Piecing Together the Puzzle: The Economic Frictions that Explain the Inconsistent Relationship Between Tariffs and Inequality

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Abstract

I study how economic frictions—proxied through measures of labor market regulations, lack of education, and rural-urban division—mediate how tariffs affect inequality, controlling for global time trends and country invariant factors with two-way fixed effects. I find that tariffs generally reduce inequality, with this effect strengthened in countries with higher levels of advanced education and weakened in countries with larger rural populations. The effects of tariffs on economic outcomes vary dramatically by development level—tariffs modestly increase GDP per capita in low-income countries but substantially reduce it in high-income economies (implying that tariffs in high-income countries compress the income distribution at the expense of reducing overall economic output). While labor market regulations do not significantly interact with tariffs to affect inequality, they reduce the ability of tariffs to improve GDP per capita specifically in low income countries. These findings help explain the lack of consensus in previous literature that did not control for such factors, and suggest that effective trade policy must be tailored to a country's specific developmental context and institutional characteristics.

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1. Introduction

The relationship between trade liberalization and economic inequality has emerged as a central concern in economics, particularly as globalization has accelerated in the 21st century. While a substantial body of literature examines the distributional effects of trade, its conclusions remain notably heterogeneous, with some finding inequality-reducing effects through enhanced efficiency and growth, and others documenting the opposite (Winters 2004). Little research explores the country-specific factors that contribute to this heterogeneity. Additionally, most models of international trade require (or assume) the ability of labor to fluidly adjust between sectors or firms when determining the distributional implications of trade (such as factor price equalization, benefits to export sectors, or aggregate productivity increases). In practice, however, labor cannot adjust quickly or perfectly, if at all, due to obstacles like labor market regulations, lack of education, and geographical constraints. Such country-specific factors may explain the inconsistent distributional outcomes of trade liberalization. Labor market regulations can determine if workers are affected through unemployment or changing wage premia, education level can determine the ability of the median worker to transition between industries (or whether they are a scarce or abundant factor), and level of rurality (percent of population living in rural areas) can represent geographic constraints that may limit workers' abilities to transition industries or how economic shocks may affect urban and rural areas differently due to sectoral employment.

Despite the theoretical importance of these factors in determining how trade shocks translate into distributional outcomes, empirical research has not yet examined their interactions on a large, multi-country scale, and case studies that consider one factor omit the others and thus likely over or under-attribute effects. This paper will contribute to the study of the distributional effects of trade policy by determining if the aforementioned frictions can explain the heterogeneity in tariffs' effects on inequality, answering the research question: "how do labor market institutions, education levels, and rurality affect the relationship between trade liberalization and inequality?"

2. Literature Review

Prior research on the relationship between trade liberalization and inequality presents notably heterogeneous findings. Several studies document increases in inequality following trade

liberalization (Gourdon et al., 2008; Hanson & Harrison, 1999; Robertson, 2000; Rojas-Vallejos & Turnovsky, 2017), while others find inequality reductions (Cicowiez et al., 2010; Reuveny & Li, 2003). Still others identify no significant relationship (Dollar & Kraay, 2002; Edwards, 1997; Ravallion, 2001). This heterogeneity suggests that the relationship between trade and inequality is "mediated" by other factors, which I define to include models with ambiguous predictions that depend on one or more country-specific parameters.

A seminal survey by Goldberg & Pavcnik (2007) systematically examines this heterogeneity in the context of globalization's distributional effects. They identify several country-specific characteristics that potentially mediate the trade-inequality relationship, emphasizing "the flexibility of domestic markets in adjusting to changes in the economic environment, in particular the degree of within-country labor and capital mobility" (Goldberg & Pavcnik, 2007).

2.1. Studies of Labor Market Regulations

The theoretical mechanisms linking labor market institutions to trade outcomes are developed in Helpman et al.'s two-country model of international trade. Their analysis of "the interaction of labor market rigidities and trade impediments" reveals that countries with more flexible labor markets tend to capture proportionally greater gains from trade (Helpman et al., 2010). This finding suggests that labor market flexibility influences the magnitude of trade's effects, which could possibly be extended to shape its distributional consequences as well.

Additional research has examined specific aspects of this relationship. Topalova's (2010) study of India's 1991 trade liberalization provides empirical evidence of how labor market rigidity affects distributional outcomes. Exploiting variation in exposure to trade liberalization across Indian districts, she finds that districts with more rigid labor markets (measured by stronger employment protection laws and less labor mobility) experienced significantly worse poverty and inequality outcomes following trade liberalization. Specifically, "the impact of liberalization was most pronounced among . . . states where inflexible labor laws impeded factor reallocation across sectors" (Topalova, 2010).

Dix-Carneiro (2014) examines Brazil's trade liberalization experience through the lens of labor market frictions, finding that: 1. Labor market frictions substantially delay the reallocation of workers across sectors following trade shocks, which can take several years, 2. This delayed

adjustment reduces aggregate welfare gains from trade policy, and 3. The welfare effects depend on sector and worker age and education (Dix-Carneiro, 2014).

