Tariff-induced (de)industrialization: An empirical analysis

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Tariff-induced (de)industrialization: An empirical analysis[1]

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Abstract

In this paper we investigate if tariffs affect manufacturing value added in 25 countries from Central and Southeast Europe, the Commonwealth of Independent States and Middle East and North Africa over the period1990-2010. We use an instrumental variable approach, with the World Trade Organization bound tariff and the lagged tariff as instruments. Results suggest that, in general, lower tariffs seem to lead to higher value added, through the higher imports of inputs in the production process which were either inexistent or more expensive on the domestic market previously. The effect is not driven by the World Trade Organization membership, but by individual countries' decision to lower their tariffs. However, there are notable differences in the effects between different groups of countries and industries: tariffs are not found to affect industrialization in Southeast Europe and Middle East and North Africa, which implies that their decision to liberalize trade was likely pre-mature. This is supported by the finding that lower tariffs have positive effects on industry value added only in industries with higher value added (i.e. more mature industries).

Keywords: industrialization, trade liberalization, tariffs

JEL classification: F13, F42

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1. Introduction

Do tariffs affect industrialization patterns? In this paper, we investigate this relationship using data for the industry value added and tariffs for the transition economies of Central Eastern Europe and Baltics (CEEB) and Southeast Europe (SEE), the Commonwealth of Independent States (CIS), and the economies of the Middle East and North Africa (MENA) region. Over the preceding two decades, these countries faced different patterns and speeds of (de)industrialization. Mishandled privatization, insufficient structural reforms and incapability to attract FDIs made the economies of SEE and CIS to deindustrialize faster than CEEB, whose industrialization patterns, instead, were mainly shaped by the relatively fast transition process and better geographical positioning. On the other hand, MENA countries failed to elevate their low industrial level. However, many of them committed to trade liberalization, mainly determined by their will to join to the World Trade Organization (WTO). If tariffs somehow affect industrialization patterns, their timely reduction may have brought benefits for industries, while pre-mature liberalization may have worked detrimentally.

The paper faces two challenges: the first is the comprehension of the channels through which tariffs potentially affected industrialization; the second is the accounting of endogeneity of tariffs. Namely, trade policy is usually a part of the industrial policy and the sectorial tariffs are designed to promote sectorial policy goals, the most prominent being shielding infant industries. We test three potential channels through which tariffs may affect industrialization patterns: import, export and productivity. The paper makes references to the role of WTO.

We cover 25 countries from the regions of CEEB, SEE, CIS and MENA over the period 1991-2010. The selection is fully driven by the availability of data at the industry level. The panel data allow for reducing the bias from omitted variables or model specification that plagues cross-country studies and rule out factors that would keep manufacturing underdeveloped as those factors should not affect the differences between manufacturing industries. We take advantage of two instruments. The first is the bound tariff rate set by WTO: it is likely to be exogenous with respect to the industry value added, because it is determined by the WTO. More precisely, it is unlikely that it is correlated with the shocks onto the value added, because it has been set in advance. It is also likely to be correlated with the tariff rate that countries charge, because it represents a ceiling for the actual rates. Second, we use lagged tariffs as instruments as they are likely correlated with the tariffs of the next period and are uncorrelated with the current shocks on the value added.

Results robustly support trade liberalization, but only for mature industries. We find that lower tariffs have likely resulted in higher value added, overall, and that this has been through the higher imports and unlikely through productivity; export materialized as the significant channel in a comparative geographical context, albeit only in the CEEB. We find no evidence that this has been due to the WTO membership, but due to countries' autonomous decision to lower the tariffs. We further

document that lower tariffs resulted in higher value added in the CEEB and CIS countries but played no role for industrialization in MENA and SEE, which could be explained by the possibly pre-mature trade liberalization in these countries.

The theoretical background of the paper is discussed in Section 2. Section 3 offers some stylized facts. Section 4 describes the methodology and the data used, with special reference to the endogeneity of the tariffs. Section 5 presents the baseline results including a battery of robustness checks, while Section 6 offers a comparative analysis between the four regions involved, and mature versus young industries. The last section concludes.

2. Theoretical background and relevant literature

The starting point in the analysis is the Trade Liberalization Hypothesis (TLH). The TLH posits that trade liberalization leads to static and dynamic efficiency gains through stimulating investment, export expansion, GDP growth as well as export and output diversification in favour of manufactured goods (Balassa, 1978, 1980; Bhagwati, 1978, 1988; Krueger, 1978, 1980; World Bank, 1987). TLH's philosophy – the theory of static comparative cost advantage – has been the ingredient of conditionalities imposed on (developing) countries for their accession in multilateral, regional and bilateral trade agreements, the most prominent example being the acceptance into the WTO. TLH recommends reduction of the level and dispersion of import tariff rates, removal of import quotas, licences and other quantitative restrictions, removal of export taxes and subsidies and devaluation of national currency so as to compensate for the removal of protection or remedy overvaluation (Shafaeddin, 2010). The universality principle behind TLH implies that it is applicable to all countries, irrespective of their level of development and industrial capacity, and to each country over time.

But has the application of TLH led to improved welfare: export expansion and industry diversification? Empirical results remain mixed. Neo-liberal strand of literature (e.g. Sachs and Warner, 1995, 1997) finds some evidence in favour of the TLH. Other strand of literature (e.g. Rodriguez and Rodrik, 2001; Rodrik, 2007; Wacziarg and Welch, 2008; ECLAC, 2002; Di Maio, 2008) finds little or no evidence that greater trade openness impacts growth. Specifically, the (de)industrialization effects of greater trade liberalization have been particularly examined and results, while being dependent on the level of industrial development, are also largely inconclusive. For instance, some researchers found that manufacturing productivity increased after an episode of liberalization (Handoussa et al. (1986) for Egypt, Tybout and Westbrook (1995) for Mexico, and Tybout et al. (1991) for Chile). On the other hand, Stiglitz (2005) argues that with the tariff and other quantitative restrictions reduction, workers not necessarily move to high-productivity jobs, as such are not created when the economy is in low stages of development, but rather become unemployed.

Indeed, Shafaeddin (2006a,b) documents that trade liberalization effects depend on the stage of industrialization. For instance, for nearly half their sample, they find that liberalization was followed by rapid expansion of export of manufactured goods and fast expansion of industrial supply capacity and upgrading; and this group of countries undertook gradual and selective trade liberalization only after industries matured. On the other hand, they document that countries with insufficiently developed industrial base, like in Africa and in most of Latin America, premature trade liberalization brought de-industrialization, in the lines of Stiglitz (2005). Similarly, the results of the trade liberalization on manufacturing are not clear-cut in other part of the literature (e.g. Harrison, 1994, Harrison and Revenga, 1995).

Baldwin (2011) argues that earlier research failed to estimate neatly the trade liberalization effects because trade liberalization theory overlooked the radical change in globalization that occurred from the mid-1980s. Pre 1980s international competition occurred mainly at the level of sectors, whereas later it occurs at a finer degree of resolution – the level of production stages. As a result of information communication technology revolution it became increasingly economical to geographically separate manufacturing stages; that is to unbundle the factories which made it easy for rich-nation firms to combine the high technology they developed at home with low-wage workers abroad.[2] Within the supply chain, the developing nation only has to provide reliable workers and a hospitable business environment. Thus, apart from rushing to unilaterally lower their tariffs (especially on intermediate goods), the developing countries unilaterally reduce behind the border barriers to doing business. Although industrialization became easier due to the technological advances, the geographical proximity matters greatly in supply chains since key personnel must still visit the offshored factory (Gamberoni et al.2010). Thus, most production networks concentrate in low wage countries that are near the high-technology nations (Baldwin and Lopez-Gonzales, 2014).

There are three main channels through which tariffs can affect industry value added. As tariff is imposed on import, the first channel is through imports. Tariff effects on production are studied in many standard international economics textbook (e.g. Krugman and Obstfeld, 2014). Namely, a tariff increases the cost of import, making it less attractive, which could translate in larger costs for producers' inputs in case they cannot find a substitute on the domestic market, hence affecting producers' value added negatively; or could translate in a competitive gain for producers of substitutes to the imported good, in which case their value added may increase (at least in the short run).

The second channel is through exports. The effects of tariffs on exports are indirect (unless taxes are levied on exports). Lerner (1936) showed that there is a symmetry between the effect of an import tariff and an export tax on domestic relative prices. In other words, a tariff may reduce the incentive to

[2]Deardorff and Park (2010) provide detailed explanation about modelling trade between developed and developing countries based on exchange of capital-intensive and labour-intensive intermediates.

export by increasing the relative domestic price of import to export, which is equivalent to reducing the relative price of export to import. Tokarick (2006) adds two additional explanations of how tariff could affect export: i) with the tariff, consumers may shift demand toward the domestic good (if considered a substitute to the imported good), which is now cheaper in relative terms. Hence, the tariff actually reduces the price of export relative to non-traded goods, which is equivalent to a real exchange rate appreciation, which harms export; and ii) the tariff may make capital more expensive, especially in developing economies which import capital. Under the assumption of capital mobility across sectors, higher rental rate on capital would spread across sectors, hence raising the cost of production in the export sector and reducing output.

The third channel is through the Revealed Comparative Advantage (RCA; Balassa, 1965). The RCA index measures industry's actual comparative advantage in production and trade. The RCA approach argues that if a country's share in world export of a particular good is greater than its overall share in total world export, then the country has a revealed comparative advantage in exporting that good.[3] Balassa argued that export/import ratios would be more influenced by protectionist measures (as tariffs; Hamilton and Svensson, 1982), while the relative export shares, as RCA is, would be more reliable indicators of comparative advantage. The lower the trade costs, such as tariffs, the better the RCA measureand more equivalent is with production-based indicators of comparative advantage (Moenius, 2006). The latter reflects the productivity level of industries, which were frequently very low when waves of tariff reductions phased in transition economies. Essentially, they were unprepared to compete on foreign markets, and hence their value added has been negatively affected.Nevertheless, the trade liberalization effect on the comparative advantage development might be driven by the success in attracting FDI and its sectoral destination (Barry and Hannan, 2001). Thus, trade liberalization accompanied by knowledge-related spillovers from FDI may enhance the industry's comparative advantage. This is particularly expected in case of efficiency-seeking FDI which requires access to imports of intermediate goods and services and is thus dependent onan open trade regime (Lesher and Miroudot, 2008)

Earlier empirical analyses focused on the effects of trade liberalization on productivity, growth and employment in various countries and regions.[4]To the best of our knowledge, the literature has not considered the channels through which tariffs can affect industry value added in the Central and

[3] Hilman (1980) discusses the relation between the "revealed comparative advantage" and "comparative advantage" and provides the conditions for correspondence. As Hinloopen and Van Marrewijk (2008) argue, violations of the Hillman condition are small as a share of the number of observations and occur rarely after 1985.

