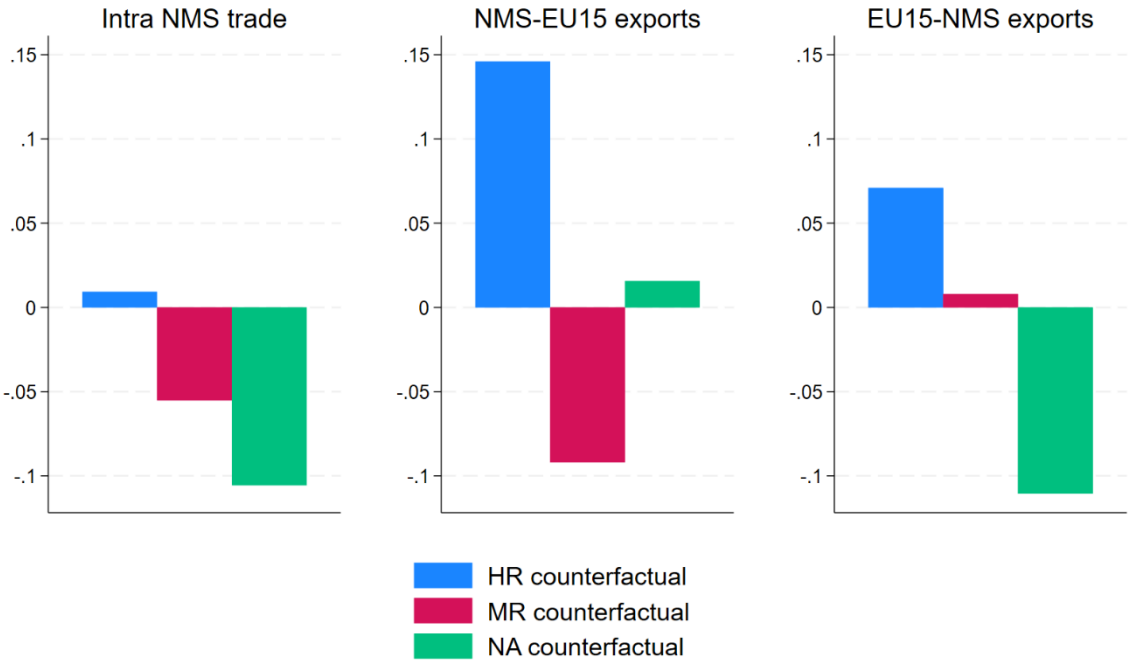


**Figure 1.** Results of a counterfactual exercise

We show that liberalisation in bilateral merchandise trade between EU member states significantly expands trade, although with different magnitudes. The most essential and augmenting impact on trade is harmonisation regulation liberalisation (HR). Their positive impact is visible independently of the trading pair (EU15-NMS; NMS-EU15, NMS-NMS), including, inter alia, sectors such as motor vehicles, pharmaceuticals, cosmetics, tobacco, chemicals, and others where safety and health are of the essence. Similar results were shown when we distinguished two groups of NMS trade (V4 countries and other NMS). Our results suggest that harmonisation pays off; that is, the alignment of the NMS laws with that of the EU provides valid barrier-free access to the single market and a sizeable expansion of trade relative to EU trade with third countries. Of the analysed sectors, the medium-low and low-tech industries seem to be the largest beneficiaries of trade expansion.

Complete harmonisation is costly institutionally, as it requires a compromise between the different member states and a change to their legal system. It also requires enterprises to adjust to the changing law. To overcome the drawbacks of the 'old approach' to eliminating technical trade barriers, the Commission launched in 1985 its 'New Approach to Harmonization and Technical Standards'. It focuses on reducing public authorities' intervention and accelerating decision-making procedures before a product is placed on the market. However, we show that while the New Approach is effective in increasing trade, this approach is more effective in sectors where it is coupled with mutual recognition, where national regulations are recognised universally across the Single Market. This type of harmonisation was essential for high-tech and medium-high-tech industries.

Our results differ across the analysed trade directions. While the expansion of exports of the NMS to the EU-15 was mainly driven by sectors covered by harmonisation and the New Approach combined with mutual recognition, the pattern of the increase in trade between the NMS has not followed the same pattern. For example, there has been a sizeable increase in trade that has not been covered by any of the approaches, which means that there may have been barriers to trade on the part of the NMS that were automatically removed by EU membership. This also applies to the EU15 exports to the NMS. Similar conclusions can be drawn for trade V4 countries and other NMS.

