The Distributive Effects of Regional Trade Liberalization on National Income Inequality: The Case of MERCOSUR

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Trends in income inequality among Latin American countries have become a regional concern. Consequently, the distributional patterns of trade integration's costs and benefits have been placed under the spotlight. We assess whether regional trade integration can be regarded as an income-increasing and inequality-alleviating policy, or if to the contrary, it induces detrimental effects on inequality within countries. We analyse the relationship between regional trade among members of MERCOSUR and levels of domestic inequality. The results from a series of econometric tests point to an overall beneficial effect of intensified regional trade on price indexes at the domestic level, as well as an overall beneficial effect of trade-induced price changes on average real wages. Regarding the total effect on income inequality, results indicate a positive – yet weak – effect of trade integration on inequality amelioration, more strongly associated with wage increases than price decreases.

1. Introduction

Free trade has been championed as the ultimate recipe for developing countries to integrate into an increasingly liberalised and interdependent world-economy. Nevertheless, vis-à-vis the lack of a unified, harmonised free-trade system, 'open regionalism' arises as the second-best option. Particularly for developing countries, this new paradigm should be situated at the forefront of governments' quests for inequality and poverty alleviation, since its focus on market mechanisms for economic development is more sustainable than welfare policies at the national level. The exponential growth of Regional Trade Agreements (RTAs) in the last two decades has naturally led to discussions about their effectiveness in tacking these issues and their distributive implications.

Latin America posed an ideal candidate for trade liberalisation in the 1990s, given its fractured landscape following the import substitution policies of the 1980s. Nevertheless, with recent trends in income inequality becoming a widespread concern, the distributional patterns of trade integration's costs and benefits have been placed under the spotlight. Hence, this analysis will utilize the case of MERCOSUR, the most important RTA in Latin America. We examine the relationship between MERCOSUR's regional trade flows and domestic inequality through price and wage effects.

Our empirical study comprises three sections corresponding to the effects of the price and wage mechanisms, while we also examine an overall effect. Methodologically, the empirical analysis is anchored through models utilizing fixed-effects panel-data techniques (autoregressive distributed lag, error-correction dynamic and instrumental-variable models). Taken together, the findings point to an overall beneficial effect of intensified regional trade on price indices at the domestic level, and a subsequent overall beneficial effect of trade-induced price changes on average real wages; all in the short run. In the long run, educational attainment demonstrates a stronger relationship with real wages. Regarding the total effect on income inequality, results indicate a positive effect of trade integration on inequality amelioration, more strongly associated with wage increases than price decreases.

We also highlight important caveats in these relationships: both price indices and real wages do not behave linearly but rather seem to progressively adjust to effects. This is a very important nuance since it introduces temporal and spatial considerations: An overall long-run benefit cannot be interpreted as a disregard for short-term losses, the same way an overall benefit for the many cannot be interpreted as a disregard for the losses of the few. This is indeed, the essence of the often controversial discussion around gains from trade.

On a policy-making level, this means that efforts directed at artificially manipulating prices and wages through trade policy (especially of a protectionist nature) are not only short-lived but could also induce far-reaching damaging consequences. Policies that can organically and smoothly influence prices and wages (i.e. boosting domestic productivity, investment in infrastructure, export diversification and universal education coverage) should be preferred.

2. The Development of MERCOSUR

The Mercado Común del Sur ("Southern Common Market") was created in 1991 by Argentina, Brazil, Paraguay and Uruguay through the Treaty of Asunción with the joint purpose of eliminating tariffs, duties and other charges for intra-bloc reciprocal trading as well as gradual reduction of these trade barriers for non-member countries.

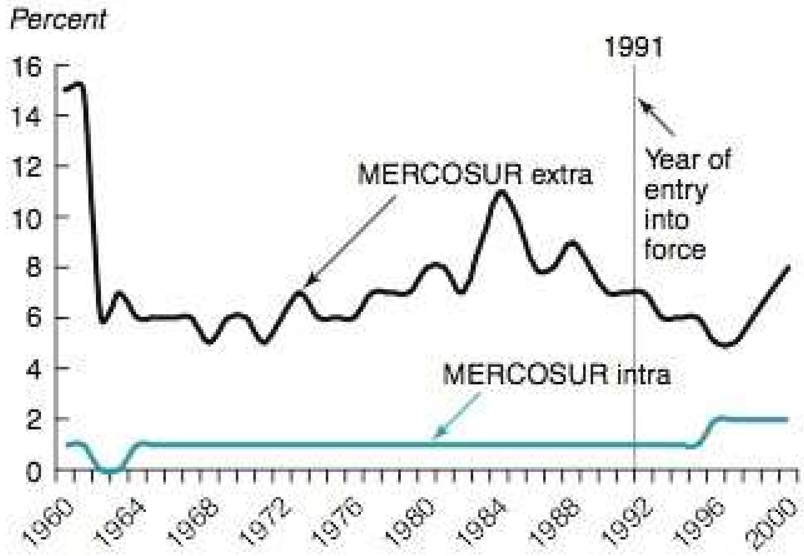
The initial agreement allowed for some exceptions to be gradually removed until 1995 with the Ouro Preto Treaty (which established a dispute settlement procedure and unintendedly, a change in the liberalization schedule). This point is important because our results indicate that regional integration 'momentum' is also linked to price and wage changes. Thus, MERCOSUR constitutes an imperfect customs union, compounded by the lack of a harmonised common external tariff and a low degree of trade-policy compliance (Borraz et al. 2012).

Since its inception, MERCOSUR has displayed a mixed integration path. The first few years were marked by a large-scale, multi-layered liberalization process (Estevadeordal et al., 2001) which in turn, fostered rapid growth in intra-regional trade (Figure 1). Post-Ouro Preto, integration efforts (especially those dealing with full tariff removal and the proliferation of non-tariff barriers) have weakened significantly, allegedly hindered by the bloc's heavyweights: Argentina and Brazil (Baer and Silva, 2014). Thus, the last decade has seen a renewed push for integration, though arguably at a superficial level (Stender, 2015).