[4] For example, OECD (2011) on the impact of trade liberalization on jobs and growth in G20; Ernst (2005) on the effects of trade liberalization on export orientationand employment in Argentina, Braziland Mexico; Paus et al. (2003) on the relationship between trade liberalization and manufacturing productivity in Latin America; Aichele and Heiland (2014) on the impact of China's WTO entry on value chains; Amiti and Konings (2007) on the effects of trade liberalization on plant productivity in Indonesia; Harding and Rattso (2010) on the effects of tariffs on labour productivity in South Africa.

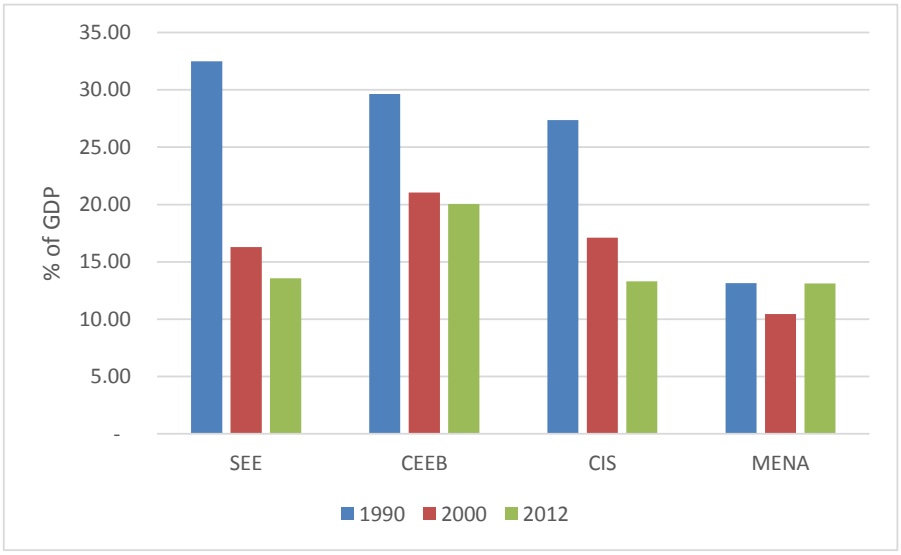
Southeast Europe, the Commonwealth of Independent States and Middle East and North Africa in a comparative geographical context. This is where the paper makes contribution to the current sparse of knowledge.

3. Some stylized facts

The manufacturing value added in transition economies has been on a steady decline in the past two decades. The possibly oversized industrial sector at the beginning of the 1990s, the structural reforms (including the long and thorny process of privatization in many cases) and political challenges largely determined the deindustrialization over the 1990s. Still, industryvalue added continued to decline over the 2000s as well, particularly in SEE and CIS. Slow structural reforms, absence of industrial policies, absence or improper policies for attracting FDI (which largely populated the service sectors), improper education policies (favouring social sciences), poor infrastructure, are among the reasons of the continuing deindustrialization.

SEE's deindustrialization has been more pronounced than that of other ex-socialist countries (Figure 1). Different patterns of (de)industrialization are observed in these countries: while the CIS suffered the same destiny as SEE, the CEEB countries saw a smaller decline in the manufacturing value added, supported by the favourable georgaphic position, the relative fast completion of the transition process and the associated structural reforms, which all led to quickacession to the EU. Finally, while deindustrialization is not observed in the MENA, it is obvious that these countries failed to industrialize over the past two decades, given their low level of initial industrialization.

Figure 1 – Manufacturing value added in a comparative context



Source: World Development Indicators

While the patterns of (de)industrialization may have differed among regions and countries due to their internal structural and policy setup, a common feature across regions or countries is the membership in the WTO and the commitment to trade liberalization. About two-thirds of the SEE countries have been WTO members since early-2000 (with the exception of Montenegro which joined in 2012), hence experiencing a decade-long trade liberalization under the WTO rules. As **Table 1** suggests, the WTO membership brought tariffs down by approximately 80 percent of the level prior to WTO accession, much more than the decline observed in the non-WTO SEE members during the same period. The SEE region is behind CEEB countries, who all joined WTO and also experienced significant tariff reductions. On the other hand, CIS and MENA lag behind, as about half their countries are WTO members. Still, even members there still face high tariff rates, despite important reduction has been observed after joining the WTO, while non-members experienced slower tariff declines.

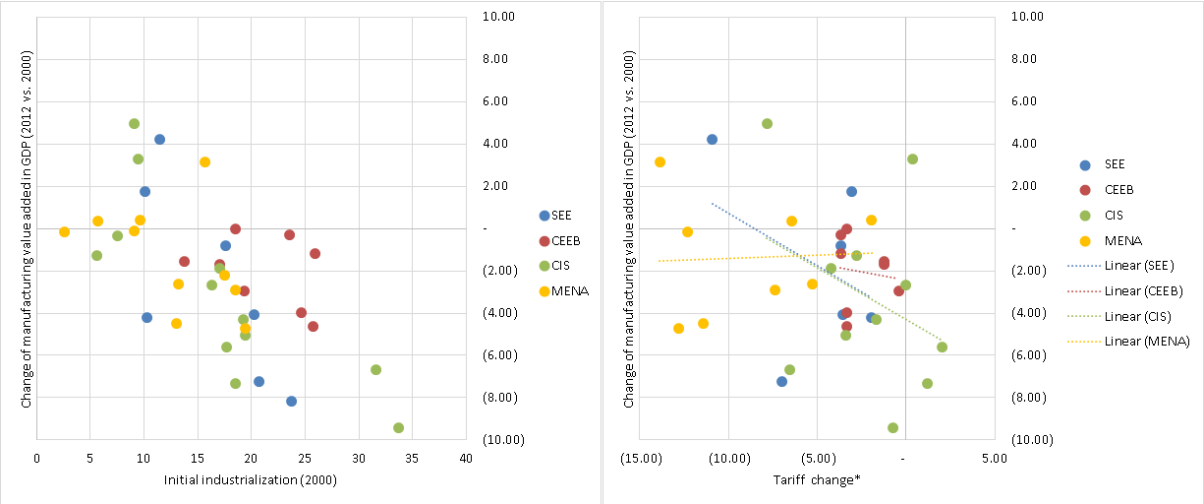
Table 1 – Weighted tariff rates of the manufacturing products (regional simple averages, %)

		WTO members			**Non-WTO members**	
	% of countries members of WTO at end	Tariff rate prior to WTO accession	Tariff rate three to five* years after	Tariff rate in 2012**	Tariff rate in early 2000s***	Tariff rate in 2012**
SEE	67%	7.35	3.75	1.39	5.83	2.22
CEEB	100%	4.07	2.47	1.61	-	-
CIS	46%	6.10	4.25	2.93	6.25	5.16
MENA	55%	18.90	10.18	5.72	20.88	12.53

Source: World Development Indicators
*Notes: * depending on data availability; ** or the closest available figure; depending on data availability, the figure is for one of the years between 2000 and 2004.*

So, the question arising, then, is if trade liberalization and WTO membership have a role to play for the (de)industrialization of the observed countries, given initial level of industrialization (in particular, the one when the country joins WTO). Data (Figure 3, left) clearly suggest a positive link between initial industrialization and deindustrialization: the higher the initial position, the deeper the decline. Figure 2, right, relates the industry decline with the trade liberalization. Data roughly suggest that fast trade liberalization (larger tariffs reduction) is related to growing manufacturing declines in regions with low initial industrialization, as the case of MENA suggests. On the contrary, smaller tariff declines (than in MENA) resulted in manufacturing 'savings' in the other three regions, being smaller in CEEB than in SEE and CIS.

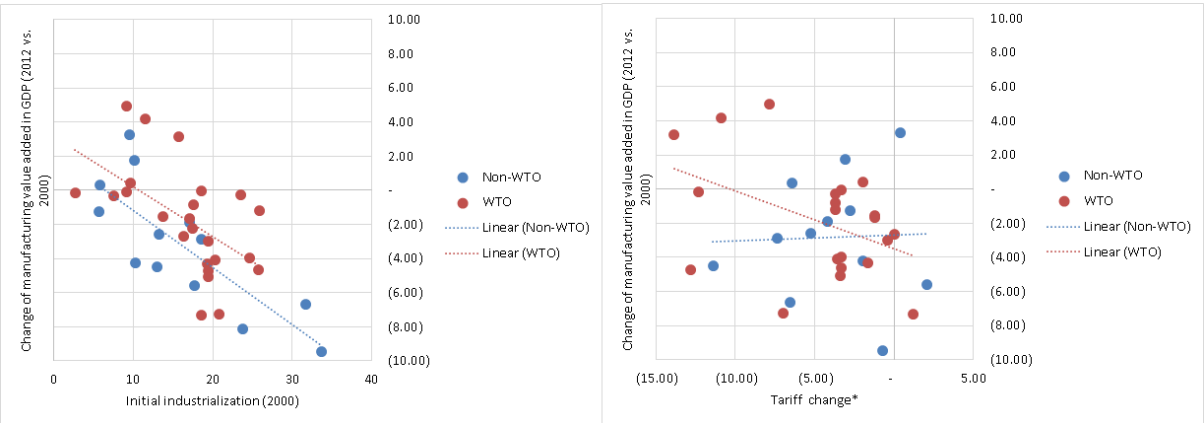
Figure 2 – Tariff reduction and deindustrialization by region



Source: Authors' draft based on WDI data.
*Notes: * Tariff change refers to the absolute difference between the tariff level in 2012 and when the country joined WTO for member and in 2000 for non-members. Hence, a negative value of the x-axis on the right chart signifies a tariff reduction and vice versa.*

WTO may be detrimental for countries which approach trade liberalization without having sufficiently developed manufacturing industry before, while timely trade liberalization may actually help industrialize. That this may have support in the data can be guessed from Figure 3, which shows the same relationships as Figure 2, but for WTO members and non-members in the observed regions.

Figure 3 - Tariff reduction and deindustrialization by WTO membership



Source: Authors' draft based on WDI data.
*Notes: * Tariff change refers to the absolute difference between the tariff level in 2012 and when the country joined WTO for member and in 2000 for non-members. Hence, a negative value of the x-axis on the right chart signifies a tariff reduction and vice versa.*

On average, WTO members experienced slightly smaller manufacturing sector declines than non-members (Figure 3, left).The right panel suggests that trade liberalization was likely beneficial for members – lower tariffs there are associated with higher industrial growth, but also that liberalization may be harmful for non-members – lower tariffs there are associated with lower industrial growth. So, the effect of trade liberalization on industrialization is likely to depend on the circumstances, being positive for some countries and negative for others.