2.2. Studies of Education Level

A study by Porto and Galiani (2006) on periods of trade liberalization in Argentina finds that it hurt all workers and increased the skill premium, benefitting educated/skilled workers more than uneducated/unskilled, thus contributing to wage inequality (Porto & Galiani, 2006).

Using data from Brazil, Dix-Carneiro and Kovak (2015) develop a specific-factors model with skilled and unskilled workers to determine trade liberalization's effect on skilled wage premia, finding that liberalization caused small reductions. This is consistent with the Stolper-Samuelson theorem[1], in that trade makes skilled workers less scarce and thus reduces their wage.

Attanasi et al. (2003) studies how tariff reductions affected wage distribution in Colombia in the 1980s and 1990s, and finds that they increased returns to college education, hurt industries with initially lower wages and more unskilled workers, and pushed the labor force towards the informal sector, which generally experiences lower wages. However, they find that these mechanisms cannot fully explain the increase in wage inequality during the period, perhaps lending support to the idea that other factors like labor market regulations or rurality could contribute to distributional impacts as well.

Mamoon & Murshed (2007) study various countries over time, and find that countries with higher initial levels of human capital experience less pronounced increases in wage disparity due to trade liberalization. This suggests that pre-existing skill endowments (or education levels of a country) play a critical role in shaping how trade-induced shocks affect wage distributions. They also discuss that trade liberalization increases wage inequality because protectionist policies tend to shield industries that disproportionately employ unskilled labor (Goldberg and Pavcnik, 2004). As such, trade liberalization disproportionately exposes these sectors to global competition, worsening wage inequality between skilled and unskilled workers (Mamoon & Murshed, 2007).

[1] Discussed in Section 3.2

2.3. Studies of Rurality

Topalova's (2010) study of India shows that trade liberalization disproportionately hurts rural areas due to limited job mobility and infrastructure, and higher concentrations of industries more exposed to trade liberalization. Topalova found that the average level of tariff changes led to a two percent increase in poverty incidence in rural areas, compared to rural areas with no tariff changes. Therefore, while trade liberalization may generally have lowered poverty across the country, "certain areas and certain segments of the society benefited less (or suffered more)." In a different study, Topalova also found that the impact of trade liberalization in India was most pronounced for the least geographically mobile (Topalova, 2010).

Perez-Silva and Krivonos (2021) focus on Peru's second era of trade liberalization (2001-2016), and determine its differential impacts on wages, earnings, and employment between rural and urban areas. They find that trade openness increases urban workers' earnings and wages, but also that agricultural workers benefited from trade openness because agriculture was a competitive export sector. These findings are not necessarily inconsistent with the theory that rurality serves as an obstacle to labor adjustment, in that if the agricultural sector benefits from trade liberalization due to the country's comparative advantage and export potential, then labor has no need to adjust away from that sector.

These studies collectively suggest that labor market institutions, education levels, and rurality play crucial roles in determining how trade liberalization affects inequality. However, there remains a notable gap in the literature regarding the systematic examination of how these factors individually mediate the trade-inequality relationship across countries and over time, and there exists no literature that discusses combined effects. This paper aims to address this gap by leveraging comprehensive panel data to directly examine these relationships, and will additionally determine if the effect differs by development level. Ultimately, this paper offers insight into how trade policies can minimize economic inequality, and if it requires labor market reform or investment in human capital or infrastructure to minimize barriers to labor adjustment.

3. Theoretical Framework

3.1. Labor Market Regulations

The rigidity of labor markets, determined by labor market institutions (such as regulations around hiring, firing, and wage-setting), will shape the labor market's response to trade shocks. There are essentially two avenues through which labor market regulations can lead to inequality: by exacerbating unemployment or increasing wage differentials.

First, transitional unemployment is heightened by trade liberalization due to the profitability of certain industries changing after reaching new foreign markets or competing with foreign imports (tariff changes can lead to changes in industry unemployment [Pavcnik, 2006]). In flexible labor markets, jobs are less secure and workers have fewer protections (like severance pay or unemployment benefits). When trade liberalization leads to the contraction of less competitive industries, workers in flexible labor markets will be more easily displaced, and may face more difficulty securing new jobs or maintaining their income levels, which can increase short-term inequality (particularly if the declining industries are heavily employed by poorer workers, which may be related through skill-level). Workers in rigid labor markets may be at lower risk of immediate unemployment, as their jobs are better protected and regulations around firing exist.

Second, trade policy can interact with labor market regulations to create inequality by altering wage premia. Countries with rigid labor markets may adjust to industry-profitability changes through altering industry wage premia, rather than hiring or firing workers. If labor markets are rigid, and workers cannot move easily across industries, reductions in tariffs will cause proportional declines in industry wage premia (Heckman and Pages, 2000). To the extent that the declining industries are heavily employed by poorer workers, such a decrease in wages would contribute to increasing inequality. Which of these effects dominate, and the corresponding implications on inequality, is ambiguous and thus requires empirical investigation.