On the other hand, regional trends in real wages and prices indexes, displayed a consistent increase and decrease respectively, throughout most of the last two decades. Indeed an 'artificial trend', this was largely due to growth resulting from the commodity boom. Latin American countries that did not experience it saw their wages stagnate (World Bank, 2015). Moreover, within beneficiary countries, industries that were not directly related to exports experienced the same. As GDP growth dictated price and wage trends in countries centred on commodity exports, benefits were mainly accrued by low-skilled workers in industries with low diversification and technology levels. Consequently, an important reduction in inequality and poverty levels took place throughout the 2000's (Figure 2).

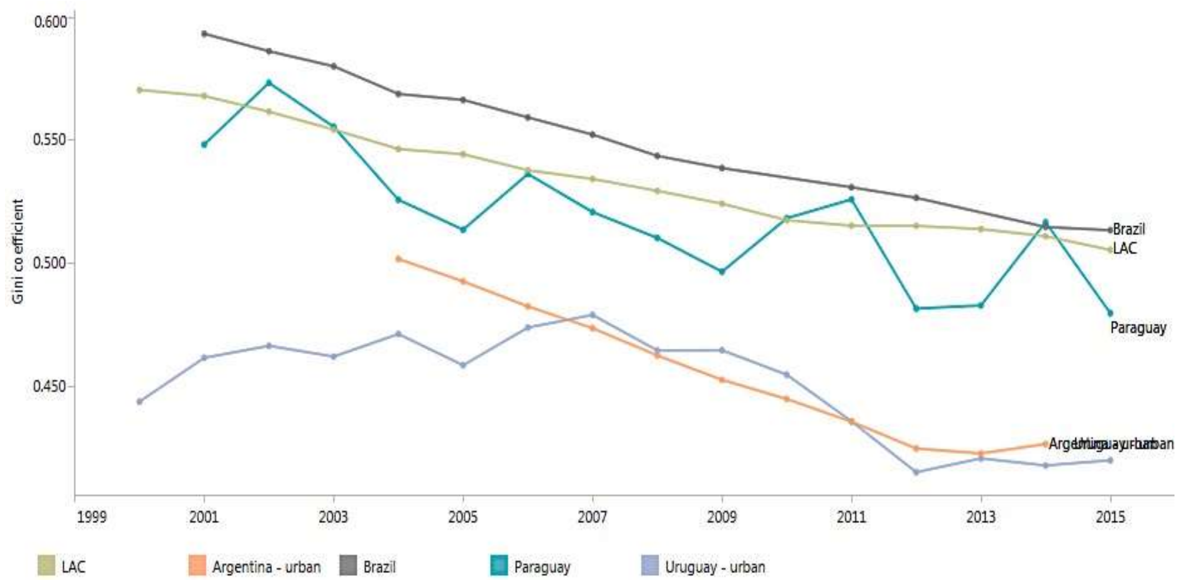
In the aftermath of the commodity boom and decelerating economic-performance figures, it has become clear that regional sustainable economic growth, inequality- and poverty-alleviation cannot rely on commodity exports or trade with minimal diversification patterns, for its effect on income is no longer significant.

Figure 1: Extra- and Intra-regional trade as a percentage of GDP



Source: World Bank Indicators.

Figure 2: Gini trends for MERCOSUR countries and LAC



Source: LAC Equity Lab tabulations of SEDLAC (CEDLAS and the World Bank) and World Development Indicators (WDI).

3. Trade and Inequality

The relationship between trade, prices and wages is one of the most problematic yet fascinating questions in international trade, as results from existing research are starkly heterogeneous, with existing positions split between: 1) Adamantly blaming trade for inequality, 2) Recognising the existence of a –rather weak- linkage between both, or 3) Rejecting any hypothetical correlation altogether. While the lack of consensus may only provide frustration for policy makers, the debate has succeeded in merging research from the fields of labour and international economics.

During the 1990s and early 2000s, a number of studies identified a link between international trade and higher levels of domestic inequality across the world. For instance, Feenstra and Hanson (1996, 1999), Baldwin and Cain (2000) associate trade openness with up to 20% rising inequality in the US. Wood (1994) directly attributes the effect's magnitude to a drop in the demand for unskilled labour within import-competing industries. However, Leamer (1996) argues against this point, stating that sector bias (and not factor bias) vis-à-vis technological progress can explain decreasing returns to unskilled labour in developed countries.

Mixed results are also abundant. For example, Freeman and Oostendrop (2001) found heterogeneous convergence/divergence effects for (non)production workers among 20 developing and newly-industrialising countries. Bloom and Blender (1993) had previously claimed this, but emphasized the role of factor price equalization (FPE) rates and cross-country capital accumulation. More recently, Lee and Kim (2016) report a strong positive correlation between inequality and trade in services, and the opposite for trade in goods.

In contrast, Carneiro and Arbache (2003) and Fieleke (1994) reject the relationship altogether, citing educational attainment and labour-market composition as more relevant drivers behind income divergence. Paradoxically, they also claim that effects from trade cannot be totally ignored for not being 'king of the hill' (Richardson 1995: 51). Bergstrand et al. (1994) also reject a significant trade-inequality relationship through an analysis of US wages relative to trade and investment. Edwards (1997) also finds no statistically-significant relationship. Krugman and Lawrence (1994) argue that unless via skill-biased technology as a source for domestic wage divergence, trade should be absolved of influencing inequality. Likewise, Bhagwati and Dehejia (1994) both reject the underlying assumptions of the Heckher-Ohlin model and discard any linkage unless this is via skill-biased technological change causing an increase in the associated wage premium.

At the regional level, studies are not only conflicting, but also very limited in number, with ASEAN-related studies predominant. Research examining Latin American integration and inequality is sporadic, which comes as a surprise given that the latter has become the development 'buzzword' and consequently, the main driver for advocates championing further trade liberalization for economic growth. Among the pre-MERCOSUR, regional-convergence literature, Caceres and Sandoval (2000), Dobson and Ramlogan (2002) find evidence that suggested wage convergence occurred in the two decades up to 1990. On the other hand, Madariaga et al. (2003) finds a convergence between Argentina and Brazil's income per capita 1985-1995; additionally, highlighting beta convergence between 1985 and 2000 conditional upon agglomeration of production (manufacturing) activities; meaning trade liberalization is a necessary yet not sufficient condition. This pattern suggests a story of endogenous bloc (and tariff) formation; which indeed, Ollaeraga and Soloaga (1998) had previously studied. In that sense, Sanguinetti et al (2004) also finds evidence for manufacturing cluster-formation within MERCOSUR members albeit with relatively little specialization; assigning joint significance in fostering intra-bloc trading with reduced intra-bloc tariffs. While it is not the first instance that empirical results suggest that agglomeration and specialisation patterns influence regional wage divergence (take for instance, Venables 1999), these studies represent the first systematic econometric account for MERCOSUR.