Our results suggest a visible difference in trade performance between the different Single Market approaches to removing TBT with a rather robust advantage to harmonisation compared to mutual recognition, which may mean that mutual recognition does not fully eradicate the barriers stemming from different standards. Therefore, as costly as it may seem, it may be advisable to push towards increasing

harmonisation and the coverage of EU-wide product regulation to deepen the single market. This may be particularly important in the context of upcoming enlargements; the new potential entrants, the Western Balkans, Georgia, Moldova, and Ukraine, as well as Turkey, have functioned in an institutional environment quite detached from that of the European Union, and this includes their product regulations. Mutual recognition may not be enough to ensure that the increased product regulation diversity does not harm the internal trade of the enlarged EU.

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# Appendix

**Table 4.** TBT observations distribution

| TBT | Freq. | Percent | Cum. |
|---|---|---|---|
| HR | 2,417,594 | 19.11 | 19.11 |
| HR+MRA | 187,271 | 1.48 | 20.59 |
| HR+MRP | 237,622 | 1.88 | 22.47 |
| MRA | 571,503 | 4.52 | 26.99 |
| MRP | 2,187,488 | 17.29 | 44.28 |
| NA | 3,149,899 | 24.90 | 69.18 |
| NA+MRA | 687,612 | 5.43 | 74.61 |
| NA+MRP | 140,800 | 1.11 | 75.72 |
| None | 3,072,386 | 24.28 | 100.00 |
| Total | 12,652,175 | 100.00 | |

Source: own elaboration

**Table 5.** The list of TBT and industry

| Industry | NACE | Technology | TBT | Industry | NACE | Technology | TBT |
|---|---|---|---|---|---|---|---|
| Mining and agglomeration of lignite | 102 | Low-technology | HR | Ceramic goods | 262 | High-technology | None |
| Extraction of crude petroleum and natural gas | 111 | Low-technology | MRP | Bricks, tiles and construction products | 264 | High-technology | NA |
| Service activities incidental to oil and gas extraction, excluding surveying | 112 | Low-technology | MRP | Cement, lime and plaster | 265 | High-technology | NA |
| Mining of uranium and thorium ores | 120 | Low-technology | HR | Articles of concret, plaster and cement | 266 | High-technology | NA |
| Mining of iron metals | 131 | Low-technology | None | Cutting, shaping, finishing of stone | 267 | High-technology | None |
| Mining of non-ferrous metal ores, exept uranium and thorium ores | 132 | Low-technology | None | Other non-metallic mineral products | 268 | High-technology | HR |
| Quarrying of stone | 141 | Low-technology | MRP | Basic iron and steel, ferro-alloys (ECSC) | 271 | Medium-high-technology | NA+MRP |
| Mining of chemical and fertilizer minerals | 143 | Low-technology | None | Tubes | 272 | Medium-high-technology | None |
| Production of salt | 144 | Low-technology | None | Other first processing of iron and steel | 273 | Medium-high-technology | None |

Continued **Table 5.** The list of TBT and industry

| Industry | NACE | Technology | TBT | Industry | NACE | Technology | TBT |
|---|---|---|---|---|---|---|---|
| Meat products | 151 | Low-technology | HR | Basic precious and non-ferrous metals | 274 | Medium-high-technology | NA |
| Fish and fish products | 152 | Low-technology | HR | Structural metal products | 281 | Medium-high-technology | NA |
| Fruits and vegetables | 153 | Low-technology | HR | Tanks, reservoirs, central heating radiators and boilers | 282 | Medium-high-technology | NA |
| Vegetable and animal oils and fats | 154 | Low-technology | HR+MRP | Forging, pressing, stamping and roll forming of metal; powder 289x metallurgy | 284 | Medium-high-technology | None |
| Dairy products; ice cream | 155 | Low-technology | HR | Treatment and coating of metals; general mechanical engineering | 285 | Medium-high-technology | None |
| Grain mill products and starches | 156 | Low-technology | HR | Cutlery, tools and general hardware | 286 | Medium-high-technology | NA |
| Prepared animal feeds | 157 | Low-technology | HR | Machinery for production, use of mech. power | 291 | Medium-high-technology | NA |
| Other food products | 158 | Low-technology | HR | Other general purpose machinery | 292 | Medium-high-technology | NA |
| Beverages | 159 | Low-technology | MRP | Agricultural and forestry machinery | 293 | Medium-high-technology | NA |
| Tobacco products | 160 | Low-technology | HR | Machine-tools | 294 | Medium-high-technology | NA |
| Textile fibres | 171 | Low-technology | None | Other special purpose machinery | 295 | Medium-high-technology | NA |
| Textile weaving | 172 | Low-technology | None | Domestic appliances n. e. c. | 297 | Medium-high-technology | NA+MRA |
| Finishing of textiles | 173 | Low-technology | MRP | Office machinery and computers | 300 | Medium-high-technology | MRA |
| Made-up textile articles | 174 | Low-technology | MRP | Electric motors, generators and transformers | 311 | Low-technology | NA |
| Other textiles | 175 | Low-technology | NA+MRA | Electricity distribution and control apparatus | 312 | Low-technology | MRP |
| Knitted and crocheted fabrics | 176 | Low-technology | MRP | Isolated wire and cable | 313 | Low-technology | MRA |
| Knitted and crocheted articles | 177 | Low-technology | MRP | Lighting equipment and electric lamps | 315 | Low-technology | NA+MRA |
| Other wearing apparel and accessories | 182 | Medium-low-technology | None | Electronic valves and tubes, other electronic comp. | 321 | Low-technology | NA+MRA |
| Dressing and dyeing of fur; articles of fur | 183 | Low-technology | MRP | TV, radio and recording apparatus | 323 | Low-technology | HR+MRA |