4. Methodology and data

4.1. Basic model

The model used in the analysis links developments in manufacturing value added in different industries with the tariff rate, only through the channel(s) through which the latter may influence the former.More precisely, the basic model is:

$$va_{ijt} = \rho \cdot va_{ijt-1} + \beta_1 \cdot X_{jt} + \gamma_1 \cdot channel_{ijt} + \alpha_{1j} + \alpha_{1t} + \varepsilon_{1ijt} \qquad (1)$$

$$channel_{ijt} = \beta_2 \cdot X_{jt} + \gamma_2 \cdot tariff_{ijt} + \alpha_{2j} + \alpha_{2t} + \varepsilon_{2ijt} \qquad (2)$$

where i indexes the industries, j the countries and t the time, va_{ijt}stands for the logarithm of the manufacturing value added, $tariff_{ijt}$is the ad-valorem tariff rate imposed onto industry i in country j at time t; X is a vector of conventional explanatory variables, like road density, credit to GDP, foreign investment to GDP, log of GDP per capita, spending on education in GDP, market capitalization in GDP and trade to GDP;α_j'sare the country fixed effects, while α_t's the time fixed effects; ε_{ijt}'s are the error terms, which are assumed to be well-behaved (which is controlled by reporting errors robust to heteroskedasticity and autocorrelation). Note that we do not use industry fixed effects, since the model becomes bulky and suffers widespread multicollinearity; however, their omitting is acknowledged and results' robustness to this omission tested in Section 5.4.Also note that the manufacturing value added likely comes with a stochastic trend and we hence use the lagged value on the right-hand side. $channel_{ijt}$ stands for one of the three channels through which tariff imposition potentially affects value added - import, export and comparative advantage.

4.2. Tariffs' endogeneity

The econometric challenge in estimating (1) and (2) is that tariffs are almost always endogenous to the industry value added. The underlying premise of the endogenous tariff theory (Brock and Magee, 1978; Findlay and Wellisz, 1982) is that "political decisions on tariff rates are reflections of the selfish economic interests of voters, lobbying groups, politicians, or other decision makers in trade policy matters." (Mayer, 1984, p.970), despite the post-WTO era reduced the excessive use of trade policies.

We, therefore, need to find a suitable instrument that affects tariff, but not value added (nor the channels) directly except through the tariff. In technical terms, to our system of equations (1) and (2), we need to add a third equation:

$$tariff_{ijt} = \psi \cdot instrument_{ijt} + \alpha_{3j} + \alpha_{3t} + \varepsilon_{3ijt} \quad (3)$$

Whereby notations are self-explanatory. A plausible candidate to be considered for instrument in this context is the bound tariff rate set by WTO. The bound tariff rate is likely to satisfy the two conditions for a good instrument – it is likely to be exogenous with respect to the industry value added, because it is determined by the WTO. More precisely, it is unlikely that the bound tariff is correlated with the shocks onto the value added. It is also likely to be correlated with the tariff rate that countries charge, because it, in a certain way, represents a ceiling for the actual rates.

Still, a possible counter-argument is that when bound tariffs are set during negotiations, the level of development of a country is considered. Even if there is a correlation between country's level of development and the level of bound tariffs, by considering industry-level data, we actually investigate how tariffs affect the dynamics of the industrial value added and not the growth of the entire economy or manufacturing sector. From that viewpoint, the bound tariff should still preserve its exogeneity assumption with respect to the industry value added.

Additional argument against our instrument may be that bound tariffs are set taking into consideration the level of development of individual industries. More precisely, bigger industries may be more able to push for higher bound tariffs, due to their power. To control for this possibility, in the robustness checks section, we add additional stage in the estimation, in which the bound tariffs are modeled as a function of the average value added for each industry in each country.

A second candidate for instrumenting tariffs is their past value. Lagged tariffs are also likely to satisfy the two criteria for a good instrument: i) they are likely correlated with the tariffs of the next period (consider that, especially within WTO, governments prevent large and unexpected changes in tariffs); and ii) it is unlikely that former tariffs are correlated with the current shocks on the value added.

4.3. Estimable model

The model that we estimate is given by the following five-equations:

$$va_{ijt} = \rho \cdot va_{ijt-1} + \beta_1 \cdot X_{jt} + \gamma_1 \cdot imp_{ijt} + \gamma_2 \cdot exp_{ijt} + \gamma_3 \cdot rca_{ijt} + \alpha_{1j} + \alpha_{1t} + \varepsilon_{1ijt} \quad (4)$$

$$imp_{ijt} = \beta_2 \cdot X_{jt} + \varphi_2 \cdot tariff_{ijt} + \alpha_{2j} + \alpha_{2t} + \varepsilon_{2ijt} \quad (5)$$

$$exp_{ijt} = \beta_3 \cdot X_{jt} + \varphi_2 \cdot tariff_{ijt} + \alpha_{3j} + \alpha_{3t} + \varepsilon_{3ijt} \quad (6)$$

$$rca_{ijt} = \beta_4 \cdot X_{jt} + \varphi_2 \cdot tariff_{ijt} + \alpha_{4j} + \alpha_{4t} + \varepsilon_{4ijt} \quad (7)$$

$$tariff_{ijt} = \beta_5 \cdot X_{jt} + \psi \cdot bound\_tariff_{ijt} + \alpha_{5j} + \alpha_{5t} + \varepsilon_{5ijt} \quad (8)$$

Whereby notations are as before; imp_{ijt} is the log of the imports of industry i in country j at time t; exp_{ijt} is the log of exports respectively; rca_{ijt} is the revealed comparative advantage index calculated as the share of the country j's exports of industry i at time t in total export of the same country, divided by the share of exports of the same industry at the same time of the sample countries in their total export. The vector of control variables includes the log of the GDP per capita, the share of foreign direct investment in GDP, the public spending on education in GDP, the market capitalization of listed firms in GDP, trade openness, an indicator of public infrastructure and credits to GDP. They are to capture various development that may have affected (the speed of) industrialization in the countries investigated.

4.4. Estimation technique

Given that we need to estimate a system of five equations, we rely on Roodman's (2011) Conditional Mixed Process (CMP) estimator which allows mixing the standard limited dependent variable models in multi-equation systems. The CMP method is a parametric one, meaning that distributional assumptions are imposed on the model which leads to higher efficiency. The standard IV approach, however, is not; there is an implied trade-off between both estimators. As our model is not recursive and fully articulated, i.e. equations for earlier stages include instruments to address endogeneity and omit some variables, the applied estimator is a limited-information (LIML) estimator.

4.5. Data

The empirical analysis is done at the industry level. By using industry-level data, the bias from omitted variables or model specification that plagues cross-country studies isarguably diminished, because the omitted variables are less likely to affect all the industries. The analysis focuses on manufacturing industries.In that way the study can rule out factors that would keep manufacturing underdeveloped as those factors should not affect the differences between manufacturing industries (Rajan and Subramanian, 2011, p. 100).The level of aggregation of the industries is at the 4-digit ISIC classification.

We use annual data. The sample is composed of 25 countries from the transition regions of CEEB, SEE and CIS and from the MENA region. These countries were chosen on the basis of the availability of industry-level data. The time period covers 1990-2010, but differs from country to country and depends on the data availability. For most of the countries the analysed period covers only the 2000's. Data on industrial value added, import and export are from UNIDO. Data on tariffs are from TRAINS. Data on bound tariffs are from WTO. Data on the other variables used as controls are from

the World Development Indicators of the World Bank. Data on non-tariff measures are from WTO's Integrated Trade Intelligence Portal (I-TIP). See Appendix 1 for further details.

5. Results and discussion

5.1. Validity of instruments

Because we are dealing with a multi-equation system, we cannot provide the conventional instrument tests. Hence, to provide some preliminary evidence for the validity of our instruments, we run a conventional Two Stage Least Squares model, whose first stage regresses tariffs on the two instruments, while the second-stage regresses the log of the value added on tariffs and other variables (given the constraint to produce these tests for a multi-equation system). Four tests about instruments are reported in Table 2. The first three tests the null hypothesis that the excluded instruments are weakly correlated with the endogenous regressor; the provided F-statistics are far above the rule of thumb of 10, providing evidence that both instruments are strong. The last one tests the null that the excluded instruments are uncorrelated with the error term; the p-values provide sufficient evidence that the null cannot be rejected, at least at the 5%, hence supporting our argument about instruments' exogeneity with respect to the value added.

Table 2– Instruments' tests

	Only tariffs	**Tariffs and channels**	**Tariffs, channels and controls**
Under identification test (Kleibergen-Paap rank LM statistic)	100.1	68.55	60.22
Weak identification test (Cragg-Donald Wald F statistic)	35282	23691	5060
Weak identification test (Kleibergen-Paap rank Wald F statistic)	2932	1808	615.7
Hansen J statistic (Over identification test of all instruments, p-value)	0.835	0.075	0.277
Source: Authors' calculations			

5.2. Tariffs' role for (de) industrialization: Baseline results

Table 3 presents the results of our baseline model (4)-(8). The left half of the table (columns 1-5) presents the model without control variables, while the right half (column 6-10), with them. Including control variables halves our sample, but coefficients remain highly robust. Hence, we interpret the results with the controls (columns 6-10). Coefficients do have the expected signs and a large part of coefficients of interest is significant. First, we document again that we deal with strong instruments, as both the bound tariff and the lagged tariff are highly significant in the first-stage regression. The coefficients suggest that lagged tariff positively affects the current tariff, with a fairly large coefficient, suggesting that 94% of the current tariff rate is due to the tariff in the period before. This corroborates our earlier guess that governments would refrain from abrupt changes of tariffs, in order to comply with the needs of the WTO membership where applicable, but also to smooth traders'

incentives. Bound tariff also positively affects the average tariff, although the coefficient is fairly low: average tariffs reduce with the reduction of bound tariffs, but the moves may be sluggish.

Results suggest that tariffs, then, affect import and the revealed comparative advantage, but not export. An increase of the tariff by one percentage point results in a reduction of import by 1.3%, on average, ceteris paribus. Or, if one takes the interquartile range of the tariff rate as a measure for a normal change in tariffs (see Appendix 2 for the descriptive statistics of the variables), one could see that increase in tariffs by 11 percentage points reduces imports by roughly 15%. Tariff is insignificant for export, which is also an expected result, given our earlier claims that tariffs are mainly associated with import, despite we identified some possible ways in which it could affect export. Finally, an increase of tariff by one percentage point is found to result in an increase of the RCA index by 0.05 index points, which is fairly small magnitude, likely a result of the fact that major part of our sample is small economies. To comprehend the magnitude of this change, note that for a country to move from the first to the third quartile along RCA's distribution, an increase of tariffs by 130 percentage points would be needed. Indeed, this finding may explain the liberalization-productivity channel: declining tariffs resulted in lower comparative advantages of the countries, probably because their productivity levels were relatively low when liberalization started, insufficient to compete on foreign markets.