3.2. Education

In terms of education, the percent of workers with and without basic education can be used as a proxy for skilled and unskilled labor. The Stolper-Samuelson theorem posits that trade liberalization benefits the abundant factor in a given country while harming the scarce factor, because when opened up to other countries, the abundant factor becomes relatively less

abundant, and the scarce factor becomes relatively less scarce. In lower-income countries, where unskilled labor is abundant, trade liberalization may increase the relative demand for unskilled labor, leading to higher wages for unskilled workers and a reduction in inequality. Conversely, in higher-income countries, where unskilled workers are relatively scarce, trade liberalization is likely to benefit skilled labor, exacerbating wage inequality as demand for skilled workers increases while unskilled workers face stagnant or declining wages.

Another possibility is that workers with higher education often benefit more from trade liberalization due to their ability to adapt to changes in industry demand and skill requirements. More educated workers can better transition to new, higher-paying industries or roles that emerge as a result of trade. Lower-educated workers, more often employed in industries more vulnerable to international competition (like agriculture), may also lack the qualifications or resources to transition into industries with rising demand, exposing them to job displacement or decreased wages. Furthermore, while educated workers can transition downward into unskilled jobs if necessary, uneducated workers do not have the option to transition upward into skilled roles. Thus, lower-educated workers may bear a disproportionate share of the adjustment costs associated with trade liberalization, leading to worsened inequality.

3.3. Rurality

The share of a country's population living in rural areas reflects geographic constraints that can limit labor mobility in response to trade liberalization. Rural workers are often employed in agriculture or low-skill manufacturing, which may be more exposed to international competition when tariffs are reduced. While urban workers may have better access to alternative employment opportunities, rural workers may face additional challenges transitioning to new jobs due to physical and economic barriers, such as distance to urban centers, lack of transportation infrastructure, or the cost of relocation. If so, rural workers may remain in low-productivity employment, accept lower wages, or face prolonged unemployment. This would contribute to inequality, particularly if rural populations are already concentrated in poorer income brackets. Therefore, the percentage of a country's population living in rural areas may serve as an indicator of factor immobility, capturing the geographic and economic constraints that shape the adjustment process to trade liberalization.

However, there is an additional potential mechanism through which rurality may affect inequality: the share of rural population may serve as a supply of flexible labor. For example, research from China finds that rural voluntary labor mobility "helps to adjust the supply and demand for labor between rural and urban areas" (Seeborg et al., 2000). When economic shocks occur or new opportunities arise through trade policy changes, rural populations may be more willing to migrate for work, and thus experience gains.

This mobility phenomenon may play out differently depending on a country's baseline urbanization rates. In countries with moderate urbanization, rural workers might more readily relocate to urban areas when tariff changes create new industrial opportunities, potentially mitigating inequality. However, in highly rural countries, infrastructure limitations, family ties to agricultural land, and inadequate urban housing can prevent this adjustment mechanism from functioning effectively. Conversely, in highly urbanized countries, the small rural population may not provide a significant labor buffer.

In summary, a country's structural characteristics like labor market regulations, education levels, and rural populations essentially measure how easily labor can adjust in the face of trade shocks from liberalization. By studying these factors together, this paper aims to explain the heterogeneity in inequality responses to trade liberalization across countries, hypothesizing that it can, in part, be attributed to differences in these characteristics; countries with rigid labor markets, low education levels, and large rural populations may experience greater increases in inequality due to trade liberalization, because it is more likely for workers to be stuck either in succeeding or failing industries without the effects equalizing through labor transition.

It is crucial to study these factors collectively, rather than separately, because analyzing these variables in isolation risks underestimating their combined effects on inequality or committing omitted variable bias. For example, if the percent of rural population is correlated with education level, and education level is a determinant of inequality in a country, then omitting education level will overestimate how much rurality affects inequality.

Additionally, taken together, these factors essentially represent how closely trade liberalization's effects on a country will resemble the theoretical effects that occur under perfectly flexible factor adjustment. In other words, by accounting for a country's level of factor rigidity, one can also isolate what effect trade liberalization would have on inequality if factors

were perfectly mobile (as in, the value of labor market regulations is low, basic education is high, and rurality is low). This result can be compared with theoretical predictions to determine the accuracy of trade models in the real world, if their assumptions hold true.

