Structural Transformation and Trade Liberalization: Evidence from RTA Enactments*

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Abstract

We ask whether trade liberalization promotes labor and value-added reallocation to manufacturing and manufacturing labor productivity growth using Regional Trade Agreements (RTAs) as a proxy for trade liberalization. We leverage a panel dataset of structural transformation measures on 51 developing and developed economies from 1990-2018. We also exploit the covariates related to the agreement via 2SLS estimations using a novel method proposed by Freyaldenhoven et al. (2019). We find that RTAs promote industrialization trends in value-added shares but have no statistically significant effect on manufacturing employment shares. Interestingly, the impact on manufacturing labor productivity is significant, suggesting that trade liberalization throughout the last 30 years has promoted overall productivity growth through sectoral productivity rather than structural change. This is in line with the total productivity decomposition results, which show that from 1990-2018, sectoral productivity growth has been the primary source of total labor productivity growth and that the manufacturing sector has made a significant contribution.

Keywords: Structural Change, Trade liberalization, Labor productivity, Regional Trade Agreements

JEL Codes: F60, F63, L16, O13, O24, R11,

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1 Introduction

It has been long established in the development economics literature that growth goes in hand with industrialization[1]. Reallocation of factors of production from less to more productive sectors shifts the economy's production patterns in the same manner, leading to an overall increase in productivity and income (Lewis et al., 1954; Chenery, 1960; Kuznets and Murphy, 1966). Consequently, developed and developing economies differ in the degree of industrialization and, thus, in their overall labor productivity characteristics (Herrendorf et al., 2014). Whether the past decades of trade liberalization have promoted the industrialization process for liberalizing economies converging the labor market characteristics of developing economies to that of the developed ones or have driven them towards deindustrialization is still an open question.

The challenges in answering this question come from the general equilibrium considerations implying that trade liberalization triggers multiple mechanisms and channels potentially affecting the conditions in the labor market. Trade has important income effects that could generate shifts in expenditures and production towards more productive sectors (Teignier, 2018; Matsuyama, 2019; Erten and Leight, 2021). Still, it could also trigger the specialization of poor economies in less advanced sectors (Rodrik, 2016).

We propose to use trade agreements as a proxy for trade liberalization to develop insights into the relationship between trade liberalization and structural change over the past 30 years. Our identification strategy relies on the plausible uncertainty around the timing of trade agreements as a source of exogenous variation in trade policy. We attempt to control for factors that could simultaneously influence both variables. We also implement a novel approach in establishing causal links between treatment and the dependent variable in event study designs proposed by Freyaldenhoven et al. (2019).

In particular, we are interested in studying the relationship between Regional Trade

[1]We use the terms structural change, structural transformation, and industrialization interchangeably in the study. We refer to the reallocation of value-added and employment shares towards manufacturing.

Agreements (RTAs) and labor/value-added allocation, and labor productivity in manufacturing. We use panel data on the structural transformation measures for 51 developed and developing economies from 1990-2018. The focus on this sample period has to do with the increased popularity of RTAs, globalization trends worldwide in general, and the availability of comparable data. This comparability allows us to decompose the total labor productivity into a) within sectoral and b) structural change components similar to McMillan and Zeufack (2022) and look into sectoral labor productivity. Throughout the past 30 years, structural change in manufacturing has had a negligible contribution to the overall labor productivity growth, unlike the structural change in the non-manufacturing sectors. Furthermore, most of the labor productivity growth of 2.5% has been driven by within sectoral labor productivity growth of 1.6%, out of which around 0.5% has been within manufacturing (Figure 2).

Our identification strategy is based on an event study framework to capture the variation in the measures of structural change around the enactment of RTAs. We use the potential uncertainty around the timing of the enforcement of RTAs to establish a potentially causal effect on structural change. In doing this, we follow the strategy proposed by Abman and Lundberg (2020), where they study the relationship between RTAs and deforestation. Instead of looking into the presence of a trade agreement in a given period, we look into the enactment of RTAs. The identification assumption would then become that the nature and the process of RTA enforcement make its timing uncertain and, thus, exogenous to a given country's economic conditions.

We then look into the relationship between manufacturing labor productivity and RTA enactment. Using PPP conversion factors, we generate a comparable measure of labor productivity at the sectoral level and use these measures as dependent variables in our analysis. With this additional variable, we can look into the trade liberalization effects on growth through the framework proposed by McMillan et al. (2014) [2]. This framework essentially breaks the sources of total labor productivity growth into three parts; structural change,

[2] See also Dani Rodrik's presentation at "STEG Special Lecture 2022"

within-sector growth, and long-term fundamental factors determining economic performance. In other words, the convergence of developing economies' total labor productivity and income would be driven by three channels; movement of labor from less to more productive sectors, within sector productivity shifts, and long-term fundamental determinants of growth such as education, health, etc. Controlling for the fundamental factors and looking at both labor reallocation and labor productivity shifts at the sectoral level could give us insights on what has been driving total labor productivity and through which mechanism, if any, has trade liberalization impacting it throughout the last 30 years.

The event study framework allows us to have a closer look at the pre-trends of industrialization to study the potential endogeneity between RTAs and structural change. If we observe a statistically significant coefficient of the leads for the RTA enactment, that would imply that there is a relationship between our explanatory and dependent variables prior to the RTA enactment. It could be a sign of a presence of a confounding variable. In other words, the relationship is not what we had thought it was, i.e., causal because an unobserved and omitted variable constitutes the effect of RTA enactments on industrialization. If omitted variable bias is an issue in our analysis, the pre-trend diagnosis should allow us to notice it. Even if such pre-trends are missing or their presence could be interpreted as anticipation effects, we further develop our empirical strategy to look closer into the causal effect.

One of the potential confounds could be the institutional development of the economy. The idea that institutional development and industrialization or, more broadly, the state's economic conditions are connected causally or through historical patterns has been a discussion theme in economic literature for an extended period (Acemoglu et al., 2001, 2010; Rodrik, 2011).

Trade agreements aim to reduce trade barriers; simple reduction of tariffs is not the only tool available. Nowadays, trade agreements cover broader non-economic dimensions such as institutional/political provisions. That is, RTAs themselves include provisions on institutional development matters. All these give ground for considering that RTA enactment and structural change might be linked through causal effects and the state's institutional quality level. That is, institutional quality could be an omitted time-varying factor in the story between trade liberalization and structural change.

We make use of a novel approach in event studies with panel data proposed by Freyaldenhoven et al. (2019). The potential concern in this framework is that there is an omitted variable or a confound correlated to both the dependent variable and the policy. Given that an unobserved measure of the potential confound exists that changes with the confound but is not directly affected by the policy, we can deduce the dynamics of the confound around the policy. This would allow us to establish the direction of the bias of our main coefficient of interest and cleans the causal effect we are looking for. Instrumenting the potential proxy for the confound by the leads of the event, i.e., RTA enactment, and using 2SLS estimations, we can disentangle the effect of RTA enactment on structural change from the impact coming from institutional development.

We find positive and statistically significant coefficients for the share of value-added in manufacturing following RTA enactment, with the 4-year cumulative effect being around 4 percent. Interestingly, the coefficients for labor share in manufacturing are negative. This is in line with the negative time trends observed for the share of manufacturing labor for the countries in our sample during our study (Kruse et al., 2022). In other words, trade agreements can at least partially explain the trends prevalent in these countries.

We also note significant pre-trends one period prior to the enactment of RTAs. The interpretation of these pre-trends is not entirely straightforward as they are similar in magnitude and sign to the coefficients on the treatment and its lags. It could be that these are signs of anticipation effects due to the context in which RTA enactment takes place. Enactment is preceded by lengthy negotiations and post-signing periods, which hints at possible anticipation effects. Using the 2SLS specification and instrumenting for the measure of institutional quality as a potential confound, we do not seem to observe any more pre-trends; we also note similar coefficients for the treatment and its lags both in sign and in magnitude. We lose, however, statistical significance for the share of manufacturing labor. The coefficients are cumulatively statistically significant for the share of real value-added in manufacturing and show around a 3.5 percent increase following four years after the enactment of RTAs.

Interestingly, the coefficient on RTA enactments for labor productivity in manufacturing is positive and statistically significant even after controlling for time-varying factors and implementing the 2SLS estimation. This gives grounds to argue that the relationship of trade liberalization with overall labor productivity has to do with shifts in the sectors themselves rather than the reallocation of factors of production around the sectors.

This paper contributes to the well-established literature on how international trade and openness affect structural change. To the best of our knowledge, our paper is the first to try and estimate a causal link between trade agreements and structural transformation/sectoral productivity at the aggregate country level. Consequently, we elaborate on Goldberg and Pavcnik (2016) conquest against the idea that trade policy no longer matters, proposing addressing the question through structural transformation lenses.

Herrendorf et al. (2014) present a survey on both the theoretical and empirical efforts on structural change generally and the importance of the international dimension, in particular. Diao et al. (2019) outline that the patterns of structural change claim a different responsibility for different regions' economic growth experiences. In contrast to the East Asian experience, none of the recent growth accelerations in Latin America, Africa, or South Asia was driven by rapid industrialization. Rodrik (2016) outlines a significant deindustrialization trend in recent decades for both advanced and developing economies, possibly driven by globalization patterns.

Several scholars have addressed structural transformation in an open economy model. Matsuyama (1992) theoretically showed that having access to international markets potentially distracts the economy with higher productivity in the backward sector from the path of industrialization. Matsuyama (2009) shows that the growth of manufacturing productivity and the relative size of the manufacturing sector can be decoupled in open economies. Uy et al. (2013) study the structural change patterns in South Korea between 1971 and 2005 using an open-economy model. Using a quantitative trade model, Cravino and Sotelo (2017) show that reducing trade costs can hurt manufacturing employment.

Our study also relates to the studies concentrating on the relationship between trade and labor markets. Autor et al. (2013) study the effect of 20 years of trade with China on the US labor market looking into the commune zones and finding significant job losses specifically in manufacturing. Feenstra et al. (2019)bring the US global exports to the analysis showing that US export growth offsets job losses due to imports from China. Erten and Leight (2021) study the impact of China's WTO accession on its industrialization patterns at the country level utilizing the variation in the shifts of tariff uncertainty. Dix-Carneiro and Kovak (2017) analyze the impact of tariff cuts on Brazil's local labor markets at the regional level. McCaig (2011) analyzed the effect of the bilateral trade agreement between the US and Vietnam in 2011 on Vietnam's poverty level using variations in the labor force across provinces. McCaig and Pavcnik (2018) then look into the reallocation of labor between businesses and the formal sector.

It should be mentioned that we are aware of the possible endogeneity concerns even after implementing this method. These biases could have two roots. One is that institutional development could not be the only omitted variable systematically changing with both RTA enactment and structural change. Having used the 2SLS estimation, we no longer observe pre-trends; further, we introduce fixed effects with additional time-varying controls that could be thought of as fundamental determinants of growth to alleviate further concerns about omitted variables. We use the theoretical and empirical literature on industrialization and trade to determine the confounding factors, differentiate those from suppressors or mediators and identify potential proxies of the confounds in order to control for their presence. The second concern has to do with reverse causality, the idea that trade agreements are not presented by hazard. We offer some evidence on the variance in the timing of RTA enactments and arguments on the uncertainty in its timing, given the nature of ratification of such agreements. We continue treating RTA enactments as an exogenous variation in trade policy to be able to look into its relationship with industrialization.