By contrast, Blyde (2006) not only finds a consistent upward trend for income inequality throughout the 90s, but to the extent that agglomeration of production might theoretically influence it, agglomeration figures in MERCOSUR have in fact decreased. Moving towards the 2010s, Stender (2015) utilizes a modified Gravity Model to identify pure creating vs. diverting patterns induced by tariff liberalisation, partly explaining the intra- and extra-bloc heterogeneity. The SELA special report on Latin American Integration (2015) expands on this latter argument, claiming that the existing asymmetries in regional trade dynamics are to an extent due to the pre-existing inequality levels within each member country. In other words, the asymmetrical trade patterns feed back into the inequality patterns in a cyclical fashion, which have jointly precluded deeper integration levels.

On the other hand, Borraz et al. (2012) make a particularly innovative approach, directly analysing the distributive effects of MERCOSUR on Paraguay and Uruguay as the "small trading partners", using disaggregated household data to systematically trace the pro-poor benefits of MERCOSUR integration on prices and wages, per broad commodity group. While ultimately not finding a significant effect on poverty and inequality levels, the study's statistical robustness is indeed a remarkable contribution to the field. Akin to this model, Helpman et al. (2017) utilize disaggregated firm-level data on Brazilian industries to fit a model that manages to capture intra- and inter-sectorial frictional dynamics, ultimately finding sizable effects of trade on wage inequality. Finally, the most recent contributions to the literature come from the IMF (Cluster report, March 2017) and Ametoglo and Ping (2016): the former argues that integration is not only imperative but that growth from trade poses no risk for income inequality at the regional or domestic level. The latter paradoxically finds a correlation between trade and declining income inequality for the Andean Community yet remains non-conclusive about the causal role of growth in the process.

4. Trade and Inequality among MERCOSUR Members

Trade has the effect of redistributing domestic market share and production resources among trading partners. The consequences of this redistribution for inequality vary as a result of a range of factors. The economic characteristics of each trade partner play a role in influencing the composition of trade flows, whether they are dominated by comparative advantage, trade in like varieties, or supply-chain trade, all of which carry different implications for inequality. These effects can be passed through two different mechanisms: prices and wages.

In addition to reducing the costs of imported goods, removing trade barriers can affect relative prices at the domestic level, which has ramifications for household income and expenditures. On the expenditure side, net benefits or losses depend, 1) on individuals' consumption basket of goods (and their associated consumption shares); and 2) on whether they are net producers (such as farmers) or consumers, associated with importing/exporting activities. While it is feasible to imagine losses for producers in these markets being offset by gains for consumers, this is only the partial-equilibrium story of price-induced dynamics.

There is additionally an important distinction to make between relative prices and price indexes: When a country liberalises its economy, it is the relative prices of imported goods that decrease; exports' relative prices by necessity, increase. Hence, the general-equilibrium story can only be told accounting for the income effect of trade-induced price changes.

Trade implies a domestic reallocation of resources and factors between and within sectors as they adjust to the increased foreign competition. The reallocation of factors brings about fluctuations in factor prices, particularly wages, which are likely to accentuate differences between industries following the Heckscher-Ohlin framework as well as domestic and internationalizing producers. Among these internationalizing firms, vertical intra-industry specialization can further influence wage responses to trade.

Among MERCOSUR members, income and consumption effects are remarkably different, not the least as a result of market and demand size, but also regarding labour composition and price-adjusting mechanisms. Furthermore, export technology levels vary significantly among member countries, potentially generating greater heterogeneity in inequality effects.

5. Research Design and Data

We study the effects of within-MERCOSUR trade on member states' inequality through three mechanisms: prices, wages, and the total effect as represented by income inequality. Our macroeconomic approach complements micro-level firm-based analyses: while those studies point to diverse effects among producers and within industries, our focus is on the aggregate result of these responses to trade within the MERCOSUR bloc. Table A presents the descriptions of the variables used in our analyses, while Table A1 in the appendix describes the data sources, and Table A2 presents descriptive statistics. In our analyses, all variables are log-transformed unless explicitly stated.

Table A – Variable Descriptions

Variable	Description
CPIT	Consumer price index on tradable goods
Wages	Real annual average wages
Gini Index	Captures total effect of inequality levels.
T	Annual bilateral imports, captured at the dyad-commodity-year level
RRS	Regional Relative Share: Fraction of commodity imported from MERCOSUR members
Trade Intensity Index (TIR)	Following Urata and Okabe (2014), this ratio captures the share of intra-regional trade out of a country's trade with the world.
Weighted Average Tariff (WAT)	Tariff lines weighted by import values.
Terms of Trade (TOT)	Controls for time-varying competitiveness with trade partners as well as real effective exchange rates.
GDP Growth Rate	Controls for growth cycles.
GDP Per Capita Growth Rate	Controls for the income effect of domestic production.
CPINT	Consumer price index of non-tradable goods
TWM	Commodity-level world imports less MERCOSUR imports
Educational Attainment	Net secondary education enrolment percentage as a proxy for the skill premium on real wage associated with education.

To estimate the price model, we use a panel dataset comprising 1801 observations distributed across 108 cross-sectional panels and 18 time periods, 1995 to 2012. The 108 panels correspond to the combination of MERCOSUR reporter, partner and SITC (Revision 3) commodity group (a list is available in Table A3). While the dependent variable in this set of models is the consumer price index on tradable goods (CPIT), we estimate intra-MERCOSUR trade in three different ways: dyadic bilateral commodity-level imports (T), the regional relative share (RRS) of a commodity imported from MERCOSUR members, and a trade intensity index.