4. Methodology

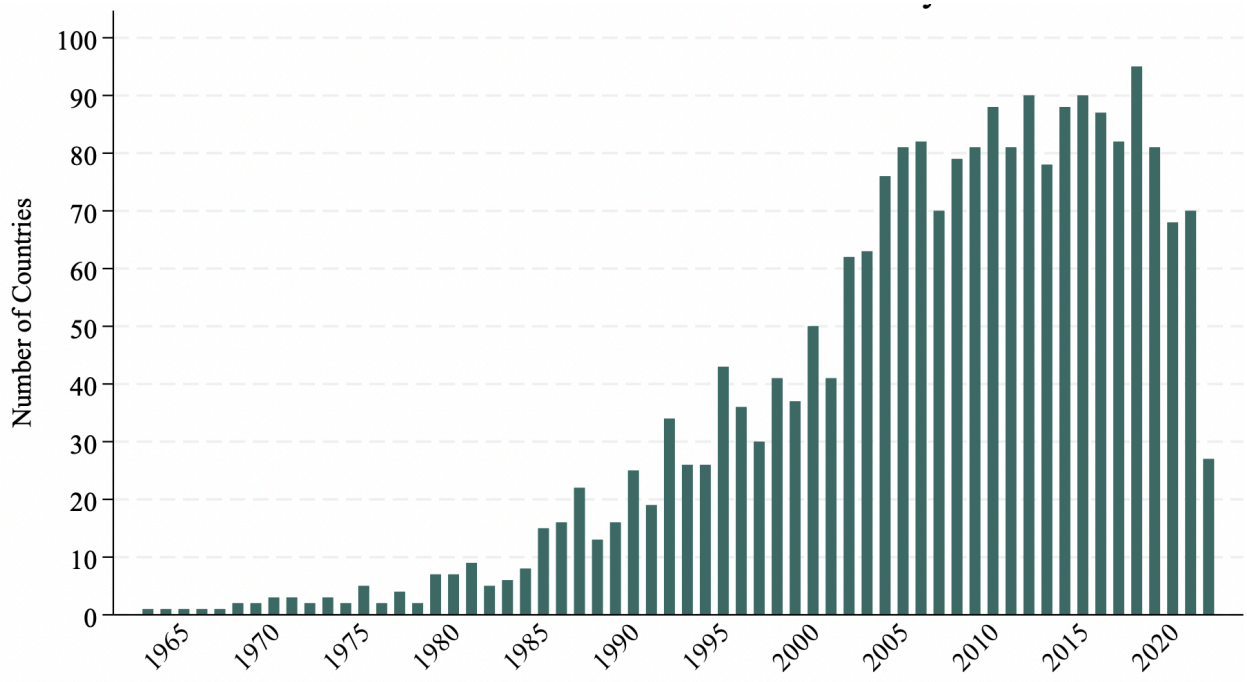
4.1. Data

The data used in this analysis originates from the Fraser Institute's Economic Freedom of the World (EFW) Dataset, the UN, and the World Bank. The EFW dataset measures the "degree to which countries' policies and institutions support economic freedom," and ranks 165 countries and territories, with data for over 100 nations dating back to 1950 (Gwartney et al 2024). From this dataset, I extract information on mean tariff rate (as a percentage) and labor market regulations (scaled from 0-10).

The Gini index for a country-year is collected from UN and World Bank data ("Gini index," 2025). The World Bank data also contains information on basic country controls, such as GDP, income level classification, education levels, rurality, and percent exports ("DataBankWorld Development Indicators," 2025). Before conducting analyses, I center data values to improve interpretability.

The final dataset contains data for years 1970, 1975, 1980, and 1985-2022. However, the Gini index is not available for all countries in the earlier years. Figure 1 demonstrates the number of countries for which the Gini index is available over time.

Figure 1. Number of Countries with Gini Index Available per Year

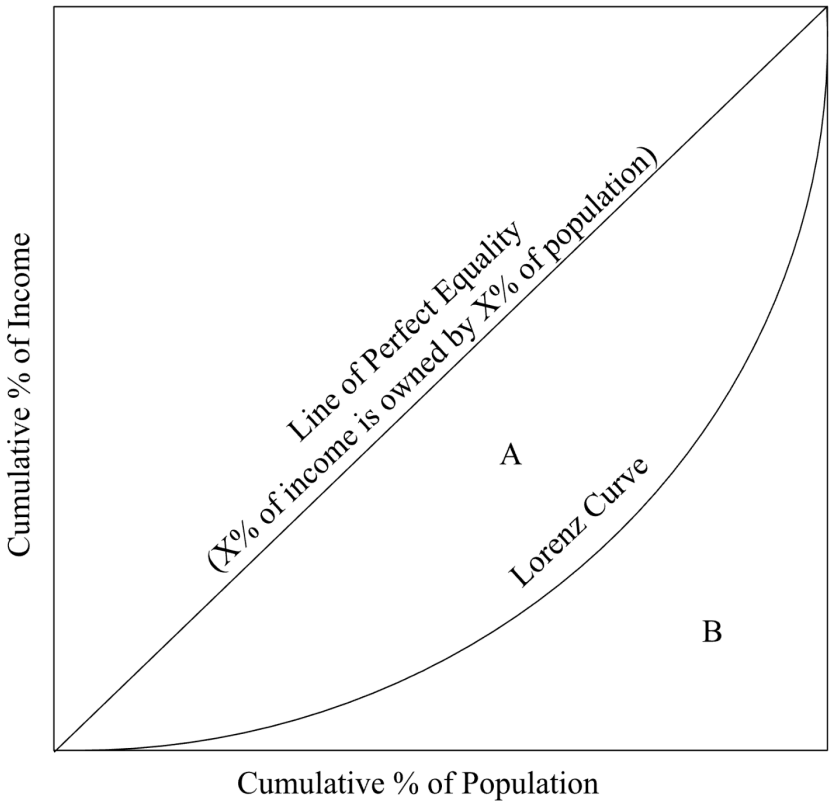


Due to data availability limitations, the panel data is unbalanced, weighted towards more recent years. Since the composition of countries changes over time, with lower-income countries being underrepresented in earlier years, there essentially exists a form of selection bias. Thus, to avoid this issue, the empirical analyses use data from the year 2000 and after, limiting the final count of countries to 162.