The remainder of the paper is organized as follows. Section 2 gives details on the data, variables, and data sources used in the study. Section 3 develops a conceptual framework to outline the possible mechanisms through which trade liberalization could have an impact on the patterns of structural change. We discuss the key findings in the literature and show how our effort adds to these findings. The discussion of the existing results gives theoretical grounds for the empirical strategy and methods implemented in this analysis.

Section 4 details the empirical framework and methods used for the analysis, the limitations, possible concerns and the requirements of the proposed identification strategies. We discuss two main specifications employed. The event study framework with time and country-fixed effects generates insights into the relationship between trade liberalization and structural change. It also gives the possibility to study the possible pre-trends. We then discuss the method proposed by Freyaldenhoven et al. (2019) and the ability to analyze the causal relationship. Section 5 gives the findings of the study and their possible interpretations. Finally, Section 6 concludes the study, underlines the potential caveats present, and offers propositions for the direction of future research.

2 Data

To assess the effect of RTAs on structural change, we gather data on the RTA enactments, sectoral allocation of value-added and labor, and institutional development characteristics. This section presents the data and data sources utilized in the analysis.

2.1 Industrialization Measures

Industrialization is usually measured through 2 key variables; the share of manufacturing in total employment and the share of manufacturing in value-added in constant prices (real

MVA). The GGDC/UNU-WIDER Economic Transformation Database (ETD) provides comprehensive, long-term, and internationally comparable sectoral data on these key variables of structural transformation (De Vries et al., 2021). The database is constructed on a country-by-country basis using available statistical sources. Furthermore, international consistency is ensured through the System of National Accounts for value-added and the use of a harmonized classification of sectors. The dataset divides the economy into 12 sectors and gives information on the key parameters of structural transformation mentioned above. The sectoral division is based on ISIC rev. 4, namely agriculture (ISIC rev. 4 code A), mining (B), manufacturing (C), public utilities (D + E), construction (F), trade (G + I), transport (H), business services (J + M + N), finance (K), real estate (L), government services (O + P + Q) and other services (R + S + T + U). Together these sectors cover the entire economy. The data on value-added are at constant 2015 prices in local currencies; using PPP conversion factors for the 2015 US dollar, we transfer these values to internationally comparable values. We use the World Bank's PPP exchange rates for 2015 US dollars and simply divide the sectoral value-added values by the PPP exchange rates. The data on labor statistics are given in terms of the number of people engaged in the sector. This means that the data includes all paid workers, aged 15+, self-employed, and family workers. This is important as it implies that we consider both formal and informal sectors. Having both the sectoral employment and value-added data in comparable units, we then generate sectoral labor productivity measures by dividing the value-added by labor.

The dataset covers 51 developing/developed economies with 20 Asian, 9 Latin American, 4 Middle-East and North African (MENA), and 18 sub-Saharan African (SSA) countries—the time series with annual data range from 1990 until 2018. The countries included are:

- *Developing Asia (14)* - Bangladesh, Cambodia, China, India, Indonesia, Lao People's Democratic Republic, Malaysia, Myanmar, Nepal, Pakistan, Philippines, Sri Lanka, Thailand, Vietnam

- *Advanced Asia (5)* - Taiwan, Israel, Japan, Korea (Rep. of), Singapore, Hong Kong

- *Latin America (9)* - Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Ecuador, Mexico, Peru

- *Middle East and North Africa (4)* - Egypt, Morocco, Tunisia, Turkey

- *Sub-Saharan Africa (18)*- Botswana, Burkina Faso, Cameroon, Ethiopia, Ghana, Kenya, Lesotho, Malawi, Mauritius, Mozambique, Namibia, Nigeria, Rwanda, Senegal, South Africa, Tanzania, Uganda, Zambia

2.2 Regional Trade Agreements and Institutional Quality

The key explanatory variable we are interested in is the enactments or the entry into force of the RTAs. Mario Larch's Regional Trade Agreements Database (Egger and Larch, 2008)includes all plurilateral and bilateral RTAs that were notified to the World Trade Organization for the last 70 years, from 1950 to 2023. A total of 570 agreements in the dataset are distributed as dummies between each possible country pair. When an agreement between countries is concluded, the dummy is equal to one. Consequently, when the agreement is between multiple states, the dummy is equal to one for all the pairs of countries participating in the agreement. The same is true for the economies joining an agreement; joining the European Union, an economy, is, in practice, entering into a trade agreement with all the economies of the EU.

We use this information to construct our key explanatory variable, which is also a dummy variable. The variable equals 1 if the given country has enacted an agreement with any possible counterpart. The conclusion of these agreements varies within the year as the timing ranges anywhere from January to December. However, with yearly data of the key explanatory variables ranging from January to December, we believe that a year dummy for RTA enactment is the optimal way to conduct the analysis. Doing this, we follow the strategy of Abman and Lundberg (2020) implemented when studying the relationship between RTA enactment and deforestation for a shorter period. Essentially, the variable takes the value of 1 if one or more RTAs have been enacted that given year.

To study the role of institutional quality in the relationship between trade liberalization and structural change and to test the hypotheses of it being a potential confound in this relationship, we need a good measure of institutional quality that captures the characteristics through which institutions and RTAs might be related. One such measure is the degree of regime authority in society. The Center for Systemic Peace proposes such a measure under the framework of the Polity Project, which analyses the more or less institutionalized authority patterns of a polity/state. The Polity Project codes the authority characteristics of states in all independent countries with a total population greater than 500,000 in 2018 (167 countries in 2018). Hong Kong is the only country missing in our sample of 51 countries.

The key index of the Polity5 project is the "Polity Score"; it captures the regime authority spectrum on a 21-point scale ranging from -10 (hereditary monarchy) to +10 (consolidated democracy). The Polity scores can also be converted into regime categories in a suggested three-part categorization of "autocracies" (-10 to -6), "anocracies" (-5 to +5), and "democracies" (+6 to +10). The Polity scheme consists of six component measures that record key qualities of executive recruitment, constraints on executive authority, and political competition. It also records changes in the institutionalized qualities of governing authority. This measure seemed appropriate compared to its counterparts, such as the index provided by the Freedom House, due to the characteristics it takes into account. These characteristics fit better into the context of the story analyzed. In particular, when an RTA is negotiated and signed by one administration, its ratification depends on the level of authority and ease that administration has in ratifying it in the state's legislative body. With authority characteristics in use as a basis, the constructed polity index best suits the role of a measure of institutional development in our context.

3 Background and conceptual framework

3.1 Industrialization and Trade Liberalization

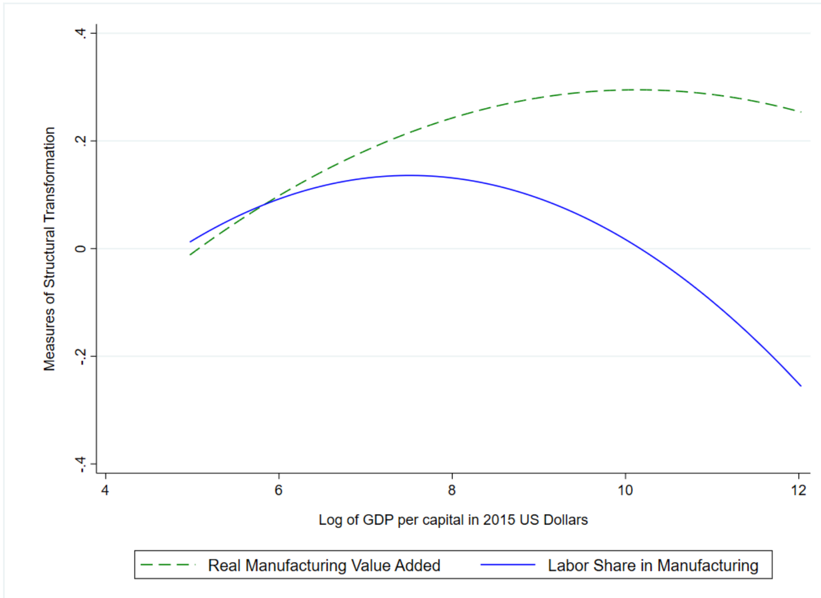
Herrendorf et al. (2014) use contemporary data to revisit the matter of structural change and to summarize stylized facts on the path of economic development. They use panel data with long time series of sectoral labor and value-added shares over the 19th and 20th centuries for developed countries, including Japan, South Korea, Australia, and the US. They show that over the last two centuries, increases in GDP per capita have been associated with decreases in both the employment and the nominal value-added shares in agriculture and increases in those in services; the manufacturing sector first documents an increase in these estimates (industrialization) and then a decrease (deindustrialization) as factors of production move to services, thus highlighting a hump-shaped relationship with GDP per capita.

However, using disaggregated data from 15 EU countries, they also find considerable heterogeneity in the structural transformation paths of those for a given level of development. This is not limited to EU members but could be observed between the EU and Japan, Germany, and South Korea, which have a high level of concentration of factors of production in manufacturing which is unusual given their GDP per capita. In the context of comparative advantages, one could interpret these differences in the allocation of production factors. As part of a highly integrated and open market, EU member countries specialize according to their comparative advantages, as do other trading partners like Germany and Japan.

Rodrik (2016) also reexamines the link between income and industrialization using panel data on 42 economies from the 1940s until the 2010s. Based on quadratic estimations using country fixed effects and controlling for population size, Rodrik again shows the hump-shaped relationship between measures of structural change and income. We repeat the same exercise for our data sample of 51 economies from 1990-2018, uncovering the same hump-shaped relationship in Figure 1 (estimations are based on equation (3)).

McMillan et al. (2014) analyze the structural transformation paths of 38 developing and

Figure 1: Simulated manufacturing shares in real value-added and employment as a function of income.



Notes: Figure is based on a quadratic estimation of measures of structural change on income, population, time, and country fixed effects. The time period covered is 1990-2018.

developed countries in Africa, Asia, and Latin America from the 1950s up to 2005. They find that prior to the 1990s, the structural transformation was growth-enhancing for all the continents, implying that labor has been reallocating towards more productive sectors. However, starting from the 1990s, labor was reallocated to agriculture in Latin American and African countries. This was not true for the Asian countries that continued their industrializing paths throughout the 1990s up to the early 2000s.

One possible explanation for these differences in the structural change paths or the heterogeneous paths discussed earlier is that these countries have been practicing open market policies. With more openness to trade and participation in international markets, countries were to specialize in their comparative advantages. These reasonings, particularly the way trade liberalization directly affects structural change, have not, however, been documented at the aggregate country level.

Our analysis allows us to think in the framework proposed by McMillan et al. (2014). They study the patterns of structural change and productivity growth in developing economies from 1990-2005. The economy-wide productivity growth is decomposed into two channels: within-sector productivity growth and structural change, that is, labor reallocation to more productive sectors. The decomposition of these channels for their sample of 38 countries from Asia, Latin America, and Africa shows that structural change has been, in fact, a negative contributor in the developing economies of Latina America and Africa. This implies that there has been a deindustrialization trend for these economies in the sense that labor has been moving from more to less productive sectors. The opposite is true for sectoral productivity growth. The driving force of overall labor productivity growth for these economies has been within sectoral labor productivity [3].