For the wage model, we use a smaller panel dataset originally comprising 68 observations: four cross-sectional panels (corresponding to the four Mercosur member countries) and seventeen time periods, 1996-2012. We lose information from 1995 due to our dynamic modelling approach. Our dependent variable is real annual average wages as a proxy for household income, avoiding the region's extensive history of inflationary cycles, which would yield overestimated and biased coefficients (Stender 2015). We include CPIT among our explanatory variables to capture the influence of traded goods prices on real wages.

Our model of the total effect uses the Gini index as the dependent variable, relying on the same dataset as the wage model. The Gini index is particularly appropriate for its flexibility and efficiency in capturing variation between and within distinct population sizes, and additionally is the most complete and readily-available indicator for MERCOSUR inequality. Our model of the total effect of trade on inequality incorporates both CPIT and real wages among the explanatory terms to capture the effects of these mechanisms on inequality.

6. Results and Analysis

Our decision to limit the analysis from 1995 onward is driven by two concerns. First, the rates of tariff removal from 1991 through 1995 and the tariff lines that persisted up until the 1994 Ouro Preto Protocol are partly explained by industry lobbying activities (Ollarreaga and Soloaga, 1998), creating a potential endogeneity issue when assessing the relationship between trade and inequality. Second, data availability prior to 1995 is extremely sparse, further complicating estimation.

Indeed, trade data availability is a major issue permeating the research in this area. Standard data sources (such as UN Comtrade, WITS, and ECLAC CEPALSTAT) all suffer from large gaps in their time-series, cross-sectional data even at the SITC Rev.3 1-digit level, which potentially corresponds to reporting issues at the individual country level.

Regarding the first (price) model, issues arise regarding partially-available data for the Paraguay-Uruguay dyad where entire consecutive years are missing. This results in inadequacy for use in an error correction model, as co-integration testing is only possible with datasets with continuous time-series. We are still able however, to capture the short-run effects by applying the standard technique of differentiation prior to regression.

In the case of the second (wage) model, annual real average wages are also only partially available. Data from 1996 to 1999 are missing for all Mercosur member countries, therefore only 2000 to 2012 are included. Alternative measures of wages (excluding nominal wages) are not available in any of the data sources abovementioned. Similarly, no wage-by-occupation databases, productivity-associated employment- and/or salary-level databases, include information on all four MERCOSUR countries, if any. This entails that: 1) Because of the lack of disaggregated data at the sectorial level, differences between trading and non-trading industries cannot be observed, precluding analysis regarding labour-market frictional dynamics vis-à-vis trade liberalization. 2) Methodologically, it means more rigorous modelling for causal inference – for instance path analysis by solving structural equation simultaneously – cannot be done for the entire trade-prices-wage-inequality relationship.

Having considered these issues, we proceed to perform interpolation and extrapolation to fill some missing values in variables with less than 15% missing values and clear stationary, linear trends. Multiple imputation is usually a more robust technique, yet some of the variables were non-stationary; therefore, MI (and interpolation) would yield biased covariates. Missing values generated from lagging, logging and/or differentiating variables were kept.

6.1. The effect of regional trade on tradable-goods prices

Tables 1, 2 and 3 summarize the results for the ADL dynamic model. All specifications incorporate panel fixed effects. An augmented Dickey Fuller Fisher-type unit root test shows that CPIT follows a non-stationary process with I(1), therefore the variable is first-differentiated to make it I(0) prior to regressing it on any of the equations. This process is vital to ensure resulting covariates are not spurious, especially with macroeconomic variables. Additionally, it effectively captures dynamic short-run effects as oppose to simple static forms. Similar tests are conducted for all other variables to ensure stationarity.

Bilateral trade / dyadic effect on CPIT:

Table 1 shows estimated results. Like CPIT, the trade value variable displays non-stationarity and is therefore differentiated before regressing. Differentiation can potentially induce serial correlation in the model and overestimate coefficients, therefore we proceed to cluster standard errors. Thus, Model 1clusters standard errors at the country level, while Model 2 clusters country (dyad)-commodity level. Model 3 follows the country-commodity clustering and includes an interaction term between trade volumes and terms of trade.

Table 1: Coefficients for the bilateral effect on CPIT

	Model 1	Model 2	Model 3
Trade Value (USD)	0.004*	0.004*	-0.391***
	(0.002)	(0.002)	(0.076)
WA Tariff	0.011*	0.011***	0.011***
	(0.004)	(0.002)	(0.002)
Terms of Trade	0.118**	0.118***	0.123***
	(0.033)	(0.014)	(0.015)
GDP Growth	-0.059	-0.059***	-0.048***
	(0.036)	(0.012)	(0.012)
World Trade Share	-0.038**	-0.038***	-0.039***
	(0.009)	(0.004)	(0.004)
Non-traded CPI	0.074**	0.074***	0.073***
	(0.021)	(0.007)	(0.007)
Trade * Terms of Trade			0.088***
			(0.017)
Constant	-0.032	-0.032	-0.029
	(0.129)	(0.060)	(0.062)
N	1801	1801	1801
Adjusted R2	0.21	0.21	0.24

***p<0.001, **p<0.01, *p<0.05 All variables log-transformed. Model 1 has SEs clustered by country and Models 2 and 3 have SEs clustered by dyad-commodity.

All three specifications show a consistent, significant correlation between Mercosur-dyadic import volumes and CPIT; the direction and magnitude however, differ. Model 1 and Model 2 specification results display a significant positive correlation. Coefficients are identical in magnitude for both clustering variations, however Model 1 shows smaller S.E.'s, which result in higher significance levels for all control variables, except for our regressor with slightly higher S.E. yet no decrease in significance level (95%).

Model 3 on the other hand includes an interaction term between changes in the imports volume and terms of trade (which as we mentioned before, is meant to capture time-varying competitiveness between trading partners as expressed by relative import/export prices) and displays a positive correlation. Interestingly, the interaction term not only increases the magnitude of the isolated dyadic effect but also changes its direction and is significant at the 99.9%. To be precise, a 10% increase in the volume of imports per Mercosur dyad would induce on average, a 3.9% decrease in the price index variation at the domestic level for a given commodity group k, in the short run.