4.2. Empirical Strategy

To determine the effects of labor market regulations, education levels, and rurality of a country on the relationship between tariffs and inequality, I use the outcome measure of the Gini index. The Gini index measures inequality as the "extent to which the distribution of income or consumption among individuals or households within an economy deviates from a perfectly equal distribution," with zero representing perfect equality and 100 perfect inequality ("DataBank Metadata Glossary," 2025). To calculate the index, a Lorenz curve of cumulative percentage of total income received against cumulative population is plotted, as well as a line representing perfect equality. The area between the line of equality and the Lorenz curve (A) is then divided by the total area under the line of equality (A+B). A higher Gini index implies that a country is further away from perfect equality.

Figure 2. Gini Index Visualization



The independent variables are defined as follows. Labor market regulations is an index calculated by averaging the scores in the following subcomponents scaled from 0-10 based on the distribution of data: hiring regulations and minimum wage, hiring and firing regulations, centralized collective bargaining, hours regulations, mandated cost of worker dismissal, and conscription (The Fraser Institute). Rurality is defined as the percent of a country's population living in rural areas, and education level is defined as the percent of a country with advanced education, both of which are accessed through World Bank data.

For each independent variable focus, two main regressions are conducted, with various specifications each. The first is meant to demonstrate how the relationship between the variables differ between a regular OLS regression and regressions that include various combinations of fixed effects, to determine how the relationships change when controlling for country and year variation (Specifications 1, 2, 3). For each model, regressions are run with no fixed effects (no underlined terms), year fixed effects (dotted term), country fixed effects (underlined term), and both year and country fixed effects (dashed line). If the relationships are strong even with two-way fixed effects, then the results are very robust.

(1) Model Specification to Measure Effect of Labor Market Regulations

$$Gini_{it} = \alpha + \beta_1(Labor\ market\ regulations)_{it} + \beta_2(Tariff\ rate)_{it} + \beta_3(Income\ class)_{it} + \beta_4(Labor\ market\ regulations * Tariff\ rate)_{it} + \epsilon_{it} + \underline{\mu_i} + \underline{\mu_t}$$

(2) Model Specification to Measure Effect of Advanced Education

$$Gini_{it} = \alpha + \beta_1(Advanced\ Education\ \%)_{it} + \beta_2(Tariff\ rate)_{it} + \beta_3(Income\ class)_{it} + \beta_4(Advanced\ Education\ \% * Tariff\ rate)_{it} + \epsilon_{it} + \underline{\mu_i} + \underline{\mu_t}$$

(3) Model Specification to Measure Effect of Rurality

$$Gini_{it} = \alpha + \beta_1(Rural\ \%)_{it} + \beta_2(Tariff\ rate)_{it} + \beta_3(Income\ class)_{it} + \beta_4(Rural\ \% * Tariff\ rate)_{it} + \epsilon_{it} + \underline{\mu_i} + \underline{\mu_t}$$

A second group of regressions explores various specifications of the two-way fixed effect model, to determine how the relationships change when omitting an income control or the interaction term.

Third, I consider the separate relationships between the Gini index and tariff rate, labor market regulations, education level, and urbanization, without including how they interact with each other.

Finally, I explore the relationships using GDP per capita as the dependent variable instead of Gini index, in order to understand how tariffs affect the economic situation of the average person, other than by impacting inequality.

Note that when the low income variable is included with fixed effects, it only captures the variation from countries that switch their income status designation over time.

5. Results

5.1. Labor Market Regulations

Table 1. Considering Country and Year Fixed Effects

Dependent variable: Gini Index				
	1	2	3	4
Labor Market Regulations (LMR)	-1.118***	-1.035*	0.371	0.971**
	(0.207)	(0.565)	(0.549)	(0.443)
Mean Tariff Rate (MTR)	-2.926***	-2.929***	-1.138**	-0.812*
	(0.289)	(0.718)	(0.529)	(0.434)
Low Income	-1.889**	-2.356*	0.394	-1.778*
	(0.809)	(1.416)	(1.052)	(0.994)
LMR x MTR	-0.547***	-0.491	-0.105	-0.0817
	(0.183)	(0.608)	(0.363)	(0.279)
Observations	1483	1483	1467	1467
Adjusted R^2	0.1595	0.1885	0.9103	0.9311
Year FE	No	Yes	No	Yes
Country FE	No	No	Yes	Yes

Standard errors in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

The regression output in Table 1 shows the results of four different model specifications: 1. OLS regression without fixed effects, 2. Year fixed effects, 3. Country fixed effects, and 4. Both year and country fixed effects. Specifications 2, 3, and 4 have clustered standard errors at the country level.