Thus, the total labor productivity growth could be considered as comprising of three channels - unconditional convergence driven by long-term fundamental determinants of growth, conditional convergence that drives the increase in productivity within sectors, and structural change where labor moves from less to more productive sectors. The following formula is to fix these ideas.

$$\hat{Y} = \gamma(lny\ (\theta) \quad lny) + \alpha_M \pi_M \beta(lny_M \quad lny_M) + (\pi_M \quad \pi_{NM})da_M \tag{1}$$

where $\hat{Y}$ is the overall labor productivity growth in the economy, $\gamma(lny\ (\theta) \quad lny)$ represents the growth in the fundamental or long run factors like institutions, education, etc., $\alpha_M \pi_M \beta(lny_M \quad lny_M)$ represents the shifts in productivity within sectors, namely manufacturing with α_M being the share of labor in manufacturing and π_M is its productivity, and finally $(\pi_M \quad \pi_{NM})d\alpha_M$ is the structural change channel measured by the movement of labor to manufacturing. Using RTA enactments, it is also our task to see through which of these two channels trade liberalization has been promoting growth for the economies in our sample.

We conduct a decomposition of productivity growth into the within and structural components to have a better understanding of the patterns. This decomposition strategy is

[3] Dani Rodrik's presentation at "STEG Special Lecture 2022"

similar to that of McMillan and Zeufack (2022), where they study the labor productivity growth patterns for 18 African economies using the same database as us. Our concentration, however, is on the broad patterns for the total sample of the available countries and longer time spam. Without going into details, we aim at looking at how much within and structural components have been responsible for the total labor productivity change and what role has the manufacturing sector played in each of the components.

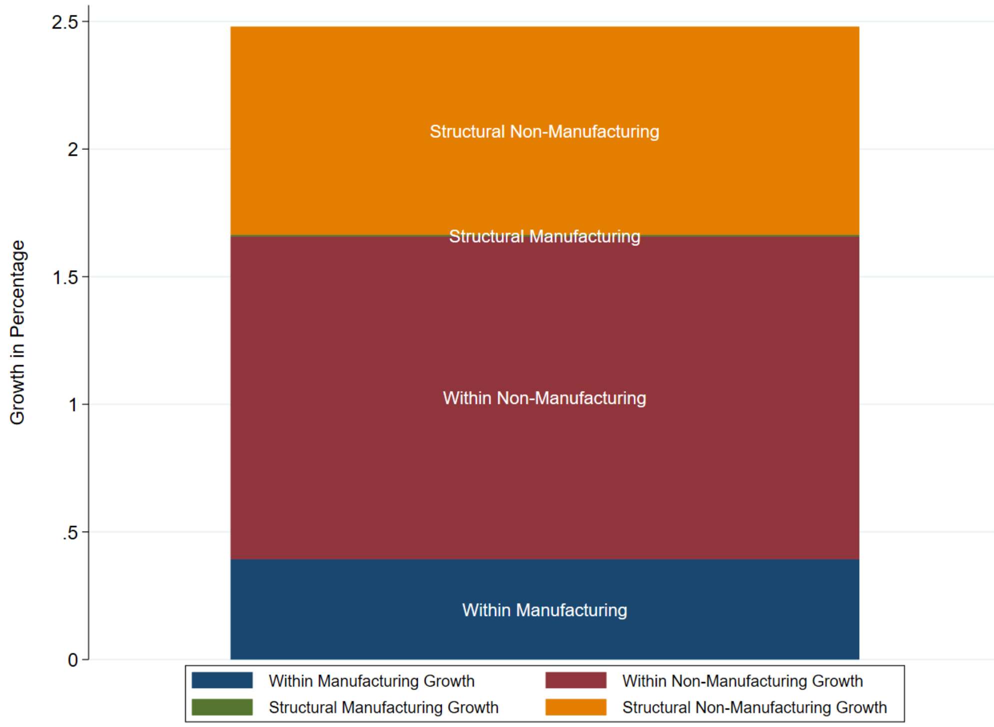
Figure 2 shows the decomposition results for the sample of 51 countries from 1990 to 2018. We divide the economy into two parts, manufacturing and everything else. Several things from this figure are relevant for our purposes. One is that both Structural change and Within sector growth have had a positive influence on total labor productivity. Second is that manufacturing has had a positive and significant contribution to the within the component. Third, manufacturing had a negligible impact on the structural component.

Of course, the results and the interpretations from the decomposition are highly dependent on the sample aggregation degree, i.e., which countries are included and from which parts of the world. It also depends on the time period or the division of the economy between sectors. As we aim to have a broad understanding of the patterns for the overall 1990-2018 period, we omit further segregation into subsamples or subperiods.

How has trade liberalization contributed to these processes? Understanding these effects would be a step forward in answering important policy-related questions: how open should the economy be; how does it depend on the comparative advantages and the development level of the country; what would be the effect of trade liberalization on the structural transformation path of the economy?

Overall, in an open economy framework, the usual triggers of structural transformation could have potentially ambiguous effects, possibly driven by the comparative advantages of the economy. Structural transformation paths are distorted by the influence of international markets and potentially directly influenced by shocks such as higher access to international trade. However, trade liberalization and structural transformation results are ambiguous and context-specific.

Figure 2: Total Labor Productivity Growth Decomposition



Notes: This figure decomposes the total labor productivity growth for the 51 states in the period 1990-2018 into two components, within and structural. The two components are later decomposed into two parts; manufacturing and non-manufacturing sectors.

The literature on structural change in an open economy framework gives grounds to develop insights into how trade could affect sectoral labor allocation. Firstly, trade liberalization could generate trade flows between the signatories, increasing income and demand. Assuming that preferences are non-homothetic, increased income would mean higher demand for the advanced sector, thus, reallocating expenditure and factors of production towards services (Matsuyama, 2019). Increased income also implies an increased savings rate. Those savings or increased capital could reallocate towards manufacturing or services, similar to the case of Brazil (Bustos et al., 2020), and thus, attract also factors of production towards those sectors. Second, trade liberalization implies "imports of industrialization" or advanced technologies for producing goods in the advanced sectors (Rodrik, 2016).

Thirdly, trade liberalization through agreements also has implications regarding the import of goods produced by the agricultural sector. Lower trade costs would facilitate trade in that sectors freeing up factors of production for other sectors (Tombe, 2015). Fourth, trade agreements also imply lower tariff uncertainty triggering more production in the sectors concerned. It should be mentioned that disentangling the roles of these mechanisms specifically is outside the scope of this study (Erten and Leight, 2021). Understanding the direction of the trade liberalization influence would be an important first step toward building a further understanding of the mechanisms at play.

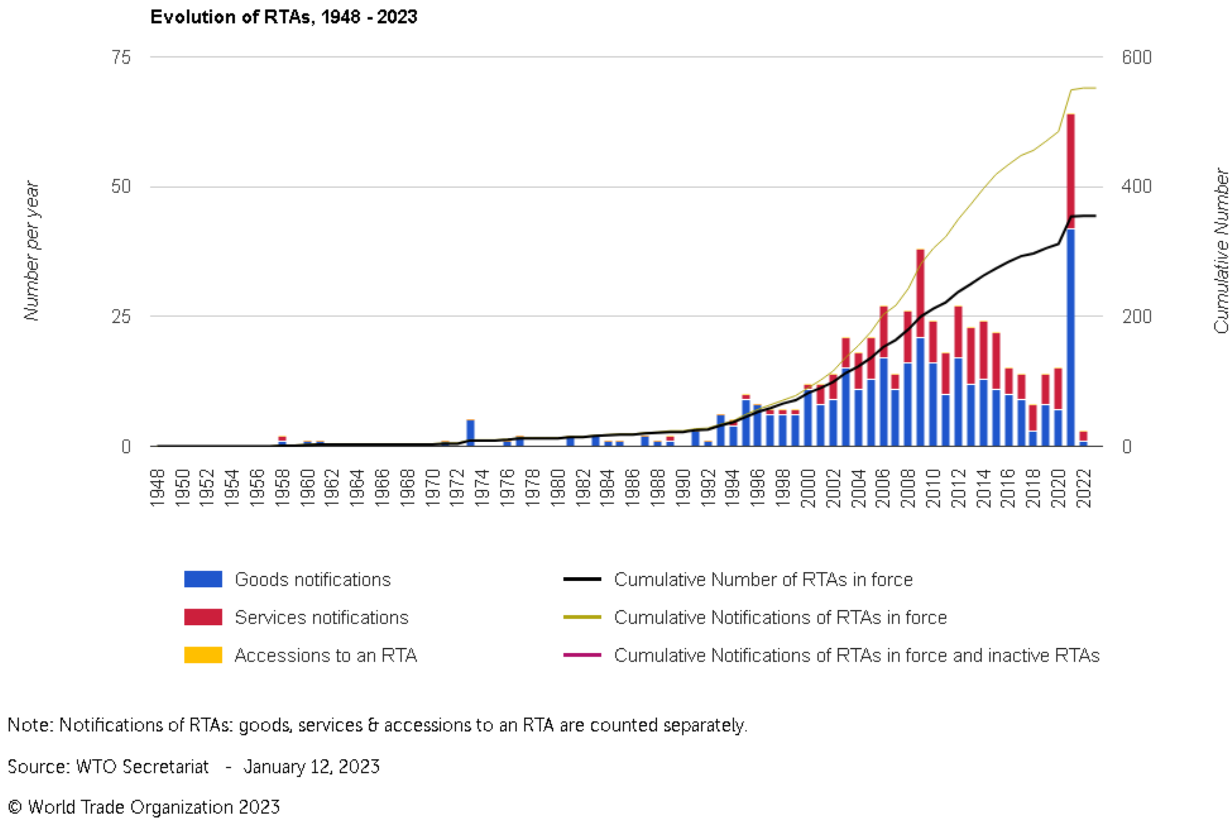
3.2 Exogeneity of RTA Enactments

RTAs are treaties defining the rules of trade between the signatories and aim to liberalize trade flows between them. They have become more common in recent decades with 354 RTAs currently in force and around 700 RTA notifications received by WTO since 1948. The cumulative number of RTAs in force until the 1990s was around 30; their popularity and enforcement became evident during the last 30-year period of globalization, with about 300 active RTAs in force in 2018. Figure 1 [4] illustrates the dynamic of the popularity of RTAs. The World Trade Organization (WTO) classifies as RTAs the following seven types of trade agreements; Customs Union (CU), Free Trade Agreement (FTA), Partial Scope Agreement, Economic Integration Agreement (EI), Customs Union and Economic Integration Agreements, Free Trade and Economic Integration Agreement, Partial Scope and Economic Integration Agreement. Logically, each type of RTA has its economic implications, which come from different degrees of integration offered by each type of agreement. These specific implications of the types of agreements are not of concern to this article as we have as our goal determining the effects of the agreements in general on the patterns of structural transformation.