Here, we hypothesize that the reason behind the contrasting results is that the interaction term enables us to isolate the variation in CPIT explained by increases in import volumes from Mercosur dyads as they simultaneously interact with relative price changes. In other words, by accounting for ToT and trade volumes jointly, the remaining variation in CPIT corresponds to other macroeconomic fluctuations excluding those from intra-bloc importing.

Interpreting the terms together suggests that Mercosur-dyadic import volumes in relation to time-varying trading competitiveness initially increase CPIT at the domestic level. Nevertheless, CPIT still decreases in the short-run, as prices adjust to an increased supply of imported goods.

What this means in practical terms if we trust the latter model , is that increases in import volumes at preferential tariff rates are overall beneficial for the individual at the domestic level, admittedly contingent upon respective income and expenditure functions. Model 1 and Model 2 on the other hand, reflect that macro-economic fluctuations such as inflation or other monetary/financial phenomena at the domestic level possibly offset any beneficial effect stemming from trade, ergo resulting in positive covariates between DPV and IDPVs.

In terms of the control variables, all are almost identical in magnitude and direction across the three specifications with some differences in significance level. Model 2 (country-level clustering) displays the lowest significance levels (95%) for all controls while Model 3 (country-commodity-level clustering) displays the highest (99.9%). Moreover, they are all consistent with the theory: Decreases in tariff levels are correlated with decreases in CPIT changes, decreases in GDP growth rates are associated with increases in CPIT changes (as GDP reflects the competitiveness of domestic productivity), increases in trade volumes with the world are associated with decreases in CPIT changes (albeit the effect is smaller than the dyadic IDV, potentially reflecting the trade diversion effect of Mercosur) and finally CPINT levels are positively correlated with CPIT changes (strengthening our point on macro-domestic fluctuations).

Regional Relative Share effect on CPIT:

Table 2 shows estimated results. As mentioned above, the Regional Relative Share (RRS) regressor is meant to capture the importance of regional trading as a share of world trading for a given Mercosur member country, per commodity group.

Table 2: Regional Relative Share effect on CPIT

	Model 4	Model 5	Model 6
Regional Relative Share	0.050***		
	(0.012)		
d(RRS)			0.012
			(0.011)
RRS(t)*Terms of Trade		0.010**	
		(0.003)	
WA Tariff	0.011**	0.012**	0.009*
	(0.003)	(0.003)	(0.004)
Terms of Trade	0.071**		0.067**
	(0.023)		(0.022)
GDP Growth	-0.078**	-0.076**	-0.079**
	(0.023)	(0.022)	(0.023)
Non-traded CPI	0.051***	0.062***	0.041***
	(0.012)	(0.013)	(0.011)
Constant	-0.407***	-0.143**	-0.401***
	(0.084)	(0.048)	(0.084)
N	1801	1801	1801
Adjusted R2	0.15	0.13	0.11

***p<0.001, **p<0.01, *p<0.05 All variables log-transformed. SEs are clustered at the importer-commodity level.

This variable follows a stationary process so the equation is a simple log-linearised functional form. Despite following an ADL model, there is no theory to support the use of a lag in any functional form. Nevertheless, a dynamic/differentiated form is used in the third specification (Model 6) for consistency. Models 4 and 5 display a positive correlation between the regional relative share regressor and changes in CPIT. Model 6, that uses the dynamic/differentiated form of the IDV, is not significant. All 3 specifications are clustered at the reporter-region-commodity level (36 groups).

Model 4 utilizes RRS in its static form and suggests that a 10% increase in Mercosur imports relative to global imports for a given commodity group, is on average associated with a 0.5% increase in CPIT changes. The interaction term in Model 5 accounts for time-varying competitiveness and static RRS together, suggests that a 10% increase in the share of Mercosur imports relative to global exports, relative prices considered, is on average associated with a 0.1% increase in CPIT at the domestic level.

Results from this model are consistent with the analysis in the previous section, namely that intra-regional imports' immediate effect is that of increasing CPIT changes at the domestic level. Because the RRS regressor has the added benefit of comparing the regional effect against the global effect, one could infer that indeed, relative prices considered, importing a given commodity group k from other Mercosur member countries as oppose to other extra-bloc countries is not as beneficial because they are not as competitive.

Research points out to successful and beneficial trade agreements being the ones within regions with the most dissimilar export structures, as means to fully seize the benefits of Ricardian comparative advantages. Thus, despite some recent import/export diversification developments, Mercosur is by and large still centred around similar commodity groups. Consequently, benefits from increased intra-regional imports aren't as big.

Beyond the immediate effect however, price adjustment mechanisms at the domestic level will presumably yield much more ambiguous results. This is to say, how CPIT reacts from an increased supply of Mercosur imported goods will be contingent on market mechanisms that differ greatly among member countries. For instance, CPIT changes in Brazil will undoubtedly, largely differ from CPIT changes in Uruguay if one merely takes GDP growth and market size as points of reference. A study of this sort requires more micro-level data.

In terms of control variables, all magnitudes and directions behave quite similarly across all three specifications and are consistent with the model in the previous section.

Trade intensity/integration effect on CPIT:

Table 3 shows estimated results. As mentioned above, this regressor follows Urata and Okabe (2007) and captures the 'pure intensification' of the trade relationship.

Table 3: Trade intensity/integration effect on CPIT

	Model 7	Model 8	Model 9
Trade Intensification Ratio	-0.010***	-0.061**	
	(-3.76)	(-2.77)	
TIR * TOT		0.011*	
		(2.39)	
d(TIR)			-0.129**
			(-2.71)
d(TIR*TOT)			0.029**
			(2.72)
WA Tariff	0.009***	0.010***	0.009***
	(4.29)	(4.37)	(3.73)
Terms of Trade	0.064***	0.076***	0.066***
	(5.04)	(5.32)	(4.99)
GDP Growth	-0.078***	-0.077***	-0.077***
	(-6.07)	(-5.98)	(-5.85)
Non-traded CPI	0.044***	0.044***	0.040***
	(6.91)	(6.87)	(6.27)
Constant	-0.412***	-0.463***	-0.394***
	(-8.83)	(-8.36)	(-8.13)
N	1801	1801	1801
Adjusted R2	0.15	0.13	0.11

***p<0.001, **p<0.01, *p<0.05 All variables log-transformed, with t-stats reported below coefficients. SEs are clustered at the country-reporter-commodity level.