Finally, results in column (10) suggest that only import and export are important for the value added of the industrial sector. This suggests that tariffs work only through the main channel– import: larger tariff reduces import, which then feeds into lower value added. Tariff has not affected export, but export is found to have increased value added. Finally although tariff affects competitiveness, it does not channel to manufacturing value added, as the comparative advantage is found insignificant for the latter.

To understand the magnitudes of the identified channel(s), one needs to consider the lagged value added in column (10). It is significant and fairly large, suggesting that the value added is likely to follow a stochastic trend, which if not properly modelled may lead to wrong inference. Due to the presence of this lagged variable, the remaining coefficients are 'short-term' ones. We obtain the long-run coefficients by dividing the short-term ones with (1 – coefficient on the lagged dependent variable). If import increases by 1%, manufacturing value added is predicted to increase by 0.1%. If export increases by 1%, manufacturing value added is predicted to increase by 0.5%. Apparently, the export plays stronger role for the manufacturing production, but is not determined by tariffs. Overall, under the case of trade liberalization, a reduction of the tariff rate by 1percentage point will result in an increase of import of 1.3%, converting into a 0.13% increase of the manufacturing value added. Or, reduction in the tariff rate by 11 percentage points (the interquartile range) will results in 15% higher imports and 1.5% higher value added. **This main finding suggests that in the overall sample, trade liberalization may have been timely, i.e. resulted in support of the industrialization processes.**

Turning the focus on the control variables, the first result to note is the unexpected coefficients on the infrastructure and credit indicators. Better roads seem to lower industry value added, as well an additional percentage of bank credits into the economy. Under the assumption that roads are built by the government with public money, the finding may suggest a crowding out effect, especially if the road building has been financed with domestic debt. On the other hand, the negative effects of credits on value added may suggest a misallocation of bank money: they have likely supported sectors which were not growing; or simply favoured consumption loans. Contrary to this, FDIs supported industrialization, while trade openness reduced value added.

Table 3 – Baseline results

	Baseline system					System including control variables				
Dependent variables:	Tariff	Log of import	Log of export	RCA index	Log of value added	Tariff	Log of import	Log of export	RCA index	Log of value added
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Lag of log VA					0.870***					0.879***
					(0.003)					(0.004)
Log of import					0.013***					0.012***
					(0.003)					(0.005)
Log of export					0.061***					0.058***
					(0.003)					(0.005)
RCA index					0.012					0.013
					(0.020)					(0.020)
Tariff rate		-0.004***	-0.001	0.000*			-0.013***	0.001	0.000**	
		0.000	0.000	0.000			(0.001)	(0.002)	0.000	
Bound tariff	0.079***					0.079***				
	(0.005)					(0.008)				
Lag of tariff rate	0.936***					0.857***				
	(0.004)					(0.005)				
Road density						-1.996***	-0.007	-0.007	0	-0.010***
						(0.218)	(0.010)	(0.014)	(0.002)	(0.003)
Credit to GDP						0.123***	0.003	0.004	0	-0.001**
						(0.031)	(0.010)	(0.013)	(0.002)	(0.001)
FDI to GDP						0.355***	0.002	-0.016	-0.002	0.002**
						(0.070)	(0.013)	(0.018)	(0.003)	(0.001)
Log of GDP p/c						-30.108***	1.989	2.708	0.348	-0.111
						(1.250)	(1.324)	(1.831)	(0.275)	(0.101)
Spending for education to GDP						3.042***	0.162	0.034	0.035	0.005
						(0.536)	(0.126)	(0.171)	(0.026)	(0.019)
Market capitalization to GDP						0.070***	-0.002	0.003	0	-0.001**
						(0.010)	(0.004)	(0.005)	(0.001)	0.000
Trade to GDP						-0.074***	0.002	0.007	0.001	-0.004***
						(0.023)	(0.007)	(0.010)	(0.001)	(0.001)
Constant	-1.245***	9.790***	5.906***	0.117***	1.622***	345.345	-5.283	-12.46	-3.224	3.247***
	-0.252	-0.109	-0.155	-0.028	-0.054	-38.966	-12.006	-16.602	-2.497	-0.978
Observations	24,665	24,665	24,665	24,665	24,665	11,391	11,391	11,391	11,391	11,391

Source: Authors' calculations., ** and *** denote statistical significance at the 10, 5 and 1% level, respectively. Standard errors given in parentheses. Country and time fixed effects not reported due to space, but available on request.*

5.3. Is the effect driven by WTO?

The main result we obtained in the previous section may seem small: a reduction of the tariff by one percentage point results in an increase of industry value added by 0.13%. However, if one considers the difference between median tariff rates in WTO and non-WTO countries, of 6.5% and 11.9%, respectively, than a WTO membership may be perceived to result into higher manufacturing value added by 0.8%. But, is this the case? **Table 4** provides some preliminary evidence if WTO membership – and hence, trade liberalization due to the accession to the WTO – led to some changes in industrial value added. The result is that it did not. In order words, trade liberalisation in general, irrespective of whether it has been associated with WTO or not, resulted in higher industrial value added. Note that our results in **Table 4** are pure OLS estimates, but largely resemble the main findings of **Table 3**; only a dummy for WTO membership is added and it is insignificant in any composition of the main equation.

Table 4 – WTO membership and industrialization

	Only WTO	**WTO and trade-related**	**WTO, trade-related and controls**
	(1)	(2)	(3)
Lag of log VA	0.944***	0.870***	0.879***
	(0.004)	(0.007)	(0.010)
WTO membership	0.023	0.011	-0.047
	(0.028)	(0.027)	(0.160)
Log of import		0.009***	0.011**
		(0.003)	(0.005)
Log of export		0.064***	0.060***
		(0.005)	(0.006)
RCA index		0.02	0.009
		(0.013)	(0.016)
Road density			-0.011***
			(0.003)
Credit to GDP			-0.001**
			(0.001)
FDI to GDP			0.002**
			(0.001)
Log of GDP p/c			-0.128
			(0.127)
Spending for education to GDP			0.005
			(0.022)
Market capitalization to GDP			-0.001***
			0.000
Trade to GDP			-0.004***
			(0.001)
Constant	0.567***	1.516***	2.830***
	(0.104)	(0.143)	(0.969)

Observations	23,099	15,299	7,768
R-squared	0.94	0.947	0.952

*Source: Authors' calculations. *, ** and *** denote statistical significance at the 10, 5 and 1% level, respectively. Standard errors given in parentheses. Country and time fixed effects not reported due to space, but available on request.*

Still, we investigate the idea that WTO-induced trade liberalization led to changes in industrial value added for a while more. To do so, one needs to recognize that a WTO trade agreement sets up tariff bindings for each country and sector – the instrument we used in our previous calculations. If the applied tariff is then lower than the bound tariff, the government has the flexibility to increase the applied tariff in order to protect the import market without paying any costs (Rho, 2012).In other words, the positioning of the applied tariff vis-à-vis the bound tariffs not driven by the WTO, but is determined by the country itself. The difference between the bound and the current applied tariff is known as the tariff overhang. The overhang is different across countries and sectors. Beshkar et al. (2015) provide evidence that the overhang reduces with country size. The overhang is suitable for investigating if the effect of tariffs on industrialization is driven by WTO or by individual countries' decision. If the overhang is significant, that could be treated as evidence that the effect of tariffs is due to the latter.

Table 5presents the estimates of the system of equations (4)-(8) with the tariff replaced by the tariff overhang. The sample size drops, because we drop the periods when countries were not (yet) members of the WTO. We instrument the overhang with its lagged value. **Table 5**largely replicates the results in **Table 4**, but the overhang is significant only in the import equation (column 2) and further loses significance when control variables have been added (column 7). Larger overhang results in larger import, since the country has lower tariff compared to its binding, which then translates into larger manufacturing value added. This suggests that the effect of tariffs on the industry value added is not due to WTO membership, but due to countries' individual decision to lower the tariffs.

Table 5 – WTO-led (de)industrialization

	Baseline system					System including control variables				
Dependent variables:	Tariff overhang	Log of import	Log of export	RCA index	Log of value added	Tariff overhang	Log of import	Log of export	RCA index	Log of value added
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Lag of log VA					0.870***					0.879***
					(0.003)					(0.004)
Log of import					0.012***					0.011***
					(0.003)					(0.004)
Log of export					0.062***					0.059***
					(0.003)					(0.004)
RCA index					0.012					0.008
					(0.017)					(0.017)
Tariff overhang		0.003***	0.001	0.000			0.002	-0.005	0.000	
		(0.000)	(0.000)	(0.000)			(0.002)	(0.003)	(0.001)	
Lag of tariff overhang	0.933***					0.865***				
	(0.004)					(0.005)				
Road density						2.091***	-0.767	-1.135	0.025	-0.010***
						(0.224)	(1.052)	(1.619)	(0.257)	(0.003)
Credit to GDP						-0.142***	0.231	0.205	-0.003	-0.001**
						(0.032)	(0.321)	(0.493)	(0.079)	(0.001)
FDI to GDP						-0.374***	0.302	0.36	0.002	0.002**
						(0.071)	(0.399)	(0.613)	(0.097)	(0.001)
Log of GDP p/c						32.257***	27.851	41.336	-0.863	-0.111
						(1.281)	(36.561)	(56.063)	(8.890)	(0.101)
Spending for education to GDP						-3.166***	5.619	7.622	-0.116	0.005
						(0.549)	(7.616)	(11.702)	(1.857)	(0.019)
Market capitalization to GDP						-0.076***	0.31	0.445	-0.009	-0.001**
						(0.010)	(0.437)	(0.671)	(0.106)	0.000
Trade to GDP						0.080***	-0.067	-0.097	0.002	-0.004***
						(0.023)	(0.107)	(0.164)	(0.026)	(0.001)
Constant	0.910***	12.949***	12.451***	0.134***	1.634***	-366.328	-234.274	-346.575	7.307	3.245***
	(0.251)	(0.106)	(0.147)	(0.020)	(0.052)	0.000	(322.808)	(494.790)	(78.472)	(0.978)
Observations	19,615	19,615	19,615	19,615	19,615	9,219	9,219	9,219	9,219	9,219

*Source: Authors' calculations. *, ** and *** denote statistical significance at the 10, 5 and 1% level, respectively. Standard errors given in parentheses. Country and time fixed effects not reported due to space, but available on request.*

5.4. Is the effect due to cheaper inputs or due to competition?

The finding that trade liberalization increases imports and hence production can be due to two underlying mechanisms. The first one is that liberalization results in imports of **inputs in the production process** which were either inexistent or more expensive on the domestic market previously. The second one is that lower tariffs result in cheaper imports, and hence in fiercer **competition** on the domestic market, which spurs innovation among domestic firms and increases production.