Using trade agreements as a proxy for trade liberalization assumes, by default, that

[4] From the website of the World Trade Organization

Figure 3: The Evolution of RTAs that have been notified to WTO



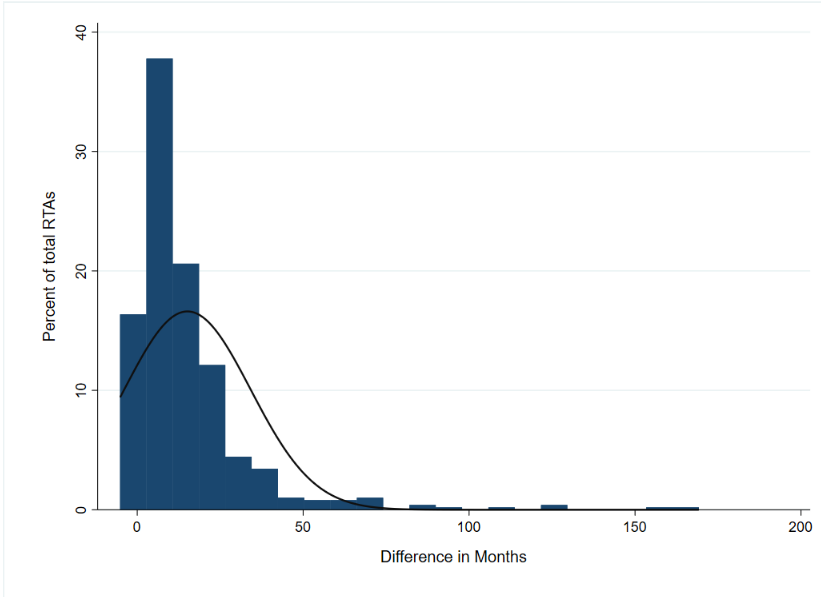
these agreements do have a significant economic impact that goes through trade liberalization. Baier and Bergstrand (2007) show that FTAs double the mutual trade between signatories after ten years. The share of world trade between pairs of countries that had any of these agreements rose from around 22% in 1965 to 60% in 2010 (Limão, 2016). Baier and Bergstrand (2007) underline that these effects are present when accounting for potential selection into the agreements or the endogeneity bias possibly present in the regressions trying to capture the economic impact of trade agreements. Logically, our study is not immune to such considerations as we aim to establish a causal link between trade agreements and economic conditions.

Figure 4: Stages of RTA Enactment

The way that RTAs come to life gives grounds to believe that there is uncertainty in the timing of their enactment. The stages of how RTAs come to life can be divided into three (Figure 3). First, the RTAs are negotiated. The negotiation in itself is a lengthy process that logically carries uncertainty in itself. Moser and Rose (2012) measure the length of these negotiations from their starting point up to the announcement that an agreement has been reached. For 88 RTAs from 1988 to 2009, they estimate that, on average, trade negotiations take 28 months with large variations in the timing. Furthermore, a survival analysis of the negotiations' duration showed that a key factor that seemed to have some influence on it was the number of participants. Second, after reaching a consensus, the parties involved sign the agreement. However, this does not imply that the agreement is enforced. The third stage is that for it actually to be in place, the parties involved must ratify it individually. This means that the agreement must pass through the legislative bodies of the signatory countries. To fix ideas, we present an actual ratification article from one of the RTAs studied: *"This Agreement shall enter into force on the rst day of the second month following the month in which the Governments of the Parties exchange diplomatic notes informing each other that their respective legal procedures necessary for entry into force of this Agreement have been completed, unless the Parties agree otherwise"*. Using the WTOs RTA dataset, which gives information on the signing and enforcement dates of the agreements, we estimate a simple histogram of the time distribution between RTA signing and ratification.

We note that there is significant variance in the time distribution and that even in some cases RTAs could be enforced before being signed, like the agreement between Ukraine and the EU in 2014. The willingness and the economic conditions of one state are not enough to have the RTA enacted. The bilateral or plurilateral nature of these agreements generates even more uncertainty and complications in the realization of these agreements.

Figure 5: Time distribution of RTA enactment since signatore



3.3 Institutional Development as a Confound

Despite the plausible uncertainty around the timing of the enactment of RTAs, the economic consequences of the agreements do not merely come from a simple tariff reduction. Limão (2016) offers a taxonomy of trade agreements by two characteristics - deepness and broadness which also touches upon non-economic provisions. Since the mid-1980s, FTAs, CU, and EI have become relatively more prevalent among RTAs. These agreements offer more profound and broader cooperation addressing issues related to non-tariff barriers to trade; they cover more general issues with non-economic provisions such as environment, human rights, conflict, etc. All these points to the institutional qualities or development as one of the policy dimensions in contemporary RTAs.

Furthermore, we have noted earlier that RTA enactment implies ratification from the legislative bodies of the signatories. Institutional arrangements of the state could have implications on the uncertainty of the enactment of RTAs. A well-known example is the US conflict between Congress and the White House when the two bodies are controlled by different political groups, i.e., Democrats vs Republicans. The trade agreements are, ultimately, negotiated by the president's administration; but Congress must ratify any enforcement of a trade agreement. Cooper (2014) exemplifies three trade agreements signed by the Bush administration with Colombia, Panama, and South Korea. These agreements were signed but not ratified, possibly due to the Democratic party controlling the majority of the Congress. They were only ratified by the Obama administration and Congress with a Democratic majority in place for almost six years, three Congress and one presidential election after it had been signed. Furthermore, the Obama administration had to renegotiate the agreements with its counterparts from the partnering countries. Autocratic countries would be expected to be much faster or less uncertain in these processes once the negotiations had been concluded.

The importance and the correlation that institutional quality or democracy has with economic growth have been long proven in the economic literature. The direction of the causality has been a topic of disagreement and discussion in the literature. However, there is a consensus that both are correlated. Acemoglu et al. (2019) shows that controlling for various fixed effects and possible confounds, democratic transition increases GDP per capita by about 20 percent in the long run. Acemoglu et al. (2008, 2009) show that controlling for historical factors, there is no statistical causal effect going from economic growth to democracy. However, there is still a correlation between the two through historical determinants. These considerations on correlations between trade agreements, economic conditions, and democratic development raise the question of whether the democratization of the country is a potential confound in the relationship between trade agreements and economic conditions. If RTAs have provisions on institutional matters of the state, if these institutional arrangements have implications on the uncertainty of RTA enactment, and if economic conditions are correlated with the institutional development of the country, it could be that the relationship between RTA enactment and structural change goes through a) the causal effect that we aim to capture and b) an omitted time-varying factor, consequently, not captured by fixed effects. Consequently, we implement an identification strategy proposed by Freyaldenhoven et al. (2019) aimed at muting the effect going through the confound.

4 Econometric Framework

4.1 Event Study

We attempt to disentangle the effect of RTA enactment on the share of manufacturing value-added and employment. Logically, the RTA enactment does not occur during the same period for all the economies in our sample. This implies that a staggered Difference-in-Difference model should be implemented for our purposes instead of a standard DiD. Having multiple treatments for multiple treatment groups for different periods removes the doubt that contemporaneous trends drive the possible effects studied.

We rely on event study DiD designs, which can accommodate the possibility of dynamic treatment effects, and are implemented by including leads and lags of the treatment variable instead of a single binary indicator variable. We use a standard event study design, including lags and leads of RTA enactment for periods after/prior to RTA enactment. The main specification used is given by:

$$y_{it} = \beta_0 + \beta_{-j+} D_{i,t}^{-j+} + \sum_{k=-j;k\neq -1}^{L} \beta_k D_{i,t}^{k} + \beta_{L+} D_{i,t}^{+L+} + c_i + n_t + \epsilon_{it} \tag{2}$$

where y_{it} is the dependent variable of interest, i.e., labor and value-added shares in manufacturing, labor productivity in manufacturing, c_i and nt are country and year fixed effects respectively, $D_{i,t}^{k}$ is the treatment variable or the enactment of RTAs indicating an enactment happening k periods away. The one-year dummy variable before the enactment or lead 1 is omitted as a normalizer. $\beta_{-j+} D_{i,t}^{-j+}$ and $\beta_{L+} D_{i,t}^{+L+}$ are long-run indicators if the RTA was enacted more than j and L periods prior and after, respectively. Markets need time to react to the competition or opportunities coming from abroad due to RTAs. From an economic perspective, the intuition for the phasing-in effects is that the reallocation of production or employment from one sector to another, specifically to manufacturing might require the generation of new skills or new capital, reassembling of production capabilities, etc. All this takes time, and the long horizon variables would give insights into the persistence of the effect, possibly driven by the complexity of this restructuring.

The long horizon dummies were created using the whole data sample for RTAs available since 1950. In other words, if a country has already had an RTA prior to the sample period of 1990-2018, it will have a post-enactment dummy up until the end of the sample. We also implement an alternative specification where we omit long horizon dummies with instead include several more leads and lags to capture the long-lasting effect of RTA enactment.

$$y_{it} = \sum_{k=-j;k\neq -1}^{L} \beta_k D_{i,t}^{k} + c_i + n_t + \epsilon_{it} \tag{3}$$

The dependent variables in focus are the share of manufacturing in real value-added and the share of manufacturing in labor. As mentioned, the data on value-added is in local currency, which restricts the possibility of looking at the effect of RTA enactments on value-added in levels; however, it is still possible to look at sectoral labor supply in levels.

Aside from time and year fixed effects, we also introduce covariates to control for time-varying factors that could preclude the effect that we are looking for. Essentially, we see our task as removing long-term determinants of labor productivity growth to further alleviate possible concerns with respect to omitted variable biases. This would allow arguing that fundamental factors are not at play in our econometric setting and that we study the relationship between trade liberalization and industrialization/sectoral labor productivity.

One such factor is human capital which is introduced to the specification by the index of human capital per person from the Penn World Tables; the index is based on average years of schooling and the return to education for five Nordic nations. Population and life expectancy are the other two long-term time-varying variables we introduce. We also control trade openness. Controls for income are omitted as the measures of structural change, or sectoral labor productivity is basically key component of it.

4.2 2SLS

One issue that could potentially bias the coefficients on RTA enactment is that there could be an omitted time-varying factor correlated to both the treatment and the outcome [5]. As discussed above, one such factor could be institutional quality. If this were the case would be able to see it in the pre-trend of the event study plots. The visual or statistical analysis of the leads gives an insight into the possible pre-trends that can be present due to a confound. It is a standard diagnostic tool to examine the potential endogeneity issues between the policy and the dependent variable.

If the agreement affects the outcome before it occurs, then it could be that the strict exogeneity assumption of the regression has failed. In other words, there is an omitted variable affecting both the enactment and structural change of the economy. The underlying assumption is that these pre-trends are absent or that the coefficients on the leads are equal to 0 or are statistically insignificant. One possible concern comes from the nature of the RTA enactment process. As mentioned, their signing does not imply enforcement, and there is time and, possibly, uncertainty present between the periods when it's signed and when it is actually enforced. This implies that anticipation effects before RTA enactment and in response to expectations of RTA enactment could be present. These effects could manifest themselves as pre-trends, leading to misinterpretation of what they imply.

Furthermore, even if such pre-trends are absent, it could be due to statistical error rather than the economic argument behind the assumption of exogeneity that limits the pre-trends. There could still be unobservable factors affecting structural change and the decision to enact the RTA at the same time. For example, the decision to enact the RTA might be dependant on a certain unobserved time-varying factor Qit; if it crosses a certain threshold Q then the state enacts the already signed and negotiated agreement with no uncertain or

[5] It should be mentioned that we are aware of the potential reverse causality present in the relationship between RTA enactment and structural change. The plausible uncertainty in the timing of RTA enactments gives grounds to believe that the estimations are unbiased by such consideration. However, this potential concern and the timing of RTA enactments should be further exploited for generating better insights on reverse causality in this framework.

unexpected delays in its timing. Following the literature studying the relationship between democratization and economic conditions and due to the nature of the RTA enactment process, we believe that this confound or factor could be the institutional development level of the state.