A standard unit root Fisher-type test with ADF confirms the stationarity of this variable, so Models 7 and 8 use the Trade Intensification/Integration Ratio (TIR) in its static form. While there is no evidence from theory or the literature that suggests fitting lagged or differentiated version of this regressor, we do so for consistency in Model 9. All specifications have standard errors clustered at the partner-reporter-commodity level (108 groups).

Following the previous approaches, Model 8 accounts for Terms of Trade in an interaction term with TIR. To be precise, it can be interpreted as the initial/immediate positive correlation between CPIT changes and, TIR and relative prices' joint variation, which is on average 0.1% from a 10% increase. The single static term TIR then displays an average 0.6% decrease in CPIT associated with a 10% increase in the TIR.

Model 9 is consistent with the previous analysis and similarly shows a short-run positive correlation through the interaction term and a short-run negative correlation through the dynamic IDV. Taken together, results of this specification validate the arguments made above, regarding the initial increase in price indexes of tradable goods vis-à-vis an intensification of the trading relationship coupled with relative price changes; but an overall negative effect on price indexes once trading competitiveness is accounted for.

In terms of the control variables, magnitudes and directions are very similar across all specifications, consistent with the two models used above and with predictions from theory. Significance levels remain identical.

What this means on a more practical level, and given that we use this last regressor as a proxy for regional integration (understood as two-way process of trade intensification between partners), the model indicates an overall beneficial effect Mercosur member countries via the preferential tariff treatment. A natural question would be whether this effect would be bigger and more beneficial if the preferential treatment given became a homogeneous trade policy? These results suggest so. In other words, from the point of view of income and expenditure, freer trade beyond regional integration would be more beneficial.

Nevertheless, as briefly commented above, how prices fluctuate/adjust at the intra-national level and how the economy absorbs the trade effect will greatly vary across countries. A deeper, more micro-level study of this question is needed to answer that puzzle.

6.2. Robustness Checks

A manual Ramsey RESET test with second and third order powers confirms the validity of the linear specification for all three models. To correct for heteroskedasticity and serial correlation, panel errors are clustered as above. Finally, we follow Baltagi (2005) to rule out issues arising from cross-sectional dependence as the micro-panel used in this model uses a small number of time periods (T=17) only.

The effect of prices on within-country real wages:

Having estimated the relationship between changes in Mercosur regional trade (as import volumes) and consumer price indexes of tradable goods (CPIT), we now turn to the latter's impact on wages at the national level. Fisher and Breitung-type unit roots tests show that most if not all variables follow non-stationary I(1) processes. Therefore all variables are differentiated prior to regression.

Differences' ADL Dynamic model with fixed effects:

Table 4 summarizes results for this model. Our small panel dataset poses methodological challenges for estimation. Following Beckfield (2006), we attempt to address issues arising from the very small number of cross sectional panels (N=4, four Mercosur countries) by using two simple functional form variations of Equation 5 in addition to Equation 5 itself: 1) A specification with the independent variable of interest only, and 2) A specification with the variable of interest, control variables and the squared value of the variable of interest. The model relies on a standard fixed effects regression.

Model 10 corresponds to the first functional form variation which regresses CPIT on real wages, only. Model 11 incorporates key controls, while Model 12 is augmented with the squared value of CPIT.

Table 4: The effect of CPIT changes on real wages

	Model 10	Model 11	Model 12
d(Traded-good CPI)	-0.508***	-0.316**	0.352
	(0.133)	(0.098)	(0.227)
d(GDP per capita)		0.176***	0.108**
		(0.025)	(0.031)
d(Educational Attainment)		-0.222	-0.294
		(0.337)	(0.307)
d(Traded-good CPI)^2			-3.399**
			(1.065)
Constant	0.054***	0.034*	0.019
	(0.013)	(0.014)	(0.014)
N	50	50	50
Adjusted R2	0.18	0.63	0.69

***p<0.001, **p<0.01, *p<0.05 All variables log-transformed and first-differentiated.

Both Models 10 and 11 display a negative relationship between CPIT changes and real wage changes, with coefficients significant at the 99% confidence level, at least. On the other hand, Model 12 presents some very interesting results (displaying the highest adjusted R2 too): When we add the squared form of CPIT into the equation, the original CPIT turns non-significant (and positive) yet the squared form does not. In fact, it is significant at the 95% confidence level. The direction of the effect remains negative; however, the magnitude increases at least six times. Taken together, the model suggests a quadratic relationship between CPIT changes and real wage changes at the domestic level.

A word of caution is in order here, squared terms in regressions present some estimation and interpretability challenges. On the one hand, they are useful in that they pose a less restrictive condition on the underlying relationship between variables, compared to a standard linear condition. Nevertheless, in the case of non-stationary variables (where stochastic processes make it very difficult to interpret any true underlying trend at surface-level), they are still very restrictive.

On the other hand, it is usually misleading to interpret the estimated effect through the magnitude of the resulting covariate (in this case, that on average a 1% decrease in CPIT changes, is associated with a positive 3.4% change on real wages). This is because magnitudes for quadratic terms are by construction conflated with their linear term (and by extension partially 'absorb' their significance); not to mention all the possible control variable combinations that could be included in this functional form, and that could possibly capture more variance.

These considerations notwithstanding, what can be inferred from these results is that there could potentially be a non-linear, quadratic relationship between both variables in the short run.

On a less technical level, the model would suggest that there is an initial positive correlation between changes in CPIT and changes in real wages, followed by a negative correlation. In other words – and bringing together the analysis we made through the Price model – a decrease in the price indexes of tradable goods (as a response to trade intensification via increased import volumes) would first be associated with a decrease in real wages and a subsequent increase, in the short run. The extent to which one effect would offset the other cannot be accurately estimated through this model for the reasons listed above, but the specification suggests an overall beneficial income effect due to decreased prices on tradable goods (across all three specifications), which is consistent with theory.

In terms of control variables, GDP per capita is positively correlated with real wages as predicted, and is consistently significant across both specifications at the 99.9% confidence level. Educational attainment (as measured by net secondary school enrolment percentage changes) is not significant. A possible explanation for this will be discussed in conjunction with the educational attainment control variable in the next section.