Continued **Table 5.** The list of TBT and industry

| Industry | NACE | Technology | TBT | Industry | NACE | Technology | TBT |
|---|---|---|---|---|---|---|---|
| Tanning and dressing of leather | 191 | Medium-low-technology | None | Medical equipment | 331 | Medium-low-technology | NA |
| Footwear | 193 | Medium-low-technology | None | Instruments for measuring, checking, testing, navigating | 332 | Medium-low-technology | None |
| Sawmilling, planing and impregnation of wood | 201 | Medium-high-technology | None | Optical instruments and photographic equipment | 334 | Medium-low-technology | None |
| Panels and boards of wood | 202 | Medium-high-technology | NA | Watches and clocks | 335 | Medium-low-technology | None |
| Builders' carpentry and joinery | 203 | Medium-high-technology | NA | Motor vehicles | 341 | Medium-low-technology | HR |
| Wooden containers | 204 | Medium-high-technology | None | Bodies for motor vehicles, trailers | 342 | Medium-low-technology | None |
| Other products of wood; articles of cork, etc. | 205 | Medium-high-technology | None | Parts and accessories for motor vehicles | 343 | Medium-low-technology | HR |
| Pulp, paper and paperboard | 211 | High-technology | HR | Ships and boats | 351 | Low-technology | MRP |
| Articles of paper and paperboard | 212 | High-technology | HR | Railway locomotives and rolling stock | 352 | Low-technology | MRP |
| Publishing | 221 | High-technology | HR | Aircraft and spacecraft | 353 | Low-technology | MRP |
| Printing | 222 | Medium-low-technology | None | Motorcycles and bicycles | 354 | Low-technology | MRP |
| Coke oven products | 231 | Medium-low-technology | MRP | Furniture | 361 | Low-technology | MRP |
| Refined petroleum and nuclear fuel | 232 | Medium-low-technology | HR | Jewellery and related articles | 362 | Low-technology | NA |
| Nuclear fuel | 233 | Medium-low-technology | HR | Musical instruments | 363 | Low-technology | None |
| Basic chemicals | 241 | Medium-low-technology | MRP | Sports goods | 364 | Low-technology | NA |
| Pesticides, other agro-chemical products | 242 | Medium-low-technology | HR+MRP | Games and toys | 365 | Low-technology | NA |
| Paints, coatings, printing ink | 243 | Medium-low-technology | MRP | Miscellaneous manufacturing n. e. c. | 366 | Low-technology | None |
| Pharmaceuticals | 244 | Medium-low-technology | MRA | Production and distribution of electricity | 401 | Low-technology | None |
| Detergents, cleaning and polishing, perfumes | 245 | Medium-low-technology | HR | Manuacture of gas; distribution of gaseous fuels through mains | 402 | Low-technology | None |
| Other chemical products | 246 | Medium-low-technology | MRP | Steam and hot water supply | 403 | Low-technology | None |

Continued **Table 5.** The list of TBT and industry

| Industry | NACE | Technology | TBT | Industry | NACE | Technology | TBT |
|---|---|---|---|---|---|---|---|
| Rubber products | 251 | Medium-low-technology | None | Collection, purification and distribution of water | 410 | Low-technology | HR |
| Plastic products | 252 | Medium-low-technology | NA | Motion picture and video activities | 921 | Low-technology | None |
| Glass and glass products | 261 | High-technology | NA | | | | |

Source: European Commission (1997)