To address these possible concerns, we implement the strategy proposed by Freyaldenhoven et al. (2019). Suppose that the change in the outcome at the enactment period is driven by the effect of the agreement and the confound. Freyaldenhoven et al. (2019) suggest that we can decompose the effect of the policy on the agreement with 2SLS estimation using the closest leads of the policy as an instrument for the covariate x_{it}. This is true if there exists a measure x_{it} of the confound Q_{it} that exactly mimics the relationship between the policy and Q_{it}. That is, x_{it} is carriers information about all the latent factors of Q_{it}. More formally, consider the following linear panel data model:

$$y_{it} = \beta D_{it} + \gamma Q_{it} + \epsilon_{it}$$

$$x_{it} = \delta Q_{it} + u_{it}$$

Assuming that x_{it} does contain information on the latent factors of Q_{it}, we can define the matrix $\Delta = (\delta(\delta^{0}\delta)\ \ ^{1}\gamma)$ and deduce the following relationship:

$$v_{it} = \epsilon_{it} \quad u_{it}\Delta = y_{it} \quad \beta D_{it} \quad x_{it}\Delta$$

The estimation would be equivalent to estimating an instrumental variable model with the following main specification and first-stage relationship, respectively:

$$y_{it} = \beta D_{it} + \Delta x_{it} + v_{it}$$

$$x_{it} = \tau_1 D_{it} + \tau_2 D^{1}_{i,t} + \theta_{it}$$

where θ_{it} is the error term of the first-stage. The key assumption is that there is a covariate x_{it} that is related to the confound Q_{it} but unaffected by the policy D_{it} directly, i.e., affected through the unobserved confound. Our main econometric specification would be the core of implementing the proposed method using the closest lead of the treatment as an excluded instrument for the proxy of institutional quality, i.e., the polity2 index.

5 Results

Figure 5 plots the coefficients of the main specification (2), where the dependent variables are the share of real value-added and employment in manufacturing, respectively. We note that we observe positive and statistically significant changes after the enactment of RTAs. Standard errors are clustered at the country level. These changes are persistent throughout the time, with the cumulative effect being a 0.04 or 4 percent average increase in the share of manufacturing in real value-added following the enactment of RTAs in the long term and a 2 percent average increase after 4 years. The cumulative effects are reported in Table 3.

We then change the measure of industrialization to look into the effect on labor share in manufacturing after RTA enactment. Interestingly, we see negative coefficients on and after RTA enactment. The cumulative effect for the 4-year period is around -0.02, corresponding to a 2 percent shift of labor out of manufacturing and into other sectors. The fact that labor and value-added react differently to RTA enactment generate interesting insights on the nature of the treatment's effect on structural change [6].

These findings are comparable to the results of Kruse et al. (2022). They attempt to capture the industrialization trends in developing and developed economies using the ETD data from 1990-2018. Using a model of industrialization where the dependent variable is the share of manufacturing labor that is explained by income, population, country, and year fixed effects, Kruse et al. (2022) show that compared to 1990, the economies in the ETD sample have been showing deindustrialization trends in terms of labor allocation. Their was:

[6] The coefficients of the regressions are presented in Table 1 and Table 3 for cumulative effects.

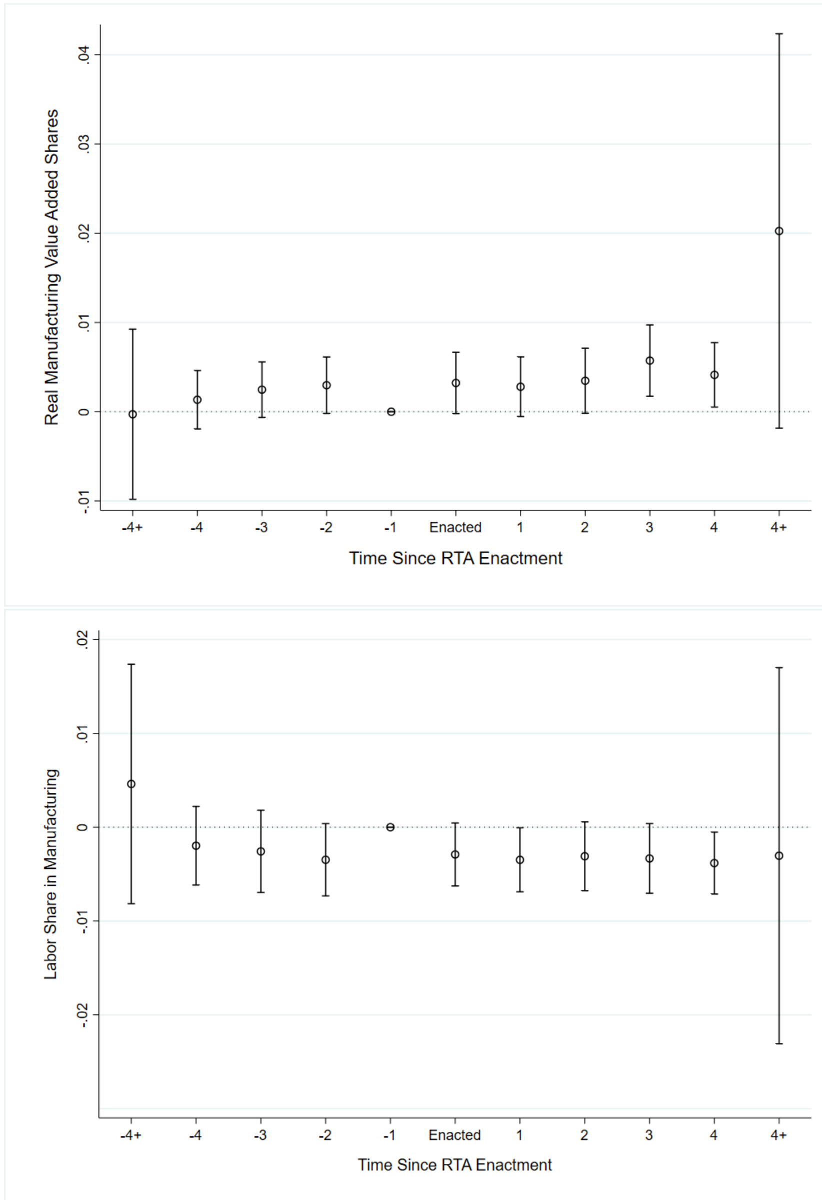
$$y_{it} = \beta_0 + \beta_1 lnGDP_{it} + \beta_2 (lnGDP_{it})^2 + \beta_3 lnP_{it} + \beta_4 (lnP_{it})^2 + \alpha_i + year_t + \epsilon_{it} \quad (4)$$

We replicate these estimations for our sample of 51 economies but both for labor and real value-added shares in manufacturing (Figure 10 in the Appendix). Labor has been moving out of manufacturing throughout the 1990s until the 2010s. In other words, trade liberalization is, at least, partially responsible for the deindustrialization trends in our sample of economies from 1990.

Figure 7 in the appendix plot the coefficients from the alternative (3) specification with 6-period lags and leads. We observe similar results to the previous specification, with the cumulative effect of RTA enactment after 6 years being a 2 percent increase in real value-added manufacturing share. The coefficient is statistically significant at 5 percent. Labor share again shows similar trends to the main specification, with a cumulative effect showing a 2 percent decrease in labor share in manufacturing after the RTA enactment. The causes of why RTA enactment has opposite effects on the two measures of structural change are not evident from this analysis. One possible consideration could be in the context of the results by Buera and Kaboski (2012). They suggest that for the past 50 years, structural change in value-added in services for the US can be accounted for by a sub-group of industries in that sector; it could be that the RTA triggered structural transformation for labor that is not yet skilled enough to participate in those sectors.

The plots also show statistically significant pre-trends prior to the enactment of RTAs. However, the reasons for such coefficients on the pre-trends should be interpreted with caution. The sign and the magnitude of these coefficients are similar to those of the lags; in a longer perspective, these coefficients are almost exactly equal to 0 for real value-added shares. In the context of RTA enactments and specifically, on the fact that negotiations, signings, and enactments do that for long periods, it could be that the significant pre-trends

Figure 6: Effect of RTA enactment on Structural Change

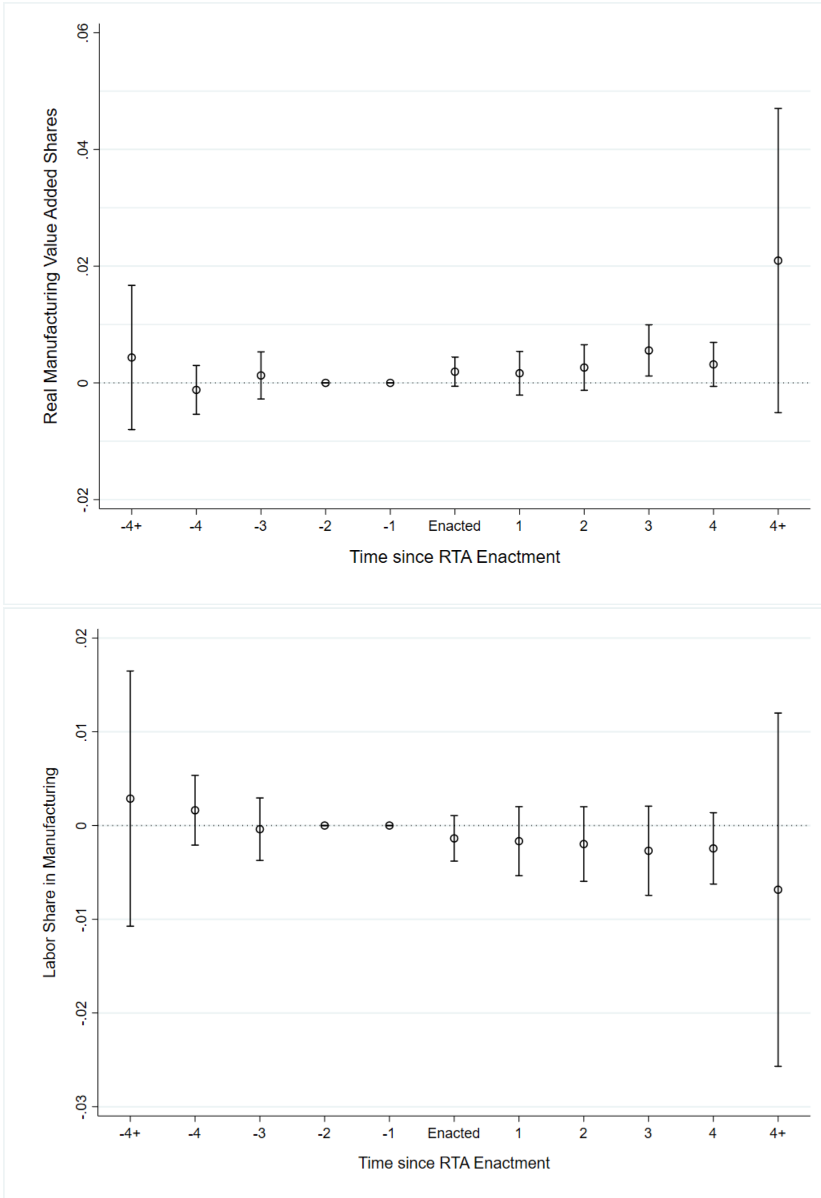


Notes: The first figure shows the coefficients from a regression of real manufacturing value-added shares on leads and lags of RTA enactment. The second figure shows the coefficients from a regression of labor share in manufacturing on leads and lags of RTA enactment. Lead 1 is omitted as a reference point. Models (1) include country and year fixed effects. Standard errors are clustered by country. The time period is 1990-2018

are anticipation effects rather than a confound affecting both the decision to enact the RTA in both countries and the economic conditions.