One way to tell which of the two effects dominates is to observe if the relationship between the tariffs and the value added is present in industries which produce intermediate or consumption goods. If the effect is present in intermediate goods industries, the underlying channel is more likely to be the cheaper inputs. If the effect is present in the consumption goods industries, the underlying channel is more likely to be competition. One needs to be cautious with this interpretation, however, because the competition channel may be present in the inputs sector, too.

Table 6 presents the results of the baseline regression, estimated on industries that can be classified as producing inputs and consumption goods[5]. One can see that the results for the **inputs** are very similar to the baseline results, the only difference being that the imports are insignificant for the value added (but with a similar coefficient as in the baseline regression). Turning to the **consumption** goods, one can see that the results are slightly different here. Once again, higher tariffs result in lower imports and, through this, in lower value added, but, on the other hand, here higher tariffs result in higher exports and, through this, in higher value added, too. In total, the exports channel prevails, meaning that for consumption goods, trade liberalization, i.e. lower tariffs, results in lower value added.

Therefore, it would seem that trade liberalization affects inputs and consumption goods differently. Lower tariffs on inputs lead to higher production of inputs, while lower tariffs on consumption goods lead to lower production of consumption goods. Because the results for the inputs are very similar to the results obtained from the whole sample of countries, we could say that the inputs channel dominates.

[5]For this purpose, first the **BEC** correspondence codes were found to the ISIC codes used so far. Then, the following codes were classified as **consumption** goods: 112 (Food and beverages, primary, mainly for household consumption), 122 (Food and beverages, processed, mainly for household consumption), 522 (Transport equipment, nonindustrial), 61 (Consumer goods not elsewhere specified, durable), 62 (Consumer goods not elsewhere specified, semi-durable), 63 (Consumer goods not elsewhere specified, nondurable). All the remaining codes were treated as inputs. In other words, the **inputs** group contains both the capital and the intermediate goods.

Table 6 – Inputs and consumption goods

	Inputs					Consumption goods				
Dependent variables:	Tariff	Log of import	Log of export	RCA index	Log of value added	Tariff	Log of import	Log of export	RCA index	Log of value added
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Lag of log VA					0.883***					0.873***
					(0.005)					(0.008)
Log of import					0.009					0.016**
					(0.006)					(0.008)
Log of export					0.056***					0.060***
					(0.006)					(0.008)
RCA index					0.008					0.043
					(0.022)					(0.059)
Tariff		-0.013***	-0.002	0.000*			-0.019***	0.037***	-0.000	
		(0.001)	(0.002)	(0.000)			(0.005)	(0.006)	(0.000)	
Bound tariff	0.083***					0.064***				
	(0.009)					(0.019)				
Lag of tariff	0.850***					0.934***				
	(0.005)					(0.009)				
Road density	-0.009	-0.006	-0.011	-0.001	-0.008**	0.068**	-0.007	-0.016	0.001	-0.017***
	(0.041)	(0.012)	(0.016)	(0.003)	(0.003)	(0.035)	(0.018)	(0.024)	(0.002)	(0.005)
Credit to GDP	-0.072	0.007	0.007	-0.001	-0.001*	-0.250***	-0.006	-0.008	0.002	-0.001
	(0.058)	(0.012)	(0.016)	(0.003)	(0.001)	(0.047)	(0.018)	(0.023)	(0.002)	(0.001)
FDI to GDP	0.071	0.001	-0.017	-0.002	0.002	0.148	0.006	-0.013	-0.001	0.003*
	(0.140)	(0.016)	(0.022)	(0.004)	(0.001)	(0.110)	(0.024)	(0.032)	(0.002)	(0.002)
Log of GDP p/c	1.261	1.534	1.788	0.472	-0.075	3.809***	2.500	3.345	0.143	-0.197
	(0.978)	(1.576)	(2.223)	(0.406)	(0.121)	(0.776)	(2.352)	(3.147)	(0.220)	(0.180)
Spending for education to GDP	1.424	0.161	0.053	0.051	-0.041*	4.736***	0.207	-0.059	0.004	0.100***
	(1.093)	(0.149)	(0.207)	(0.038)	(0.022)	(0.857)	(0.224)	(0.295)	(0.021)	(0.035)
Market capitalization to GDP	-0.003	-0.002	0.000	0.000	-0.001**	0.028	-0.002	0.006	0.001	-0.001
	(0.027)	(0.005)	(0.007)	(0.001)	(0.001)	(0.021)	(0.007)	(0.009)	(0.001)	(0.001)
Trade to GDP	-0.025	0.002	0.009	0.002	-0.005***	-0.085***	0.001	0.007	-0.000	-0.001
	(0.020)	(0.008)	(0.012)	(0.002)	(0.001)	(0.016)	(0.013)	(0.017)	(0.001)	(0.002)
Constant	-12.751	-6.410	-7.280	-5.090	4.490***	-41.297***	-16.134	-15.119	-1.643	6.448***
	(11.379)	(16.363)	(13.799)	(4.220)	(1.493)	(8.964)	(24.427)	(20.181)	(2.371)	(2.326)
Observations	7,481	7,481	7,481	7,481	7,481	3,920	3,920	3,920	3,920	3,920

*Source: Authors' calculations. *, ** and *** denote statistical significance at the 10, 5 and 1% level, respectively. Standard errors given in parentheses. Country and time fixed effects not reported due to space, but available on request.*

5.5. Some robustness checks

We conduct four robustness checks of our results: first we use variables scaled to GDP instead of their logarithms; second, we augment the previous specification with two explanatory variables related to terms of trade and real effective exchange rate; third, we control for the average value added in the baseline model; and fourth, we control for the presence of non-tariff measures.

First, we again draft **Table 3**, with relative values of the value added, import and export to GDP, instead of their logged values. **Table 7**presents the results. Since we divide industry-level variables with country-level ones, some of the coefficients are very small. However, the story of **Table 3**is largely reproduced: only the import channel is robustly working for the trade liberalization to support industrialization: a decrease of the tariff by one percentage point translates into an increase of the manufacturing value added in GDP of about 0.000003 percentage points.

The only difference between these and the baseline results is that when controls are added, the export channel gains significance at the 5%. Results suggest it may work in the same fashion as the import channel, i.e. an increase in tariffs reduces export, which reduces value added. This is in line with the suggestions of Lerner (1936) and Tokarick (2006) who identified a couple of veins through which raising tariff may harm export: by reducing the relative price of exports; by real exchange rate appreciation; and by increasing the rental price of capital and hence reducing export and output. However, this result is not stable and should be discussed with caution.

Second, augmenting the model with additional explanatory variables to control for the real effective exchange rate and the terms of trade as veins through which tariff may affect the manufacturing value added in line with the discussion in Tokarick (2006) suggests that the general conclusions arising from the previous model estimate are remarkably confirmed (**Table 8**). Both the import and export channels were supportive for the industrialization in an environment of decreasing tariffs. The real effective exchange rate and the terms of trade are not statistically significant in the equations explaining the channels; nevertheless, their changes have positive and statistically significant effects on the value added of industrial sector.

Table 7 – Relative values to GDP of the main variables used

	Baseline system					System including control variables				
Dependent variables:	Tariff	Import to GDP	Export to GDP	RCA index	Value added to GDP	Tariff	Import to GDP	Export to GDP	RCA index	Value added to GDP
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Lag of VA to GDP					0.864***					0.852***
					(0.004)					(0.005)
Import to GDP					7.302**					7.759**
					(3.396)					(3.675)
Export to GDP					39.291***					42.076***
					(3.092)					(4.367)
RCA index					0.005					0.010
					(0.006)					(0.007)
Tariff rate		-0.000***	0.000	0.000*			-0.000***	-0.000**	0.000**	
		0.000	0.000	0.000			0.000	0.000	0.000	
Bound tariff	0.079***					0.081***				
	(0.005)					(0.008)				
Lag of tariff rate	0.936***					0.856***				
	(0.004)					(0.005)				
Road density						-1.996***	0.000	0.000	0.000	0.000
						(0.219)	0.000	0.000	(0.002)	(0.001)
Credit to GDP						0.122***	0.000	0.000	0.000	-0.000*
						(0.032)	0.000	0.000	(0.002)	0.000
FDI to GDP						0.350***	0.000	0.000	-0.002	0.000
						(0.070)	0.000	0.000	(0.003)	0.000
Log of GDP p/c						-30.118***	0.000	0.000	0.351	-0.050*
						(1.258)	0.000	0.000	(0.277)	(0.028)
Spending for education to GDP						3.037***	0.000	0.000	0.035	-0.005
						(0.539)	0.000	0.000	(0.026)	(0.005)
Market capitalization to GDP						0.070***	0.000	0.000	0.000	0.000
						(0.010)	0.000	0.000	(0.001)	0.000
Trade to GDP						-0.073***	0.000	0.000	0.001	-0.000*
						(0.023)	0.000	0.000	(0.001)	0.000
Constant	-1.261***	0.000***	0.000**	0.116***	0.011*	345.363	-0.001	-0.002	-3.232	0.525*
	(0.272)	0.000	0.000	(0.028)	(0.007)	0.000	(0.004)	(0.003)	(2.508)	(0.271)
Observations	25,124	25,124	25,124	25,124	25,124	11,563	11,563	11,563	11,563	11,563

*Source: Authors' calculations. *, ** and *** denote statistical significance at the 10, 5 and 1% level, respectively. Standard errors given in parentheses. Country and time fixed effects not reported due to space, but available on request.*

Table 8 – Relative values to GDP of the main variables used and two additional explanatory variables

	System including control variables				
Dependent variables:	Tariff	Import to GDP	Export to GDP	RCA index	Value added to GDP
	(1)	(2)	(3)	(4)	(5)
Lag of VA to GDP					0.848***
					(0.005)
Import to GDP					8.154**
					(3.649)
Export to GDP					42.805***
					(4.324)
RCA index					0.010
					(0.007)
Tariff rate		-0.000***	-0.000**	0.000**	
		(0.000)	(0.000)	(0.000)	
Bound tariff	0.082***				
	(0.007)				
Lag of tariff rate	0.857***				
	(0.004)				
Road density	-0.152	0.000	0.000	-0.000	-0.000
	(1.361)	(0.000)	(0.000)	(0.000)	(0.001)
Credit to GDP	-0.154*	-0.000	0.000	0.000	0.000
	(0.083)	(0.000)	(0.000)	(0.002)	(0.000)
FDI to GDP	-0.014	0.000	0.000	-0.001	0.000
	(0.209)	(0.000)	(0.000)	(0.003)	(0.000)
Log of GDP p/c	3.390	0.000	0.000	0.235	-0.042
	(20.447)	(0.000)	(0.000)	(0.302)	(0.028)
Spending for education to GDP	0.968	0.000	-0.000	0.026	0.001
	(0.857)	(0.000)	(0.000)	(0.033)	(0.005)
Market capitalization to GDP	-0.017	0.000	0.000	0.000	-0.000
	(0.065)	(0.000)	(0.000)	(0.001)	(0.000)
Trade to GDP	0.030	0.000	0.000	-0.000	0.000
	(0.051)	(0.000)	(0.000)	(0.002)	(0.000)
Terms of trade	0.000	-0.000	0.000	-0.001*	0.000***
	(0.046)	(0.000)	(0.000)	(0.001)	(0.000)
REER	0.049	0.000	0.000	0.001	0.000***
	(0.095)	(0.000)	(0.000)	(0.002)	(0.000)
Constant	-28.475	-0.000	-0.001	-2.102	0.282
	(220.303)	(0.004)	(0.003)	(2.686)	(0.282)
Observations	11,573	11,573	11,573	11,573	11,573

As argued in Section 4.2, the results obtained in **Table 3**could be criticized for the possibility that the bound tariffs are set taking into consideration the level of development of individual industries. More precisely, bigger industries may be more able to push for higher bound tariffs, due to their power. To control for this possibility, we include additional stage in the estimation, in which the bound tariff is a function of the average value added of the respective industry in the respective country. These results are presented in**Table 9**. As can be seen, the average industry value added is a significant and positive determinant of the bound tariffs, suggesting that bigger industries may indeed push for higher bound tariffs. However, the results of the other five equations remain robust to this treatment, implying that our previous results are still likely to be valid.