The coefficient associated with labor market regulations changes dramatically across model specifications: in 1 and 2, the coefficient is negative and significant (-1.118*** and -1.035*), in 3 it is positive (0.371), and in 4 it is positive and significant (0.971**). This reversal is quite interesting and suggests that when controlling for country-specific effects (Models 3 and 4), labor market regulations are positively associated with inequality. The most likely explanation for this sign reversal is that Model 1 and 2 are omitting relevant country-specific factors, which fixed effects then control for. Such characteristics could include institutions and legal traditions, geographic factors, cultural attitudes, and development patterns. These unobserved country characteristics may be correlated with both labor market regulations and

inequality levels. For example, countries with stronger egalitarian traditions might have both stricter labor regulations and other policies that reduce inequality. Without country fixed effects, the labor regulation variable inadvertently captures these effects, producing a negative coefficient that suggests regulations reduce inequality. By accounting for fixed effects, the later models examine how variation in regulations within countries affect inequality, rather than how different countries with different regulation levels experience inequality differently. Thus, that labor market regulations are positive and significant at this more rigorous standard implies an important relationship.

The coefficient associated with mean tariff rate is consistently negative and significant, though the magnitude of its effect decreases as specification rigor increases (-2.926***, -2.929***, -1.138**, -0.812*). This suggests that higher tariff rates are associated with lower inequality, with the effect becoming weaker but remaining significant when controlling for country and time-specific factors. The coefficients having smaller magnitudes in Models 3 and 4 indicates that some of the apparent tariff effect in Models 1 and 2 may be attributed instead to country-specific characteristics.

The coefficient associated with countries being low income is significantly negative in Models 1, 2, and 4 (-1.889**, -2.356*, -1.778*), but positive and insignificant in Model 3 (0.394). This suggests that low-income countries tend to have lower Gini indexes on average, with less income inequality compared to non-low-income countries. In Model 3, the positive but non-significant coefficient (0.394) suggests this relationship disappears when only controlling for country fixed effects.

The coefficient of the interaction term between labor market regulations and tariff rates is strongly significant and negative in Model 1 (-0.547***), but insignificant in Models 2, 3, and 4 (-0.491, -0.105, -0.0817). In the Model 1, this suggests that the combined effect of labor market regulations and tariff rate differs from their individual effects. However, this interaction disappears when accounting for fixed effects, indicating that it is heavily influenced by unobserved country or time characteristics.

Table 2. Various Specifications of the Fixed Effect Model

Dependent Variable: Gini Index				
	1	2	3	4
Labor Market Regulations (LMR)	0.884**	0.921**	0.930**	0.971**
	(0.355)	(0.350)	(0.451)	(0.443)
Mean Tariff Rate (MTR)	-0.731	-0.795*	-0.746*	-0.812*
	(0.451)	(0.444)	(0.443)	(0.434)
Low Income		-1.773*		-1.778*
		(0.989)		(0.994)
LMR x MTR			-0.0757	-0.0817
			(0.286)	(0.279)
Observations	1467	1467	1467	1467
Adjusted R^2	0.9305	0.9312	0.9305	0.9311
Year FE	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes

Standard errors in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

The results in Table 2 are based on the following models: 1. Two-way fixed effects with only labor regulations and tariff rates, 2. Two-way fixed effects with labor regulations, tariff rates, and income level, 3. Two-way fixed effects model with labor regulations, tariff rates, and their interaction, and 4. Two-way fixed effects model with all variables (regulations, tariffs, income level, and interaction term). The adjusted R^2 values consistent at 0.93 indicate that the models explain about 93% of the variance in the Gini index.

Labor market regulations maintains a significant positive coefficient from Model 1 through 4 (0.884** to 0.971**). This confirms the previous analysis, but with stronger consistency, as the sign reversal is significant across all specifications with fixed effects. The effect size is also remarkably stable (0.88-0.97), suggesting a robust result that within countries, stricter labor market regulations are associated with higher inequality. This is consistent with previous literature, including Topolava (2010).

The coefficient on tariffs is strong and negative without fixed effects (-2.926***) (Table 1), and weaker with fixed effects (-0.812*). This suggests that the inequality-reducing effect of

tariffs becomes weaker when controlling for country and year fixed effects, but remains meaningful in the more fully specified models.

The income level coefficient suggests that low-income countries are associated with lower inequality, consistent with previous findings. Once again, the interaction effect loses significance with the inclusion of fixed effects, since the only variation is from countries that switch income class over time. The negative association between income class and inequality essentially confirms the Kuznets curve.

5.2. Education

Table 3. Considering Country and Year Fixed Effects

Dependent Variable: Gini Index				
	1	2	3	4
Advanced Education %	0.357***	0.328***	0.118**	0.0339
	(0.0320)	(0.101)	(0.0479)	(0.0446)
Mean Tariff Rate (MTR)	-5.932***	-6.069**	-1.233*	-1.396**
	(0.313)	(0.911)	(0.693)	(0.538)
Low Income	-2.345*	-2.795	-0.429	-1.554
	(1.257)	(1.849)	(1.325)	(1.427)
Education x MTR	-0.106***	-0.119**	-0.0325*	-0.0511***
	(0.0204)	(0.0482)	(0.0191)	(0.0176)
Observations	1201	1201	1181	1181
Adjusted R^2	0.2603	0.2756	0.9321	0.9426
Year FE	No	Yes	No	Yes
Country FE	No	No	Yes	Yes