To clarify the results from possible confounds and to have a better look at the causal

Figure 7: Effect of RTA enactment on Structural Change *(2SLS estimations)*



Notes: The first figure shows the coefficients from a regression of real manufacturing value-added shares on leads and lags of RTA enactment. The second figure shows the coefficients from a regression of labor share in manufacturing on leads and lags of RTA enactment. Polity2 index is the covariate instrumented by lead 1 of RTA enactment. Lead 2 is omitted as a reference point. The regressions include country and year fixed effects. Standard errors are clustered by country. The time period is 1990-2018

relationship between RTA enactment and structural change, we use a 2SLS estimate instrumenting polity2 indicator by the lead of period 1 before the enactment. Figure 6 plots the results where we omit one period lead as it is the excluded instrument for the polity2 index, and we omit 2 periods lead as a reference point. The dependent variable is the share of value-added in manufacturing. We first note that the coefficient on the leads is not statistically significant. Although some of the coefficients on the lags do lose statistical significance as well, the cumulative effect for both 4-year period or the longtime horizon is still statistically significant. Furthermore, the coefficient is close to the earlier specification in terms of magnitude. The cumulative effect for the 4-year period is around 0.015, corresponding to a 1.5 percent increase on average in the share of manufacturing value-added [7]. Similar results are found when we look at the manufacturing share in employment. The pre-trends are no longer significant; however, the sign and the magnitude of the coefficients persevered. Figure 8 in the appendix presents the 2SLS estimation results with the alternative specification (3) of the event study. We find no statistically significant pre-trends with the coefficients on the RTA enactment dummy and its lags showing similar patterns as in the results for specification (2).

We can note that there is a statistically significant relationship between RTA Enactment and production share in manufacturing. But the relationship between RTA enactment and structural change or labor reallocation is not statistically significant. A valid question is then through what mechanism does RTA enactment influence the increased manufacturing production? Following equation (1), one potential implication for this is that sectoral labor productivity triggers the production share increase in manufacturing. To verify this, we change the dependent variable to labor productivity in manufacturing at 2015 constant US dollars. The event study results are represented graphically in Figure 11. We see a statistically significant shift in labor productivity in manufacturing following the enactment of RTAs. These shifts are cumulatively significant at 5% with the coefficient being 10, indicating an increase of 10$ in Manufacturing production per worker

The implications of the results are all the more attractive in light of the recent study by Herrendorf et al. (2022). Considering these findings, one can develop a clearer picture of the

[7]See Table 2 for the estimation coefficients and Table 4 for cumulative effects

underlying processes and how our results fit them. Their descriptive analysis aims to investigate the notion that labor reallocation to manufacturing and manufacturing productivity [8] growth helps the development of poor economies by closing the aggregate productivity gaps with the developed ones. Note that they also utilize the ETD database for the same sample period. They estimate that productivity gaps in manufacturing are more significant than in aggregate. This implies that industrialization of employment would not necessarily decrease the aggregate productivity gap.

These gaps over time do not change in that there is no significant unconditional convergence observed in manufacturing and aggregate productivity. However, there is considerable conditional convergence in the manufacturing productivity level, i.e., convergence driven by each economy's own economic characteristics. Consequently, some poor countries did manage to close these gaps.

Furthermore, for these countries manufacturing productivity growth has a strong correlation with aggregate productivity growth, unlike manufacturing employment[9]. The decomposition of the total labor productivity level presented earlier (Figure 2) goes in line with these results. Productivity growth in manufacturing has had a positive and significant contribution to aggregate productivity growth given our sample countries and sample period. On the other hand, labor reallocation to manufacturing has had a positive yet negligible contribution.

The question then is; what are the factors that drive this convergence? One such process could be trade liberalization. What our results show is that it contributed to production growth in manufacturing, it does not significantly affect industrialization patterns, and it does increase manufacturing productivity. Whether it contributes differently to the poor economy's economic conditions or not, i.e., affects the convergence itself, is outside of the scope of the current study. But it is one of the factors that is affecting these processes.

[8] As earlier, by manufacturing productivity, it means manufacturing labor productivity

[9] It should also be mentioned that manufacturing and trade sector productivities also had strong correlations.

6 Final Remarks

Whether trade liberalization throughout the past decades has triggered industrialization or, on the contrary, specialization in less productive sectors is still an open question present in the literature. This study aimed to capture the effect of trade liberalization on structural transformation patterns using RTAs as a proxy for trade policy. Using a newly available panel dataset on measures of industrialization and sectoral labor productivities for 51 developing and developed economies for the period 1990-2018, we show that trade agreements have ambiguous effects on structural change, depending on how it is measured. Using an event study framework, we note positive and statistically significant cumulative effects of the enactment of RTAs on real value-added shares of manufacturing. When measuring structural change by manufacturing labor share, we note that our estimation coefficients lose statistical significance. Interestingly, the coefficients on manufacturing labor productivity are statistically significant and positive. This implies that shifts in sectoral productivity have driven the shifts in production towards manufacturing due to trade liberalization. This is very much in line with the findings of McMillan et al. (2014) when they observe that for Latin American, Asian and African economies, the growth in overall labor productivity has been driven by sectoral productivity increases rather than structural transformation.

Summing the lessons from previous literature, we can broadly contextualize our findings. Industrialization is not driving total labor productivity; instead within manufacturing, labor productivity growth is. For manufacturing productivity growth to contribute to the development of the economy, it should be growing faster in poor economies than rich ones. Common fundamental factors are not driving this process, i.e., no unconditional convergence. Instead what is observed is conditional convergence. Some economic factor that is specific for some economies and time has to be driving the closure of the gap of manufacturing productivity between rich and poor economies. Our results show that trade liberalization, on average contributes to manufacturing productivity growth and production but has a negative and statistically insignificant effect on industrialization.

We also note statistically significant pre-trends in the plots of our specifications. We use a novel approach proposed by Freyaldenhoven et al. (2019) to establish a causal link between RTAs and shares of manufacturing in labor and real value-added. Using the polity5 democratization index as a measure of the potential confound, we see no more pre-trends present in the plots and find similar results to the original specification. The reasons why RTAs have opposite effects on the two measures of structural change are yet to be established. One possible explanation could be connected with the nature of trade liberalization observed since the 1990s. Being more technologically driven, the past wave of trade liberalization could have driven production towards manufacturing in developing economies without needing low-skilled labor, which is dominant in developing economies. This caveat could be one of the possible dimensions of future exploration.

One other caveat is the characteristics that RTAs have and by which they are different. Trade agreements are becoming deeper and broader in the tools they include for reducing trade barriers. They are not limited to simple tariff reductions and include non-economic, mostly political provisions. Exploring the specificities of RTAs would generate insight into the mechanisms through which RTAs affect structural change. The third caveat of the study is that although we do address the issue of omitted variable bias in the relationship between RTA enactment and structural change, reverse causality remains a potential concern for establishing a causal link between the two. The potential uncertainty in the timing of RTA enactments must be further studied and exploited to generate insights into reverse causality considerations.

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Tables

Table 1: Effect of RTA enactment on Industrialization ***(2SLS Estimation)***

	(1) *ConstVA*	(2) *Employment*	(3) *Productivity*
RTA_LR-	0.0003	0.005	0.5
	(0.005)	(0.006)	(2.0)
RTA_t-4	0.001	0.002	1.2
	(0.002)	(0.002)	(0.9)
RTA_t-3	0.002	0.003	1.8
	(0.002)	(0.002)	(1.0)
RTA_t-2	0.003	0.003	2.2
	(0.002)	(0.002)	(1.0)
RTA_t-1	0	0	0
	(.)	(.)	(.)
RTA_t	0.003	0.003	2.1
	(0.002)	(0.002)	(0.9)
RTA_t+1	0.003	0.003	2.5
	(0.002)	(0.002)	(0.7)
RTA_t+2	0.003	0.003	2.7
	(0.002)	(0.002)	(0.8)
RTA_t+3	0.006	0.003	4.0
	(0.002)	(0.002)	(1.2)
RTA_t+4	0.004	0.004	3.9
	(0.002)	(0.002)	(1.2)
RTA_LR+	0.02	0.003	6.7
	(0.01)	(0.010)	(3.5)
Observations	1479	1479	1450
Adjusted R^2	0.065	0.025	0.364
Time FE	*Yes*	*Yes*	*Yes*
Country FE	*Yes*	*Yes*	*Yes*

Standard errors in parentheses
$p < 0.10$, $p < 0.05$, $p < 0.01$

Notes: The table shows the coefficients from a regression of Real Manufacturing value-added (Column 1), Labor Share in Manufacturing (Column 2), and Manufacturing Labor productivity (Column 3) on leads and lags of RTA enactment. The model follows the specification from (2). Lead 1 is omitted as a reference point. All the regressions include country and year fixed effects. Standard errors are clustered by country. The time period is 1990-2018

Table 2: Effect of RTA enactment on Industrialization (2SLS)

	(1) *ConstVA*	(2) *Employment*	(3) *Productivity*
RTA_LR-	0.004	0.003	3.4
	(0.006)	(0.007)	(3.7)
RTA_t-4	0.001	0.002	0.9
	(0.002)	(0.002)	(1.3)
RTA_t-3	0.001	0.0004	0.8
	(0.002)	(0.002)	(1.2)
RTA_t-2	0	0	0
	(.)	(.)	(.)
RTA_t-1	0	0	0
	(.)	(.)	(.)
RTA_t	0.002	0.001	1.1
	(0.001)	(0.001)	(0.8)
RTA_t+1	0.002	0.002	1.5
	(0.002)	(0.002)	(1.1)
RTA_t+2	0.003	0.002	2.1
	(0.002)	(0.002)	(1.1)
RTA_t+3	0.006	0.003	3.9
	(0.002)	(0.002)	(1.6)
RTA_t+4	0.003	0.002	3.1
	(0.002)	(0.002)	(1.4)
RTA_LR+	0.02	0.007	7.4
	(0.01)	(0.010)	(4.5)
Observations	1450	1450	1421
Adjusted R^2			
Time FE	*Yes*	*Yes*	*Yes*
Country FE	*Yes*	*Yes*	*Yes*

Standard errors in parentheses

$p < 0.10$, $p < 0.05$, $p < 0.01$

Notes: First Column shows the coefficients from a regression of real manufacturing value-added shares on leads and lags of RTA enactment. Second Column shows the coefficients from a regression of labor share in manufacturing on leads and lags of RTA enactment. Third Column shows the coefficients from a regression of manufacturing labor productivity on leads and lags of RTA enactment. Polity2 index is the covariate instrumented by lead 1 of RTA enactment. Lead 2 is omitted as a reference point. Models include country and year fixed effects. Standard errors are clustered by country. The time period is 1990-2018