Table 9 – Results when average VA is controlled for

Dependent variables:	Bound tariff	Tariff	Import to GDP	Export to GDP	RCA index	Value added to GDP
	(1)	(2)	(3)	(4)	(5)	(6)
Log of average industry VA	0.690***					
	(0.083)					
Lag of VA to GDP						0.760
						(0.007)
Import						0.013***
						(0.005)
Export						0.058***
						(0.005)
RCA index						0.013
						(0.020)
Tariff rate			-0.012***	0.002	0.000*	
			(0.001)	(0.002)	(0.000)	
Bound tariff		0.200***				
		(0.013)				
Lag of tariff rate		0.861***				
		(0.005)				
Road density	0.004	-0.057*	-0.007	-0.012	-0.000	-0.010***
	(0.143)	(0.030)	(0.010)	(0.014)	(0.002)	(0.003)
Credit to GDP	-0.011	-0.227***	0.002	0.002	0.000	-0.001**
	(0.099)	(0.042)	(0.010)	(0.013)	(0.002)	(0.001)
FDI to GDP	-0.006	0.086	0.003	-0.016	-0.002	0.002**
	(0.137)	(0.100)	(0.013)	(0.018)	(0.003)	(0.001)
Log of GDP p/c	0.353	2.354***	1.925	2.505	0.347	-0.110
	(4.488)	(0.696)	(1.323)	(1.831)	(0.275)	(0.101)
Spending for education to GDP	-0.075	2.257***	0.168	0.042	0.035	0.005
	(0.672)	(0.772)	(0.125)	(0.171)	(0.026)	(0.019)
Market capitalization to GDP	-0.003	0.001	-0.002	0.002	0.000	-0.001**
	(0.020)	(0.019)	(0.004)	(0.005)	(0.001)	(0.000)
Trade to GDP	-0.004	-0.050***	0.002	0.008	0.001	-0.004***
	(0.040)	(0.014)	(0.007)	(0.010)	(0.001)	(0.001)
Constant	3.633	-19.367**	-10.379	-10.617	-3.749	5.032***
	(49.542)	(8.080)	(13.733)	(12.104)	(2.973)	(1.260)
Observations	12,453	12,453	12,453	12,453	12,453	12,453

*Source: Authors' calculations. *, ** and *** denote statistical significance at the 10, 5 and 1% level, respectively. Standard errors are given in parentheses. Country and time fixed effects not reported due to space, but available on request.*

We finally conduct a robustness check by adding a variable of non-tariff measures in the model. The variable measures the number of non-tariff measures applied to specific industry.Columns (1) to (5) of **Table 10** provide the results. They suggest that the more numerous the non-tariff measures, the higher the import and export of the industries. At first sight this may be a surprising result. There are few possible explanations of the positive sign (see, e.g. Carrère and de Melo, 2011; Staiger, 2012). First, the number of NTMs cannot precisely reflect the magnitude of their restrictiveness for trade, since it is based on a broad set of measure affecting both the import and the export size, so that it may frequently result in opposite-than-expected effect. Second, NTMs not necessarily coincide with non-tariff barriers (NTBs). For example, a palette of measures may not necessarily harm trade as long as

the imported goods are within the standards; examples may include measures affecting the living standards and preventing disease spreading. Third, the measure we use is a de-jure one which implies that implementation may lag behind what is written in laws and procedures. This is considerably reasonable explanation in countries with still feeble institutions. Finally, the introduction of the NTMs may have coincided with the tariff reduction: had the latter been larger – in ad-valorem terms – than the former, a positive result may be obtained.

To control for this, we add to the system a sixth equation, whereby NTMs are regressed on tariffs and the other controls. Our assumption is that the introduction of the NTMs may have been a response to the tariff reduction. The new system of equations is presented in columns (6) to (11) of **Table 10**. We still do not prove the hypothesis of the trade-off between NTMs and tariffs: an increase of the tariff by one percentage points led, on average, to increase of the number of NTMs by 0.005. This may seem small, however, may be of no importance, given the unknown ad-valorem equivalent of the introduced NTM. Still, controlling for the possible trade-off between tariffs and NTMs makes the result we got previously insignificant, except for the RCA. However, given that the RCA channel was found insignificant for the manufacturing value added, we could conclude that NTMs did not impose any statistically significant effect for manufacturing value added in the investigated countries.

The remaining coefficients endure robustness to this treatment.

Table 10 – The role of non-tariff measures

	NTMs are not affected by tariffs					NTMs are affected by tariffs					
Dependent variables:	Tariff	Import to GDP	Export to GDP	RCA index	Value added/GDP	Tariff	Non-tariff measures	Import to GDP	Export to GDP	RCA index	Value added/GDP
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Lag of VA to GDP					0.879***						0.879***
					(0.004)						(0.004)
Import to GDP					0.012**						0.012**
					(0.005)						(0.005)
Export to GDP					0.058***						0.058***
					(0.005)						(0.005)
RCA index					0.013						0.012
					(0.020)						(0.020)
Tariff rate		-0.013***	0.000	0.000**			0.005***	-0.013*	0.000	0.001**	
		(0.001)	(0.002)	0.000			(0.002)	(0.009)	(0.012)	0.000	
Non-tariff measures		0.051***	0.060***	-0.002				0.000	0.106	-0.019***	
		(0.009)	(0.013)	(0.002)				(1.883)	(2.602)	(0.002)	
Bound tariff	0.080***					0.080***					
	(0.007)					(0.007)					
Lag of tariff rate	0.858***					0.858***					
	(0.004)					(0.004)					
Road density	-0.262	-0.007	-0.012	0.000	-0.010***	-0.264	0.001	-0.007	-0.012	0.000	-0.010***
	(0.208)	(0.010)	(0.014)	(0.002)	(0.003)	(0.208)	(0.014)	(0.010)	(0.014)	(0.002)	(0.003)
Credit to GDP	-0.185***	0.002	0.002	0.000	-0.001**	-0.185***	0.004	0.002	0.002	0.000	-0.001**
	(0.052)	(0.010)	(0.013)	(0.002)	(0.001)	(0.052)	(0.014)	(0.009)	(0.012)	(0.002)	(0.001)
FDI to GDP	-0.035	0.002	-0.016	-0.002	0.002**	-0.035	0.007	0.003	-0.016	-0.002	0.002**
	(0.097)	(0.013)	(0.018)	(0.003)	(0.001)	(0.097)	(0.019)	(0.014)	(0.019)	(0.003)	(0.001)
Log of GDP p/c	9.237**	1.936	2.547	0.344	-0.11	9.195**	-0.73	1.898***	2.581***	0.331	-0.111
	(4.288)	(1.321)	(1.828)	(0.275)	(0.101)	(4.287)	(1.712)	(0.089)	(0.122)	(0.277)	(0.101)
Spending for educ. to GDP	0.938	0.164	0.037	0.035	0.005	0.945*	0.058	0.167	0.034	0.036	0.005
	(0.571)	(0.125)	(0.170)	(0.026)	(0.019)	(0.571)	(0.152)	(0.165)	(0.224)	(0.026)	(0.019)
Market capitalization to GDP	-0.032**	-0.002	0.002	0.000	-0.001**	-0.032**	0.000	-0.002	0.002	0.000	-0.001**
	(0.013)	(0.004)	(0.005)	(0.001)	0.000	(0.013)	(0.005)	(0.004)	(0.005)	(0.001)	0.000
Trade to GDP	0.037	0.002	0.008	0.001	-0.004***	0.036	0.001	0.002	0.008	0.001	-0.004***
	(0.028)	(0.007)	(0.010)	(0.001)	(0.001)	(0.028)	(0.010)	(0.008)	(0.011)	(0.001)	(0.001)
Constant	-70.053*	-4.784	-10.711	-3.17	3.244***	-69.639*	6.374	-4.458	-11.011	-3.06	3.249***
	(38.964)	(11.977)	(16.570)	(2.497)	(0.978)	(38.951)	(15.493)	0.000	0.000	(2.512)	(0.978)
Observations	11,401	11,401	11,401	11,401	11,401	11,857	11,857	11,857	11,857	11,857	11,857

*Source: Authors' calculations. *, ** and *** denote statistical significance at the 10, 5 and 1% level, respectively. Standard errors given in parentheses. Country and time fixed effects not reported due to space, but available on request.*

6. Comparative analysis

6.1. Transition economies vs. MENA

Despite the unambiguous evidence that trade liberalization resulted in support of the industrialization process in the overall sample, we investigate further this issue in a comparative context across different group of countries in the sample. Namely, there have been successes but also failures to industrialise in this group of economies. As discussed previously, the initial substantial decline of the manufacturing value added share in the 90's has been followed by significant industrialisation in CEEB. On the other hand, there are many examples of failed industrialisations in the SEE and CIS. In some other developing countries from the MENA region, a failure to industrialise can also be observed. Thus, a comparative analysis of the trade liberalisation effects on the (de)industrialization process could prove more insightful among these groups of countries.