Standard errors in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

In Model 1, the simple OLS regression, the advanced education percentage of a country has a significant positive relationship with inequality levels, suggesting that higher levels of advanced education are associated with higher inequality. This is consistent with the phenomenon of skill-biased demand, in that "the wages of more-educated workers pull away from those of less-educated workers;" countries with more people with advanced education may

experience this wage differential at higher rates, leading to inequality (Bennet et al, 2024). As in the previous section, mean tariff rate and the low income category maintain strong negative relationships with inequality (low income countries show higher inequality (-2.345*) compared to the omitted group of middle and high income countries). Finally, the interaction between education and mean tariff rate is negative and significant (-0.106***), indicating that the inequality-reducing effect of tariffs is stronger in countries with higher advanced education, which is consistent with the hypothesis that lack of education is an economic friction that can impede workers from switching industries.

The results of Model 2, which accounts for year fixed effects (controlling for common global time trends that might affect all countries), generally remain similar to those of Model 1. The effect of the interaction term strengthens slightly (-0.119**), but the low income coefficient becomes non-significant, suggesting this effect might be captured by global trends.

Model 3 includes country fixed effects, controlling for time-invariant country characteristics. The coefficients for both advanced education and mean tariff rate decrease substantially in magnitude but remain significant, suggesting that country-specific factors explain much, but not all, of the variation in inequality.

Model 4, with two-way fixed effects, is the most demanding specification, controlling for both time-invariant country factors and global time trends. Advanced education is no longer significant (0.0339), and mean tariff rate remains significant but with a much smaller magnitude (-1.396**). The interaction term, of most interest, remains highly significant (-0.0511***). Overall, as model specification becomes more rigorous (from Model 1 to 4), the direct effect of education on inequality diminishes and eventually becomes insignificant, suggesting this relationship is largely explained by country-specific factors. The negative effect of tariffs on inequality persists across all specifications, though with decreasing magnitude, which implies that tariffs may reduce inequality. The interaction term remains significant across all models, providing robust evidence that the inequality-reducing effect of tariffs is stronger in countries with higher levels of advanced education.

It is interesting that under the most demanding specification, advanced education is not significant, but the education-tariff interaction term is. This implies that while education levels alone do not predict changes in inequality within countries, it becomes more relevant when considered in conjunction with trade policy. This aligns with the previous discussion about

theoretical mechanisms—under the Stolper-Samuelson framework, education's effect on inequality manifests specifically through its interaction with trade policy, as the abundant factor (skilled or unskilled labor) experiences different outcomes when exposed to trade. The significance of the interaction term rather than education alone supports this theoretical prediction; education levels matter primarily in determining who benefits from or is harmed by trade policies.

Additionally, the interaction term's significance indicates that education's importance emerges when trade policies change, as higher-educated workers can better adapt to shifting industry demands and skill requirements following trade liberalization, while lower-educated workers face more significant adjustment frictions. Overall, this suggests that education's role in inequality is contextual and depends on the trade environment, rather than being a universal, independent predictor of inequality changes. From a policy standpoint, the effectiveness of tariffs in reducing inequality is thus contingent on human capital development.

Table 4. Various Specifications of the Fixed Effects Model

Dependent Variable: Gini Index				
	1	2	3	4
Advanced Education %	0.0443	0.0475	0.0307	0.0339
	(0.0372)	(0.0370)	(0.0445)	(0.0446)
Mean Tariff Rate (MTR)	-1.459**	-1.434**	-1.423***	-1.396**
	(0.627)	(0.629)	(0.538)	(0.538)
Low Income		-1.499		-1.554
		(1.389)		(1.427)
Education x MTR			-0.0507***	-0.0511** *
			(0.0181)	(0.0176)
Observations	1181	1181	1181	1181
Adjusted R^2	0.9415	0.9417	0.9424	0.9426
Year FE	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes

Standard errors in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

The models in Table 4 experiment with various specifications of the two-way fixed effects form. Like in the Section 5.1, mean tariff rate maintains a significant and consistent effect on inequality. As before, advanced education alone does not have a significant direct relationship with inequality in any of these models, suggesting that within-country changes in education levels may not directly affect inequality. However, the interaction effect included in Models 3 and 4 is highly significant and consistent/stable, providing robust evidence that as advanced education levels increase, the inequality-reducing effect of tariffs becomes stronger. Or, during the years of data in which tariffs largely decrease, inequality increases, and more so in places with higher human capital. This suggests a complementary relationship between human capital and trade protection in addressing inequality.

The most compelling takeaway is that tariffs appear more effective at reducing inequality in countries with higher levels of advanced education. This could indicate that countries need a certain threshold of human capital to effectively translate trade protection into more equitable outcomes. The interaction term may be suspected to capture an endogenous relationship between inequality and some other factor correlated with education level, such as institutional quality. However, country fixed effects control for such time-invariant country characteristics. With two-way fixed effects, the interaction effect reveals how changes in a country's education levels modify the relationship between its tariff policies and inequality outcomes, rather than capturing cross-country institutional differences.