Table 3: 4-year cumulative Effect of RTA enactment on Industrialization

	(1)	(2)	(3)
	RealVA	*Labor*	*Productivity*
RTA	0.02	0.01	15.3
	(0.009)	(0.008)	(4.3)
Observations	1450	1450	1421
Time FE	*Yes*	*Yes*	*Yes*
Country FE	*Yes*	*Yes*	*Yes*
Controls	*No*	*No*	*No*

Standard errors in parentheses
$p < 0.10$, $p < 0.05$, $p < 0.01$

Notes: The table shows the cumulative coefficients from a regression of Real Manufacturing value-added, Labor Share in Manufacturing, and Manufacturing labor productivity on leads and lags of RTA enactment following specification (2). Columns 1, 2 and 3 show the cumulative coefficients after 4 years of RTA enactment. All the regressions include country and year fixed effects. Standard errors are clustered by country. The time period is 1990-2018

Table 4: 4-year Effect of RTA enactment on Industrialization (2SLS)

	(1)	(2)	(3)
	RealVA	*Labor*	*Productivity*
RTA	0.01	0.01	11.6
	(0.008)	(0.008)	(4.8)
Observations	1450	1450	1421
Time FE	*Yes*	*Yes*	*Yes*
Country FE	*Yes*	*Yes*	*Yes*
Controls	*No*	*No*	*No*

Standard errors in parentheses
$p < 0.10$, $p < 0.05$, $p < 0.01$

Notes: The table shows the cumulative coefficients from a regression of Real Manufacturing value-added and Labor Share in Manufacturing on leads and lags of RTA enactment following 2SLS estimations. Columns 1, 2, 3 show the cumulative coefficients after 4 years of RTA enactment. Polity2 index is the covariate instrumented by lead 1 of RTA enactment. Lead 2 is omitted as a reference point. All the regressions include country and year-fixed effects. Standard errors are clustered by country. The time period is 1990-2018

Table 5: 4-year Effect of RTA enactment on Industrialization

	(1) *RealVA*	(2) *Labor*	(3) *Productivity*
RTA	0.02	0.007	11.0
	(0.007)	(0.008)	(3.8)
Observations	1450	1450	1421
Time FE	*Yes*	*Yes*	*Yes*
Country FE	*Yes*	*Yes*	*Yes*
Long Horizon	*No*	*No*	*No*

Standard errors in parentheses
$p < 0.10$, $p < 0.05$, $p < 0.01$

Notes: The table shows the cumulative coefficients from a regression of Real Manufacturing value-added, Labor Share in Manufacturing, and Manufacturing labor productivity on leads and lags of RTA enactment following specification (2). Columns 1, 2, and 3 show the cumulative coefficients after 4 years of RTA enactment. All the regressions include country and year fixed effects. Standard errors are clustered by country. The time period is 1990-2018. The Regressions include time-varying controls like Trade Openness, Human Capital Index, Life expectancy, and Population

Table 6: 4-year Effect of RTA enactment on Industrialization (2SLS)

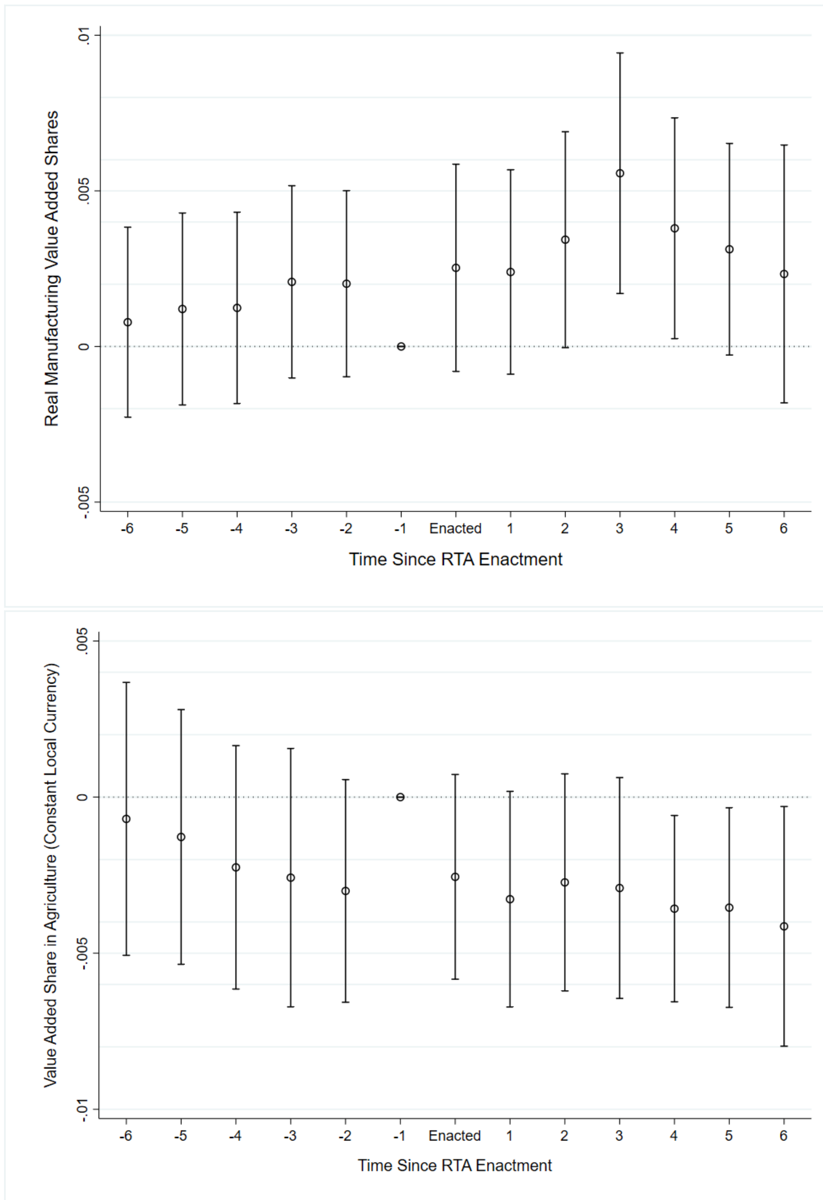
	(1) *RealVA*	(2) *Labor*	(3) *Productivity*
RTA	0.02	0.007	10.6
	(0.007)	(0.009)	(4.8)
Observations	1450	1450	1421
Time FE	*Yes*	*Yes*	*Yes*
Country FE	*Yes*	*Yes*	*Yes*
Controls	*Yes*	*Yes*	*Yes*

Standard errors in parentheses
$p < 0.10$, $p < 0.05$, $p < 0.01$

Notes: The table shows the cumulative coefficients from a regression of Real Manufacturing value-added and Labor Share in Manufacturing on leads and lags of RTA enactment following 2SLS estimations. Columns 1, 2, 3 show the cumulative coefficients after 4 years of RTA enactment. Polity2 index is the covariate instrumented by lead 1 of RTA enactment. Lead 2 is omitted as a reference point. All the regressions include country and year fixed effects. Standard errors are clustered by country. The time period is 1990-2018. The Regressions include time-varying controls like Trade Openness, Human Capital Index, Life expectancy, and Population

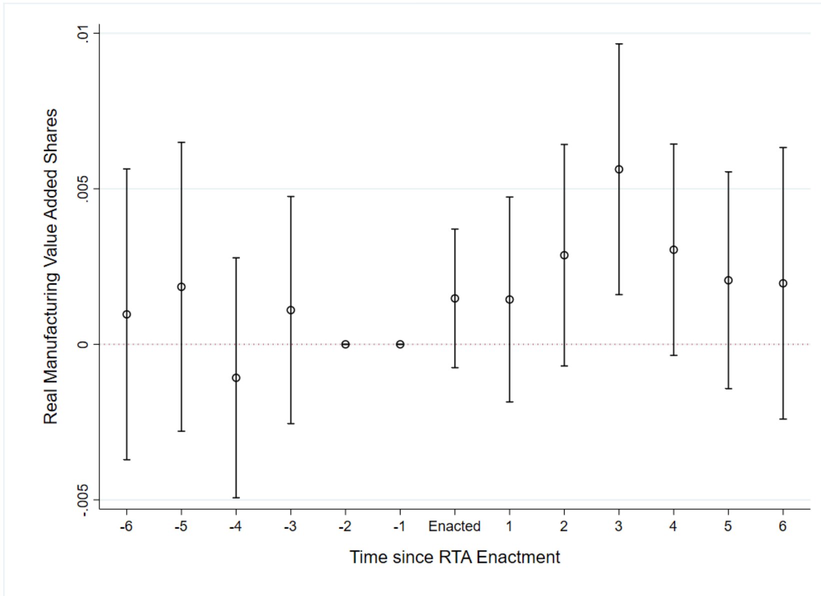
Figures

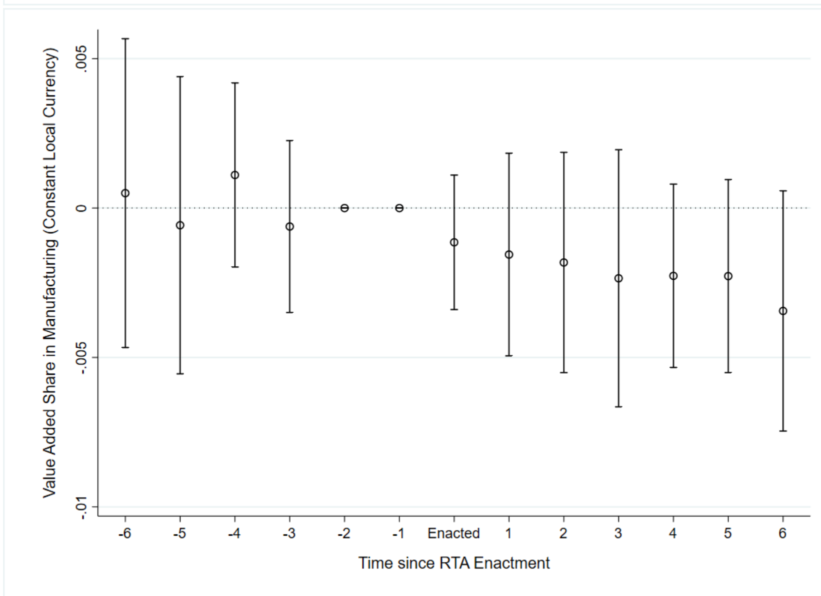
Figure 8: Effect of RTA enactment on Structural Change



Notes: The first figure shows the coefficients from a regression of real manufacturing value-added shares on leads and lags of RTA enactment. The second figure shows the coefficients from a regression of labor share in manufacturing on leads and lags of RTA enactment. Lead 1 is omitted as a reference point. The regressions include country and year fixed effects. Standard errors are clustered by country. The time period is 1990-2018