Table 11presents the estimates of the system of equations (4)-(8) separately for the different groups of countries. The findings for the overall sample that trade liberalization supported industrialization are confirmed for the CEEB and to some extent for the CIS, though with some important differences regarding the transmission channels. In the case of CEEB, the results suggest that tariffs affect both import and export, but not the revealed comparative advantage. An increase of the tariff by one percentage point results in a reduction of import and export by 1.7% and 0.8%, respectively, on average, ceteris paribus. Although the effect on import is higher than that of the overall sample by 0.4 p.p., it is not transmitted to the value added since its coefficient is statistically insignificant at any conventional level of significance. On the other hand, the export is important for the value added of the industrial sector. Lower tariff in the CEEB increases export, which then feeds into higher value added in the long run by 0.5%.Thus, the overall effect of the tariffs on the value added in CEEB is similar to the overall sample, albeit tariffs work through export and not import. This is in line with the argumentation in Tokarick (2006) that a higher tariff would raise the rental rate on capital which itself would raise costs of production in the export sector and reduce output. This might not be surprising given that the CEEBs have made great use of foreign financing in different forms, and in particular FDIs, in comparison with the rest of the countries from the sample. These large inflows of foreign funds then made capital cheaper, cutting the cost of production in the export sector and increasing output. In the case of CIS, the results suggest that tariffs affect only import, but not export and the revealed comparative advantage. An increase of the tariff by one percentage point results in a reduction of import by 0.3%, on average, ceteris paribus, which makes around a quarter of the coefficient value estimated for the overall sample. Nevertheless, in the value-added equation both the import and export are important determinants in line with the results for the overall sample. Thus, reducing the tariff in the CIS increases import, which then translates into higher value added in the long run by 0.1%, which is qualitatively similar to the effect for the whole sample. The positive effect

of export on value added is found to be double than that of the import, but this seems not to be induced by the tariffs.

As for the SEE and MENA, the results suggest that trade liberalisation did not affect the industrialisation process via reducing the tariff level. In both cases, the tariff affects import, but its effect is not transmitted to manufacturing value added in these countries. The latter is affected by export but this is driven by factors other than the tariffs. The only difference between these two groups of countries which makes simultaneously the SEE distinct from the rest of the countries in the sample is the statistically significant effect of tariff on the revealed comparative advantage. Yet this does not change the overall conclusion about the lack of influence of trade liberalisation on the industrialisation in the SEE.

In general, the main finding from the comparative analysis suggests that trade liberalization resulted in support of the industrialization processes in the CEEB and CIS, although via different trade channels; that is via export for the CEEB which transmits stronger effects to the value added than the import channel in the case of CIS. Conversely, the substantial tariff reduction in MENA and, in particular, in the SEE played no role for the industrialisation. This suggests that relatively fast trade liberalisation might have been pre-mature since some other factors important for creating an industrialisation-supportive environment have not been in place in the SEE and MENA, in contrast to the rest of the countries in the sample, in particular to CEEB. The latter were likely to take advantage of the geographical proximity to the high-technology old-EU countries in accordance with the findings in Gamberoni et al. (2010) and Baldwin and Lopez-Gonzales (2014). In addition, the CEEB were more timely reformers than the rest of the countries in the sample in terms of lifting the border barriers to doing business that awarded them with higher FDIs flowing from the old EU members, which supported the industrialization process. In other words, Baldwin (2011)'s win-win situation in international trade - my factories for your reforms –seems to have worked successfully in the case of CEEB.

Table 11 – Transition countries vs. MENA

	CEEB					MENA				
Dependent variables:	Tariff	Log of import	Log of export	RCA index	Log of value added	Tariff	Log of import	Log of export	RCA index	Log of value added
	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
Lag of log VA					0.867***					0.891***
					(0.006)					(0.007)
Log of import					-0.002					0.011
					(0.007)					(0.008)
Log of export					0.081***					0.033***
					(0.007)					(0.008)
RCA index					0.009					0.008
					(0.036)					(0.070)
Tariff rate		-0.017***	-0.008***	-0.000			-0.004***	-0.001	0.000	
		(0.002)	(0.002)	0.000			0.001	0.001	0.000	
Bound tariff						0.109***				
						(0.001)				
Lag of tariff rate	0.942***					0.928***				
	(0.007)					(0.006)				
Constant	22.444	8.608***	6.695	-0.856**	2.954***	-71.415***	10.145***	10.293***	-0.792	1.541*
	15.033	4.129	5.272	0.347	0.535	22.765	4.501	6.281	0.622	0.846
Observations	5,158	5,158	5,158	5,158	5,158	4,749	4,749	4,749	4,749	4,749
	CIS					**SEE**				
Lag of log VA					0.836***					0.858***
					(0.013)					(0.010)
Log of import					0.034*					0.019
					(0.021)					(0.014)
Log of export					0.068***					0.058***
					(0.015)					(0.012)
RCA index					0.025					0.112
					(0.041)					(0.084)
Tariff rate		-0.003**	-0.001	0.000			-0.025***	0.006	0.003**	
		0.002	0.002	0.001			0.003	0.005	0.002	
Bound tariff	0.118***					0.336***				
	(0.010)					(0.013)				
Lag of tariff rate	0.909***					0.653***				
	(0.013)					(0.013)				
Constant	0.485	10.389***	9.659***	-0.792	4.484***	45.320	13.383***	11.819***	0.781***	1.429***
	2.896	1.588	2.369	0.622	1.017	42.947	0.564	0.877	0.266	0.346
Observations	2,752	2,752	2,752	2,752	2,752	3,062	3,062	3,062	3,062	3,062

*Source: Authors' calculations. *, ** and *** denote statistical significance at the 10, 5 and 1% level, respectively. Standard errors given in parentheses. Country and time fixed effects and control variables not reported due to space, but available on request.*

6.2. Industries with different level of value added

Finally, we evaluate whether there are differences in the effects of tariffs on value added for different industries, i.e. for industries with high value added and for industries with low value added. The main argument for this distinction is that industries with low value added may consist mainly of young firms, which may need some time to develop, so may benefit from the trade protection, differently from the industries with high value added, which are usually mature.

We classify the industries into these two groups depending on whether an industry in a given year has a value added which is higher than the average value added for all the industries in that country. If this is the case, we classify the industry as an industry with high value added.

The results are presented in **Table 12**. As can be seen from the first panel, for the industries with high value added, higher tariffs lead to lower imports, but not exports and comparative advantage. The effect is such that one percentage point increase in the tariff rate reduces imports by 0.9 per cent. The value added, then, depends on the imports in a positive manner (higher imports = higher value added). Therefore, higher tariffs lead to lower value added, due to the lower imports, as in the overall sample. The size is such that this 0.9 per cent lower imports result in 0.05 per cent lower value added, in the long run.

Things are different for industries with low value added. Here, higher tariffs lead to lower imports, and through this, to lower output, just as previously. One percentage point increase in the tariff rate reduces imports by 2.9 per cent, which then translates into 0.2 per cent lower output. But higher tariffs here lead to higher exports, and through this, to higher output, differently from the high value added case. The effect is such that one percentage point higher tariff raises exports by 0.7 per cent, which then raises value added by 0.2 per cent. In sum, the imports effect and the exports effect net each other out, as a result of what the overall effect of the tariffs on the value added is insignificant.

Therefore, to summarize the analysis for the different industries, we find some evidence that protectionism may be beneficial for industries with low value added, differently from industries with high value added. These findings are in accordance with Stiglitz (2005) and Shalaeddin (2006a,b).

Table 12 – High value added industries vs. Low value added industries

	High value added					Low value added				
Dependent variables:	Tariff	Log of import	Log of export	RCA index	Log of value added	Tariff	Log of import	Log of export	RCA index	Log of value added
	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
Lag of log VA					0.761***					0.790***
					(0.009)					(0.007)
Log of import					0.014**					0.015**
					(0.006)					(0.006)
Log of export					0.035***					0.061***
					(0.006)					(0.007)
RCA index					0.007					0.078
					(0.016)					(0.076)
Road density	-0.223***	-0.014	-0.003	0.000	-0.003	0.039*	-0.006	-0.023	0.000	-0.013***
	(0.044)	(0.016)	(0.022)	(0.004)	(0.003)	(0.022)	(0.013)	(0.017)	(0.001)	(0.004)
Credit to GDP	0.037	-0.004	0.002	0.000	-0.001	-0.015	0.003	-0.005	0.001	-0.001
	(0.040)	(0.015)	(0.021)	(0.004)	(0.001)	(0.017)	(0.013)	(0.017)	(0.001)	(0.001)
FDI to GDP	-0.637**	-0.004	0.000	-0.001	0.001	0.094	0.010	-0.019	-0.001	0.002
	(0.250)	(0.020)	(0.027)	(0.005)	(0.001)	(0.114)	(0.019)	(0.025)	(0.001)	(0.002)
Log of GDP per capita	-0.667	3.473	1.002	0.192	-0.237*	1.247***	0.609	2.323	0.034	0.061
	(0.571)	(2.219)	(3.033)	(0.541)	(0.127)	(0.263)	(1.729)	(2.337)	(0.122)	(0.136)
Spending for education to GDP	-0.559	0.117	-0.269	0.030	-0.008	1.611***	0.243	0.264	0.002	-0.003
	(0.705)	(0.183)	(0.248)	(0.045)	(0.024)	(0.330)	(0.189)	(0.249)	(0.013)	(0.025)
Market capitalization to GDP	-0.101***	-0.007	-0.006	0.001	-0.000	-0.031***	0.003	0.009	-0.000	-0.001*
	(0.022)	(0.006)	(0.008)	(0.001)	(0.001)	(0.011)	(0.006)	(0.008)	(0.000)	(0.001)
Trade to GDP	-0.049**	0.023**	0.027*	0.001	-0.002*	-0.019**	-0.017	-0.014	0.000	-0.004***
	(0.020)	(0.010)	(0.014)	(0.003)	(0.001)	(0.008)	(0.011)	(0.015)	(0.001)	(0.001)
Bound tariff	0.091***					0.018*				
	(0.012)					(0.009)				
Tariff rate		-0.009***	-0.002	0.000			-0.029***	0.007**	0.000***	
		(0.001)	(0.002)	(0.000)			(0.002)	(0.003)	(0.000)	
Lag of tariff rate	0.829***					0.948***				
	(0.007)					(0.006)				
Constant	21.633***	-16.022	-3.202	-1.095	5.399***	-16.437***	5.453	-14.171	-0.397	2.872***
	(7.226)	(14.580)	(32.662)	(3.555)	(0.916)	(3.996)	(11.519)	(26.000)	(1.361)	(0.940)
Observations	5,074	5,074	5,074	5,074	5,074	6,317	6,317	6,317	6,317	6,317

*Source: Authors' calculations. *, ** and *** denote statistical significance at the 10, 5 and 1% level, respectively. Standard errors given in parentheses. Country and time fixed effects and control variables not reported due to space, but available on request.*

7. Conclusion

In this paper, we evaluate if trade liberalization has been supporting the industrialization process in transition countries. More precisely, we investigate if tariffs affect industry value added in 25 countries from CEEB, SEE, CIS and MENA over the period1990-2010. We utilise an instrumental variable approach, using the bound tariffs and the lagged tariff as instruments for the actual tariff.