Error Correcting Model with dynamic fixed effects:

The dataset used in this second stage (the wage model) only partially covers the intended period (from 2000 instead of 1996, to 2012), yet the time-series continuity of the panels allows for co-integration testing in the presence of non-stationary variables. A Westerlund panel co-integration test confirms the long-run stationarity of the underlying stochastic processes, so we proceed to fit the error correction model. Table 5 summarizes the results for the ECM with DFE.

Table 5 – ECM with Dynamic FE

	Model 13
Traded-good CPI	-0.089
	(0.129)
GDP Per Capita	0.284
	(0.157)
Educational Attainment	-1.060***
	(0.292)
Short Run	
EC	0.199***
	(0.025)
d(Traded-good CPI)	-0.368***
	(0.088)
d(GDP Per Capita)	0.150***
	(0.033)
d(Educational Attainment)	-0.170
	(0.216)
Constant	-1.338***
	(0.342)

***p<0.001, **p<0.01, *p<0.05 SEs clustered by reporting country.

The ECM DFE estimates are presented as a two-equation model, corresponding to the short and long-run effects as outlined in the functional form. The normalized, co-integrating vector (that is, the long-run equilibrium estimated parameter) is denoted by EC. The short-run dynamic coefficients are denoted by 'Short run' in the lower panel. This model can effectively be interpreted as estimating the price-wage elasticities of tradable goods, in the short and long run.

Like the panel fixed effects least squared model, there are some restrictions that control for within and between group correlation: 1) The DFE restricts coefficients of the co-integrating vector to be equal across panels and, 2) restricts the speed of adjustment (EC) coefficient and the short-run coefficients to be equal (Blackburne and Frank 2007).

The first salient result is the coefficient for speed of adjustment (EC) term. One would expect to see a negatively-signed coefficient for the EC term, given that it measures adjustment. Thus, a positive 'drift' above long-run equilibrium is corrected by a negative correction term and vice versa. This already signals the lack of a long-run, steady-state equilibrium between the variables of interest; which is confirmed by the non-significant coefficient for CPIT in the long-run co-integrating vector. Nevertheless, the short-run coefficient for CPIT is significant and denotes a negative correlation. To be precise, it denotes a 3.7% increase in real wages associated with a 10% decrease in CPIT; an approximately consistent result with the differences' ADL estimates in the previous section.

On a less technical level, the ECM model suggests that there is an overall beneficial effect for individual's real wages associated with decreases in the price indexes of tradable goods, in the short run. Nevertheless, there seems to be no steady-state, long-run equilibrium relationship between both variables. Therefore, economic policies aimed at artificially and systematically influencing real wages through tradable goods' price indexes in the long-run, would be deemed ineffective. Indeed, this would suggest that protectionist policies' effects that can allegedly 'insulate' wages at the domestic level, are rather short-lived.

In terms of control variables, GDP per capita is positively correlated with real wages in the short run, as expected. Moreover, the direction and magnitude of the effect is consistent with the previous model. Having said that, the variable seems to lose its explanatory power towards the long-run. This could be due to a variety of factors such as: selection bias (with micro-disaggregated data, a Heckman selection model could rule-out zero-valued observations from wage-GDP estimations) or unobserved domestic heterogeneity (labour-market and sectorial dynamics).

This latter point leads to a brief discussion of the coefficient direction of educational attainment as control variable: While it is widely accepted that education and wage are positively correlated, using educational attainment (measured as the net secondary education enrolment percentage change) introduces some nuances. The variable displays a non-significant coefficient in short-run, yet a significant, unintuitive negative correlation in the long-run.

The former is rather predictable since education policies' effects can only be measured in the long-run (especially those estimating an impact on wages as a function of education). The latter could be partly explained through labour-market dynamics: the relationship between real wages and the skill premium associated with education. A bigger pool of potential employees with the same post-secondary education level, exert downward pressure on the returns to that skill premium; thus, exerting downward pressure on real wages. As net secondary education enrolment converges to universal coverage, returns to the associated skill premium levels diminish, and so do real wages.

Another plausible explanation is that relative to skilled-labour, unskilled-labour displays higher returns given the prevailing export structure during the estimated period.

6.3. Further Robustness Checks

Given that fixed effects models can suffer from simultaneous equation bias (Baltagi et al 2000), a Hausman test is performed to assess the extent of the endogeneity between error term and lagged DV, which might cause said bias, by comparing DFE and MG (mean-group) estimates. Results indicate that bias is minimal for the fitted model and DFE is preferred over MG.

Estimating the total effect on income inequality:

Results from the instrumental-variable, panel fixed-effects regression are summarised in Table 6.

Table 6: The effect of prices and wages on income inequality

	Model 14
d(Real Wages)	-0.203*
	(0.102)
d(Traded-good CPI)	-0.082
	(0.086)
Constant	0.001
	(0.009)
N	50

***p<0.001, **p<0.01, *p<0.05

Results show a significant, negative short-run correlation between changes in Real Wages (as a function of CPIT, GDP per capita, Educational attainment and CPINT) with respect to Gini index changes. To be precise, it estimates a 2% decrease in income inequality associated with a 10% increase in real wages at the domestic level, at the 95% significance level. On the other hand, there is a non-significant, negative short-run correlation between CPIT changes and Gini index changes. The non-significance could be due to a true zero-effect relationship between both variables, or due to a multicollinearity issue since CPIT is both included as independent and instrumented variable.

On a less technical level, taking these models together suggests that indeed, regional integration intensification (understood as increased intra-bloc trade) is associated with a reduction in the income inequality indicators for MERCOSUR countries, in the short-run. This is consistent with empirical findings outlined in the previous sections.

Nonetheless, methodologically-speaking a more robust analysis would use a fully-integrated error correction model for all linkage mechanisms presented here, or alternatively, a structural equation model akin to path analysis which can accurately estimate the magnitudes of the covariates at hand, in addition to establishing a causal relationship. Statistical rigor aside, these models are still useful in teasing out the distributive nuances that regional trade liberalisation can exhibit at the domestic level.