**Table 6.** Summary statistics

| Variable | Obs | Mean | Std. Dev. | Min | Max |
|---|---|---|---|---|---|
| Year | 12,652,175 | 2009.808 | 6.449645 | 1995 | 2020 |
| Export value | 12,652,175 | 19094.65 | 341852.5 | 1.15e-10 | 2.01e+08 |
| RTA | 12,652,175 | .2013112 | .4009801 | 0 | 1 |
| RTA-CEE-UE | 12,652,175 | .0121949 | .1097551 | 0 | 1 |
| RTA-CEE | 12,652,175 | .002402 | .0489509 | 0 | 1 |
| NA | 12,652,175 | .3144369 | .4642912 | 0 | 1 |
| NA-EU | 12,652,175 | .0226739 | .1488616 | 0 | 1 |
| NA-EU15-NMS | 12,652,175 | .0055967 | .0746018 | 0 | 1 |
| NA-NMS-EU15 | 12,652,175 | .0048632 | .0695668 | 0 | 1 |
| NA-NMS-NMS | 12,652,175 | .0036937 | .0606633 | 0 | 1 |
| NA-EU15-NMS(other) | 12,652,175 | .0037779 | .0613486 | 0 | 1 |
| NA-EU15-V4 | 12,652,175 | .0024246 | .0491801 | 0 | 1 |
| NA-V4-EU15 | 12,652,175 | .0030244 | .0549112 | 0 | 1 |
| NA-V4-V4 | 12,652,175 | .0024284 | .0492193 | 0 | 1 |
| NA-V4-NMS | 12,652,175 | .0013491 | .0367053 | 0 | 1 |
| MR | 12,652,175 | .342041 | .4743933 | 0 | 1 |
| MR EU | 12,652,175 | .0252982 | .1570292 | 0 | 1 |
| MR-EU15-NMS | 12,652,175 | .0062408 | .078752 | 0 | 1 |
| MR-NMS-EU15 | 12,652,175 | .0053653 | .0730516 | 0 | 1 |
| MR-NMS-NMS | 12,652,175 | .0040377 | .0634147 | 0 | 1 |
| MR-EU15-NMS(other) | 12,652,175 | .0041938 | .0646238 | 0 | 1 |
| MR-EU15-V4 | 12,652,175 | .0027208 | .0520903 | 0 | 1 |
| MR-V4-EU15 | 12,652,175 | .0033346 | .0576497 | 0 | 1 |
| MR-V4-V4 | 12,652,175 | .0026562 | .0514701 | 0 | 1 |
| MR-V4-NMS | 12,652,175 | .0014717 | .0383343 | 0 | 1 |
| HR | 12,652,175 | .2246639 | .4173608 | 0 | 1 |

Continued **Table 6.** Summary statistics

| Variable | Obs | Mean | Std. Dev. | Min | Max |
|---|---|---|---|---|---|
| HR EU | 12,652,175 | .0167582 | .1283643 | 0 | 1 |
| HR-EU15-NMS | 12,652,175 | .0041769 | .0644939 | 0 | 1 |
| HR-NMS-EU15 | 12,652,175 | .0034418 | .0585656 | 0 | 1 |
| HR-NMS-NMS | 12,652,175 | .0026463 | .0513737 | 0 | 1 |
| HR-EU15-NMS(other) | 12,652,175 | .0028076 | .0529122 | 0 | 1 |
| HR-EU15-V4 | 12,652,175 | .0018074 | .0424755 | 0 | 1 |
| HR-V4-EU15 | 12,652,175 | .0020909 | .045679 | 0 | 1 |
| HR-V4-V4 | 12,652,175 | .0017252 | .0414992 | 0 | 1 |
| HR-V4-NMS | 12,652,175 | .0009456 | .0307362 | 0 | 1 |
| None | 12,652,175 | .2428346 | .428796 | 0 | 1 |
| None EU | 12,652,175 | .0193679 | .1378143 | 0 | 1 |
| None-EU15-NMS | 12,652,175 | .0047352 | .0686499 | 0 | 1 |
| None-NMS-EU15 | 12,652,175 | .003963 | .0628271 | 0 | 1 |
| None-NMS-NMS | 12,652,175 | .0029981 | .0546731 | 0 | 1 |
| None-EU15-NMS(other) | 12,652,175 | .0031353 | .0559056 | 0 | 1 |
| None-EU15-V4 | 12,652,175 | .0021295 | .0460975 | 0 | 1 |
| None-V4-EU15 | 12,652,175 | .002423 | .0491641 | 0 | 1 |
| None-V4-V4 | 12,652,175 | .0020193 | .0448908 | 0 | 1 |
| None-V4-NMS | 12,652,175 | .0010664 | .032638 | 0 | 1 |

Source: Own calculations