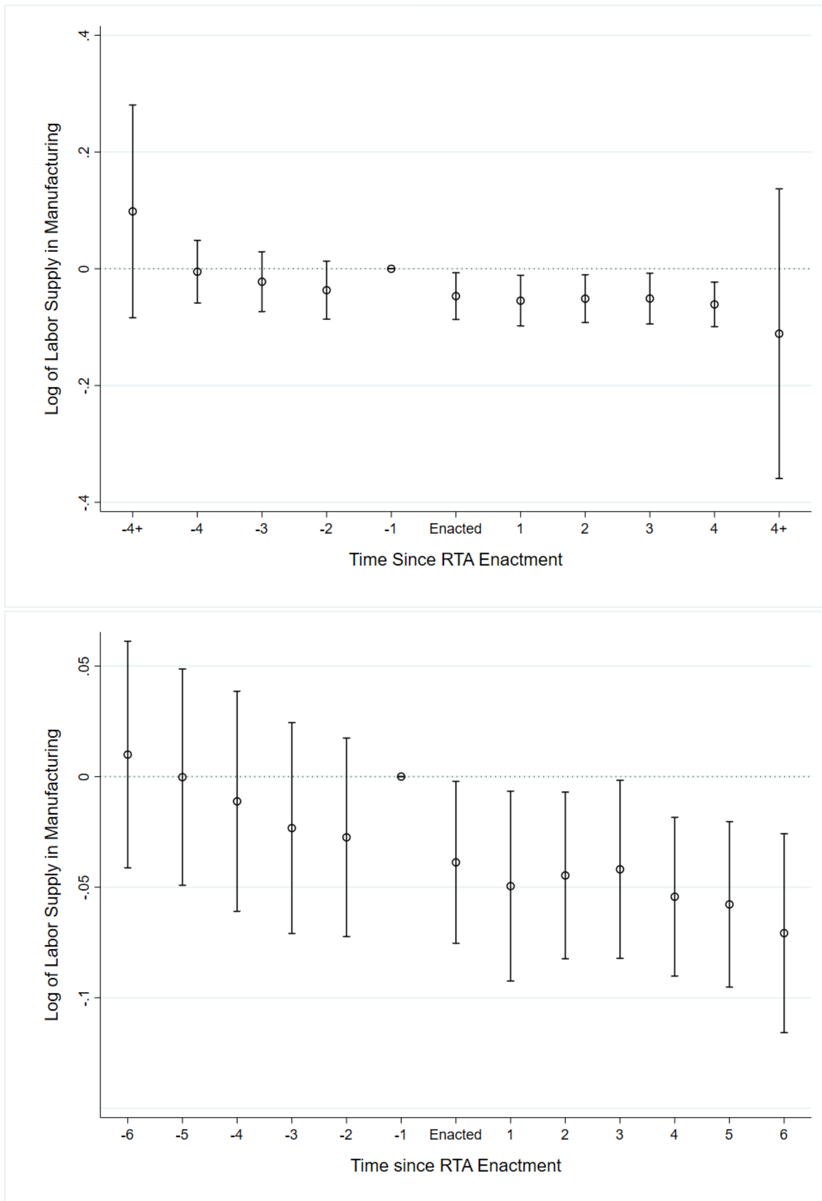
Figure 9: Effect of RTA enactment on Structural Change *(2SLS estimations)*





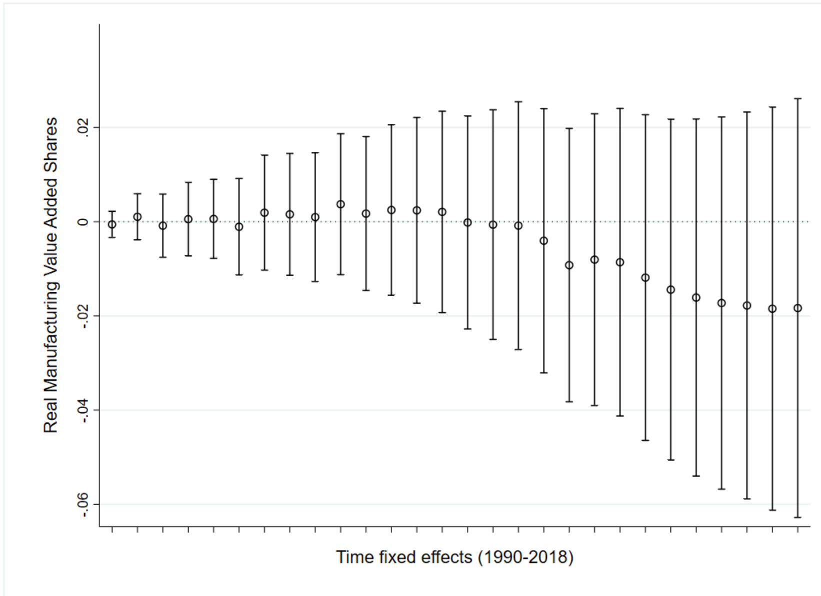
Notes: The first figure shows the coefficients from a regression of real manufacturing value-added shares on leads and lags of RTA enactment. The second figure shows the coefficients from a regression of labor share in manufacturing on leads and lags of RTA enactment. Polity2 index is the covariate instrumented by lead 1 of RTA enactment. Lead 2 is omitted as a reference point. The regressions include country and year fixed effects. Standard errors are clustered by country. The time period is 1990-2018

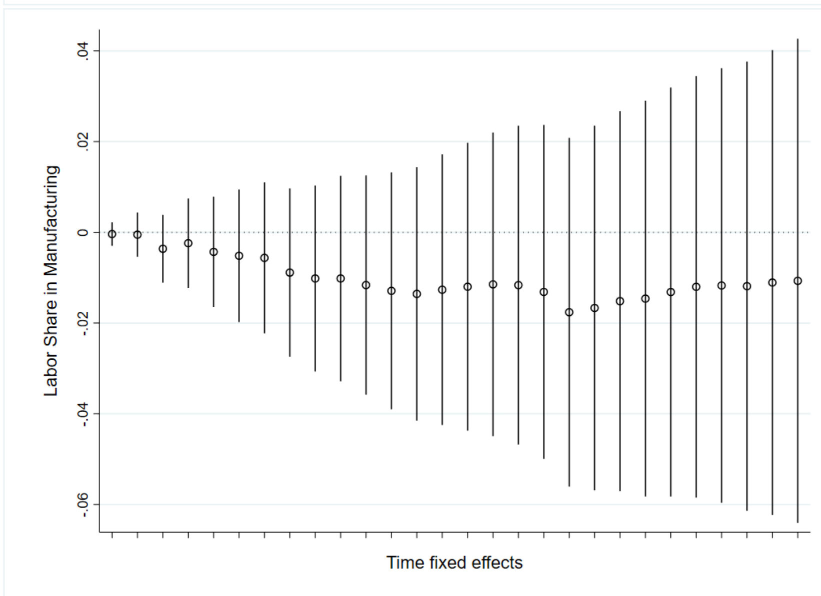
Figure 10: Effects of RTA enactment on Log of Labor supply in manufacturing



Notes: The first figure shows the coefficients from a regression of the log of labor supply (persons engaged) on leads and lags of RTA enactment. The model specification is given by equation (2). The second figure shows the coefficients from a regression of the log of labor supply (persons engaged) on leads and lags of RTA enactment. The model specification is given by equation (2). Lead 1 is omitted as a reference point. Standard errors are clustered by country. The time period is 1990-2018

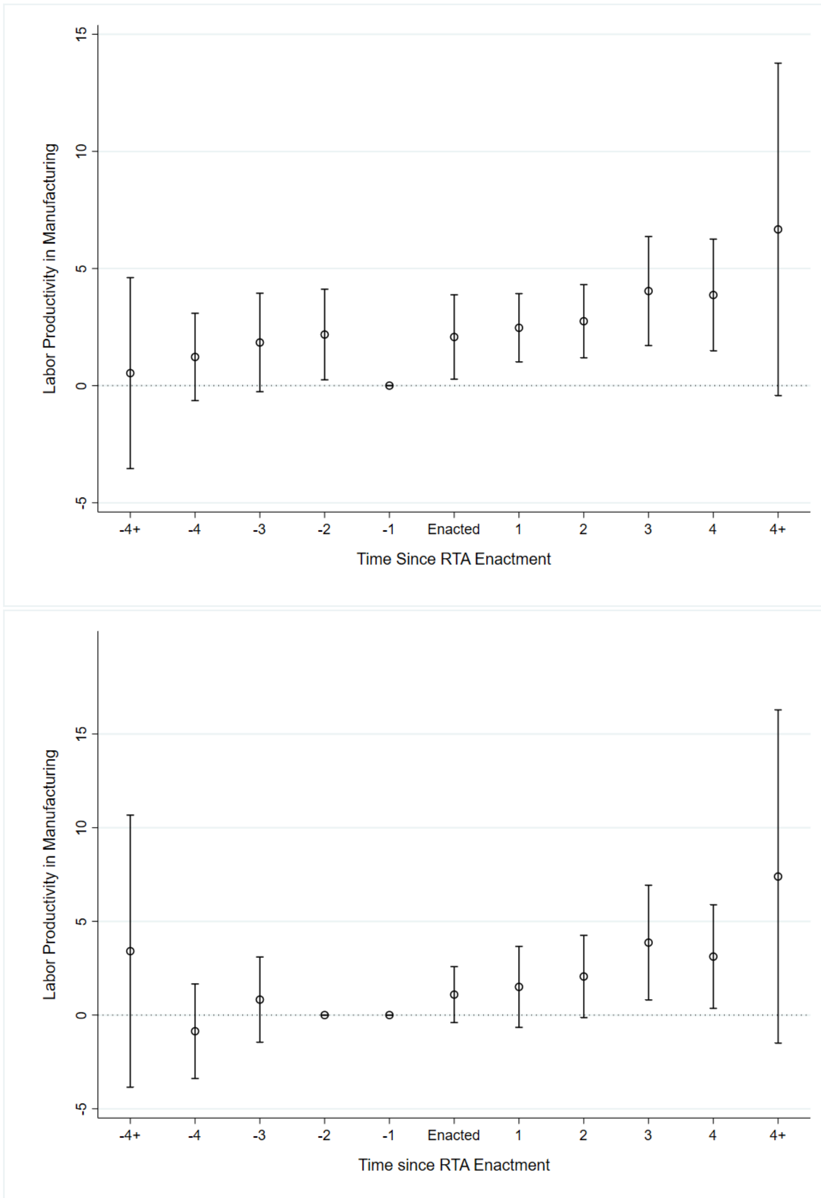
Figure 11: Annual time trend manufacturing labor and real value-added *(Kruse et al. 2022)*





Notes: The first figure shows the coefficients of time fixed effects from a regression of share of real value-added in manufacturing on income, population, country, and year fixed effects. The model specification is given by equation (4). The second figure shows the coefficients of time fixed effects from a regression of labor share of manufacturing on income population, country, and year fixed effects. The year 1990 is omitted as a reference point. The time period is 1990-2018

Figure 12: Effect of RTA enactment on Labor productivity in Manufacturing



Notes: The first figure shows the coefficients from a regression of Labor productivity in Manufacturing on leads and lags of RTA enactment. The second figure shows the coefficients from a 2SLS estimation Labor productivity in Manufacturing on leads and lags of RTA enactment. Polity2 index is the covariate instrumented by lead 1 of RTA enactment. Lead 2 is omitted as a reference point. Models (2) include country and year fixed effects. Standard errors are clustered by country. The time period is 1990-2018