7. Concluding Remarks and Policy Implications

We have assessed the impact of MERCOSUR intra-bloc liberalization and increased intra-regional trade on income inequality at the domestic level, through price indexes of tradable goods and real wages. We have deliberately used a mixture of econometric techniques to compare results against each other as well as against empirical findings and theoretical predictions.

Results are overall in line with both theory and evidence. First, the price model displays an overall benefit for individuals from an overall trade-creating effect; as increased intra-bloc trade is associated with lower prices of tradable goods in the short run. Having said that, the model also indicates an immediate, initial increase in price indexes that could partly be explained by the trade-diversion literature and macro-adjusting fluctuations ex-post trade intensification. This model attempts to explain the partial-equilibrium, expenditure side of the trade-integration story.

Second, the wage model also displays an overall beneficial correlation between changes in the price indexes of tradable goods and real wages. Moreover, it teases out the short and long-run dynamics of the relationship. Consistent with the first model, it also indicates an initial, immediate decrease in real wages associated with a decrease in price indexes, followed by an increase in the short-run as macro-domestic fluctuations adjust to price changes from foreign competition. This model attempts to draw a more general-equilibrium picture of trade-integration, by accounting for the income effects of trade-induced factor reallocation.

Third, the Gini model brings the price and wage estimations together, to assess the aggregate impact of regional trade integration on income inequality. Results support a positive, yet modest correlation between trade integration/intensification and inequality-amelioration; more strongly associated with real wage changes than price index changes.

Evidence notwithstanding, it is important to mention that the true effect size of regional trade integration might even be bigger than suggested through the models above. Moreover, since all model specifications yield non-linear dynamic behaviours (despite the level of aggregation utilised), the heterogeneity indicates that the underlying patters of gains from trade are ambiguous and remain contingent upon both international and domestic conditions.

To be clear, that gains from trade might be not be uniformly distributed between and within countries is no argument in favour of protectionist policies. Quite the opposite, the models above highlight that policies aimed at ‘artificially’ influencing prices, wages and inequality through trade policy, are in fact short-lived and could have detrimental consequences. Instead, policies aimed at diversifying export structures, boosting domestic productivity and increasing educational attainment levels can more effectively and smoothly, influence prices and wages in the long run. On the other hand, policy mechanisms should be put in place to compensate losses from trade, or at least ‘soften the blow’.

Appendix

Table A1: Data Sources

Model	Variable	Source
Price Model	Import Volumes per Commodity Group	UN COMTRADE
	Price Indexes of Tradable Goods	ECLAC - CEPALSTAT
	Price Indexes of Non-Tradable Goods	ECLAC - CEPALSTAT
	Weighted Average Tariffs	UN WITS
	Terms of Trade	ALADI
	GDP growth rate	ALADI
Wage Model	Annual Average Real Wages	ECLAC - CEPALSTAT
	Educational Attainment	WORLD BANK DATABASE
Income Model	Gini Index	LAC Equity Lab (IDB)

Table A2: Commodity Groups

Commodity code	Commodity (SITC 1-digit Rev. 3)
0	Food and live animals
1	Beverages and tobacco
2	Crude materials, inedible, except fuels
3	Mineral fuels, lubricants and related
4	Animal and vegetable oils, fats and wax
5	Chemicals and related products, n.e.s.
6	Manufactured goods classified chiefly
7	Machinery and transport equipment
8	Miscellaneous manufactured articles

Table A3: Descriptive Statistics

Variable		Mean	Std. Dev.	Min	Max	Observations
year	overall	2003.52	5.188607	1995	2012	N = 1915
	between		.4624374	2000	2006.429	n = 108
	within		5.180922	1993.72	2013.52	T-bar = 17.7315
period	overall	2003.52	5.188607	1995	2012	N = 1915
	between		.4624374	2000	2006.429	n = 108
	within		5.180922	1993.72	2013.52	T-bar = 17.7315
reporter	overall	2.489817	1.117579	1	4	N = 1915
	between		1.123246	1	4	n = 108
	within		0	2.489817	2.489817	T-bar = 17.7315
partner	overall	2.491384	1.124118	1	4	N = 1915
	between		1.123246	1	4	n = 108
	within		0	2.491384	2.491384	T-bar = 17.7315
commodity	overall	4.017755	2.596859	0	8	N = 1915
	between		2.594026	0	8	n = 108
	within		0	4.017755	4.017755	T-bar = 17.7315
trade val.	overall	17.09596	2.546499	2.70805	23.21958	N = 1915
	between		2.535222	7.934253	22.07639	n = 108
	within		.9113012	7.147104	21.47905	T-bar = 17.7315
WAT	overall	.4462649	.9417012	0	3.433987	N = 1915
	between		.3584115	0	1.608563	n = 108
	within		.8720471	-1.162298	3.193858	T-bar = 17.7315
CPIT	overall	66.18488	26.29348	26.22617	119.5921	N = 1915
	between		4.521334	50.80461	83.85716	n = 108
	within		25.96588	20.70454	123.1069	T-bar = 17.7315
CPINT	overall	69.34879	25.00278	21.54847	120.3948	N = 1915
	between		3.780685	49.20801	84.59515	n = 108
	within		24.79697	18.72489	122.6646	T-bar = 17.7315
logTWMM	overall	19.74124	2.415453	12.48453	25.0899	N = 1915
	between		2.343486	13.2998	24.12634	n = 108
	within		.6545963	17.28886	21.78743	T-bar = 17.7315
logTOT	overall	4.506099	.1345021	4.173957	4.743591	N = 1915
	between		.0856247	4.39331	4.606749	n = 108
	within		.103911	4.286746	4.85638	T-bar = 17.7315
per capita	overall	2.896308	4.387407	-10.895	13.093	N = 1915
	between		.2639886	2.375667	4.034714	n = 108
	within		4.381152	-10.89758	13.35031	T-bar = 17.7315
GDP	overall	383.558	591.0234	6.325	2612.4	N = 1809
	between		488.8665	12.43135	1577.181	n = 108
	within		343.4246	-594.1846	1808.157	T-bar = 16.75
TIR	overall	1.541213	2.867845	2.80e-06	28.77127	N = 1915
	between		2.654793	.0002898	13.19362	n = 108
	within		1.080176	-5.36237	17.93535	T-bar = 17.7315

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