Our findings suggest that lower tariffs have likely resulted in higher value added, overall, and that this has been through the higher imports. On the other hand, the other channels through which tariffs can affect industry value added have not been supportive to the industrialization process. Thus, tariff has not affected export, but export is found to have increased value added. Although tariff affects competitiveness, it does not channel to manufacturing value added, as the comparative advantage is found insignificant for the latter.

The underlying mechanism behind the imports' effect is that the liberalization resulted in imports of inputs in the production process which were either inexistent or more expensive on the domestic market previously. Comparing to the consumption goods, the trade liberalization affects inputs and consumption goods differently. Lower tariffs on inputs lead to higher production of inputs, while lower tariffs on consumption goods lead to lower production of consumption goods. Yet due to the similarity with the results obtained from the whole sample of countries, we could say that the inputs channel dominates.

The trade liberalization effects on the industrialization process have not been due to the WTO membership, but due to countries' autonomous decision to lower the tariffs. Although the tariff reductions might be followed by increasing use of non-tariff measures, our results suggest that latter did not impose any statistically significant effect for manufacturing value added in the investigated countries.

Differentiating between different geographical regions, our findings imply that lower tariffs likely resulted in higher value added in the CEEB and CIS countries. The export materialized as the significant channel in the CEEB, while the import channel was more important for supporting industrialization in CIS. On the other hand, tariffs played no role for industrialization in MENA and SEE, which may be explained by the possibly pre-mature trade liberalization in these countries. That this may indeed be the case can be inferred from our final analysis, which distinguishes between different maturities levels of the industries. More precisely, we find that industries with higher value added (more mature industries) benefit from trade liberalization; that is, lower tariffs lead to higher value added, due to the higher imports. On the other hand, the industries with lower value added (young industries) do not benefit from the liberalization since the overall effect of the tariffs on the value added is insignificant.

To summarize, our findings support trade liberalization, but only for mature industries. This could imply that protectionism may be beneficial for young industries, which is in accordance with some of the previous researches. Although the countries from CEEB, SEE, CIS and MENA experienced significant tariff reductions during the last two decades they could reconsider their trade policies for young industries in line with these findings.

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Appendix 1.Variable description, sample period and sources

Country	Value added	Import	Export/ RCA	Tariff	Bound tariff	Road density	Credits	FDI	GDP per capita	Spending on education	Market capitaliz.	Openness	REER	Terms of trade
Azerbaijan	2001-2010	1996-2010	1996-2010	2002-2009*	-	2000-2010	1992-2010	1995-2010	1990-2010	1992-2010*	1998	1990-2010	1992-2010	2000-2010
Bulgaria	1996-2010	1996-2010	1996-2010	1998-2006*	-	2000-2010	1991-2010	1990-2010	1990-2010	1990-2010*	1995-2010	1990-2010	1992-2010	2000-2010
Cyprus	1999-2010	1990-2010	1990-2010	1996-2002*	-	2000-2010	1990-2010	1990-2010	1990-2010	1990-2010*	1991-2010	1990-2010	1992-2010	2000-2010
Czech R.	1999-2007	1993-2010	1993-2010	1997-2003	-	2000-2010	1993-2010	1993-2010	1990-2010	1992-2010*	1994-2010	1990-2010	1992-2010	2000-2010
Egypt	1997-2010*	1994-2010	1994-2010	1995-2009*	1995-2010	2000-2010*	1990-2010	1990-2010	1990-2010	1992-2010*	1990-2010	1990-2010	1992-2010	1990-2010
Estonia	2000-2010	1995-2010	1995-2010	1999-2003	-	2000-2010	1995-2010	1995-2010	1995-2010	1993-2010*	1997-2010	1995-2010	1992-2010	2000-2010
Georgia	2000-2010	1996-2010	1996-2010	2002-2010*	2000-2010	2000-2010	1995-2010	1997-2010	1990-2010	1994-2010*	2000-2010	1990-2010	1992-2010	2000-2010
Hungary	1992-2009	1992-2010	1992-2010	1991-2002*	-	2003-2010	1991-2010	1991-2010	1991-2010	1990-2010*	1991-2010	1991-2010	1992-2010	2000-2010
Iran	1994-2009	1997-2010	1997-2010	2003-2008*	-	2000-2010	1990-2010	1993-2010	1990-2010	1990-2010*	1993-2010	1990-2010	1992-2010	2000-2010
Jordan	1994-2010	1990-2010	1990-2010	2001-2009*	2000-2010	2000-2010	1990-2010	1990-2010	1990-2010	1996-1999*	1990-2010	1990-2007	1992-2010	1990-2010
Kuwait	2005-2010	1990-2008	1990-2008	2005-2009*	1995-2010	2000-2010	1991-2010	1990-2010	1995-2010	1992-2006*	1993-2010	1990-2010	1992-2010	2000-2010
Kyrgyz R.	2002-2010	1995-2010	1995-2010	2002-2010*	1999-2010	2000-2010*	1995-2010	1993-2010	1990-2010	1994-2010*	1999-2010	1990-2010	1992-2010	2000-2010
Latvia	1993-2010	1994-2010	1994-2010	2001	-	2000-2010	1993-2010	1992-2010	1990-2010	1990-2010*	1995-2010	1990-2010	1992-2010	2000-2010
Lithuania	2000-2010	1994-2010	1994-2010	2002-2003	-	2000-2010	1993-2010	1993-2010	1990-2010	1993-2010*	1995-2010	1990-2010	1992-2010	2000-2010
Macedonia	1997-2010*	1994-2010	1994-2010	2004-2010	2003-2010	2000-2010	1993-2010	1994-2010	1990-2010	1992-2002*	1996-2010	1990-2010	1992-2010	2000-2010
Moldova	2001-2010	1994-2010	1994-2010	2000-2010*	-	2000-2010	1991-2010	1992-2010	1990-2010	1996-2010*	1996-1999	1990-2010	1992-2010	2000-2010
Morocco	2000-2010	1993-2010	1993-2010	1993-2009*	1995-2010	2000-2010	1990-2010	1990-2010	1990-2010	1990-2009*	1990-2010	1990-2010	1992-2010	1990-2010
Oman	1993-2010	1990-2010	1990-2010	2005-2009*	2001-2010	2007-2010	1990-2010	1990-2010	1990-2010	1990-2009*	1992-2010	1990-2010	1992-2010	2000-2010
Poland	1992-2009*	1992-2010	1992-2010	1996-2003	-	2000-2010	1990-2010	1990-2010	1990-2010	1991-2010*	1991-2010	1990-2010	1992-2010	2000-2010
Qatar	2000-2010	1991-2010	1991-2010	2005-2009*	1996-2010	2007-2010	1990-2010	1990-2010	1994-2010	1998-2008*	1997-2010*	1994-2010	1992-2010	2000-2010
Romania	1990-2010	1990-2010	1990-2010	1999-2005*	-	2000-2010	1996-2010	1990-2010	1990-2010	1996-2010*	1994-2010	1990-2010	1992-2010	2000-2010
Russia	2001-2010	1996-2010	1996-2010	1994-2010*	-	2000-2010	1993-2010	1992-2010	1990-2010	2000-2008*	1991-2010	1990-2010	1992-2010	2000-2010
Slovak R.	1993-2009	1994-2010	1994-2010	2002	-	2000-2010	1993-2010	1993-2010	1992-2010	1992-2010*	1994-2010	1990-2010	1992-2010	2000-2010
Slovenia	1995-2010	1992-2010	1992-2010	2002-2003	-	2000-2010	1995-2010	1995-2010	1995-2010	1991-2010*	1995-2010	1995-2010	1992-2010	2000-2010
Turkey	1992-2009	1990-2010	1990-2010	1997-2010*	1995-2010	2003-2010	1990-2010	1990-2010	1990-2010	1993-2006*	1990-2010	1990-2010	1992-2010	1990-2010
Number of observ.	26.798	49.574	38.277	16.122	8.401	247	471	477	503	344	403	507	475	315
Source:	UNIDO	UNIDO	UNIDO	TRAINS	WTO	WDI	WDI	WDI	WDI	WDI	WDI	WDI	BRUEGEL	WDI

* missing data in some years

Variable description:

Value added: Log of value added in current US Dollars;

Import: Log of imports from world in current US Dollars;

Export: Log of exports to world in current US Dollars;

RCA: Revealed comparative advantage index as explained in details in section 4.3;

Tariff:Ad-valorem tariff rates of manufacturing products in %;

Bound tariff: Bound tariff rates of manufacturing products set by WTO in %;

Road density: km of road per 100 sq. km. of land area;

Credits: Domestic credit to private sector by banks (% of GDP);

FDI: Foreign direct investment, net inflows (% of GDP);

GDP per capita: Log of GDP per capita (constant 2005 US$);

Spending on education: Public spending on education, total (% of GDP);

Market capitalization:Market capitalization of listed companies (% of GDP);

Non-tariff measures: Number of non-tariff measures applied to specific industry

Openness: Export and Import (% of GDP);

REER: Real effective exchange rate index (2007 = 100);

Terms of trade: Net barter terms of trade index is calculated as the percentage ratio of the export unit value indexes to the import unit value indexes, measured relative to the base year 2000. Unit value indexes are based on data reported by countries that demonstrate consistency under UNCTAD quality controls, supplemented by UNCTAD's estimates using the previous year's trade values at the Standard International Trade Classification.

Appendix 2.Descriptive statistics of variables

Statistics

	Tariff rate	Bound tariff rate	Log of imports	Log of exports	RCA	Log of value added	Log GDP pc	Road density	Credit to GDP	FDI to GDP	Spending on education to GDP	Market capitalization to GDP	Trade to GDP	Number of non-tariff measures
Minimum	0	0	0	0	0	5.0	5.8	5	1.2	-16.2	0	0	26.3	0
25 percentile	3.6	8.1	8.8	6.7	0.00	15.2	7.6	17.2	18.0	0.8	3.8	7.5	63.3	0.53
Mean	13.8	26.0	10.1	8.6	0.09	16.6	8.4	69.1	40.4	4.3	4.7	30.1	88.8	0
50 percentile	7.5	15	10.2	8.9	0.02	16.9	8.4	44.5	32.5	2.7	4.7	18.2	88.9	0
75 percentile	14.8	34	11.6	10.9	0.07	18.3	9.2	121.5	50.8	5.8	5.5	35.8	110.1	0
Maximum	2314.3	100	17.6	18.2	34.27	24.6	11.0	214.5	283.5	51.0	14.2	299.0	172.9	119
Standard deviation	46.1	28.5	2.2	3.0	0.42	2.4	1.2	60.2	35.6	6.1	1.4	37.3	30.4	3.35
Number of observations	16122	26943	49574	38277	40174	26798	63881	31369	59817	60579	43688	51181	64389	70080