5.3. Rurality

Table 5. Considering Country and Year Fixed Effects

Dependent Variable: Gini Index				
	1	2	3	4
Rural %	-0.0406***	-0.0401	0.367***	0.0841
	(0.0144)	(0.0413)	(0.0928)	(0.112)
Mean Tariff Rate (MTR)	-2.581***	-2.486***	-0.391	-0.640
	(0.279)	(0.941)	(0.463)	(0.439)
Low Income	1.055	0.602	-0.656	-1.223
	(0.993)	(1.723)	(1.188)	(1.050)
Rural % x MTR	0.106***	0.111***	0.0334	0.0345*
	(0.0136)	(0.0410)	(0.0211)	(0.0193)
Observations	1483	1483	1467	1467
Adjusted R^2	0.1520	0.1908	0.9235	0.9302
Year FE	No	Yes	No	Yes
Country FE	No	No	Yes	Yes

Standard errors in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

In Model 1, the OLS regression, rural percentage shows a significant negative relationship with inequality (-0.0406***), suggesting that countries with larger rural populations tend to experience lower inequality. This finding is consistent with the Kuznets curve hypothesis, in which nations' measures of inequality follow an inverse-U shaped pattern as they develop, with income inequality initially low in agrarian economies, as most workers are employed in similar sectoral work (Acemoglu & Robinson, 2002). Then, with initial development, inequality increases (with industrialization causing unequal wealth acquisition and wage disparities between types of work), peaking, and then decreasing with post-industrialization (as developed nations turn to focus on services, technology, and education) (Ansari, 2023). Thus, the rural percentage of a country, which is 79.11% correlated with a country's employment in agriculture (as percent of total employment), would indeed have a negative association with inequality as it represents countries in the initial stage of the Kuznets curve.

Mean tariff rate is once again strongly negatively associated with inequality (-2.581***). Low income status is not significantly related to inequality in this model. The interaction

between rural percentage and mean tariff rate is positive and significant (0.106***), meaning the inequality-reducing effect of tariffs diminishes as the rural population increases.

Controlling for global time trends with year fixed effects in Model 2, rural percentage becomes non-significant, suggesting this relationship may be confounded with time trends. Mean tariff rate remains significantly negative (-2.486***), and the interaction term remains significant (0.111***) with similar magnitude.

Controlling for time-invariant country characteristics with country fixed effects in Model 3, rural percentage flips sign and becomes significant and positive (0.367***), suggesting that within countries, increases in rural population are associated with higher inequality. Mean tariff rate and the interaction term both become non-significant.

With the two-way fixed effects of Model 4, both main effects (rural percentage and mean tariff rate) become non-significant. The interaction term regains marginal significance (0.0345*) but with much smaller magnitude.

Overall, the relationship between rural population and inequality is highly sensitive to model specification, suggesting that it is entangled with country-specific factors and global trends. The cross-sectional relationship (Models 1-2) is quite different from the relationship within countries (Models 3-4). The negative effect of tariffs on inequality appears robust in cross-sectional analyses but disappears when looking at within-country variation, which might suggest that this relationship is driven by unobserved country characteristics rather than causal effects, however, this conflicts with the robust findings in the previous sections. The interaction term indicates that tariffs' relationship with inequality varies by rurality; in less rural countries, tariffs may reduce inequality more effectively—this relationship weakens but persists even in the most rigorous specification. This suggests that the tariffs have different distributional effects in more rural versus more urban economies.

This finding aligns with rurality acting as a friction that impedes labor mobility. In less rural economies, where populations have greater geographic mobility and proximity to diverse economic activities, tariffs can more effectively reduce inequality by protecting vulnerable sectors without trapping workers in potentially declining industries.

As rurality increases, this protective effect diminishes, suggesting that geographic constraints and sectoral concentration (particularly in agriculture) limit how effectively workers can adapt to the economic changes induced by trade protection. This may occur through several

mechanisms: rural workers face higher costs of transitioning between sectors due to physical distance from alternative employment; agricultural sectors may be disproportionately affected by retaliatory tariffs; and the benefits of protection may accrue more to landowners than to agricultural laborers in highly rural settings.

The persistence of this effect even in the most demanding specifications underscores that the relationship between trade policy and inequality is fundamentally mediated by structural geographic factors that affect labor mobility and economic opportunity, supporting the central thesis that economic frictions explain heterogeneous outcomes of trade policies.

Table 6. Various Specifications of the Fixed Effects Model

Dependent Variable: Gini Index				
	1	2	3	4
Rural %	0.0821	0.0915	0.0765	0.0841
	(0.113)	(0.111)	(0.114)	(0.112)
Mean Tariff Rate (MTR)	-0.755	-0.810*	-0.574	-0.640
	(0.484)	(0.475)	(0.435)	(0.439)
Low Income		-1.676		-1.223
		(1.062)		(1.050)
Rural % x MTR			0.0404**	0.0345*
			(0.0178)	(0.0193)
Observations	1467	1467	1467	1467
Adjusted R^2	0.9290	0.9296	0.9299	0.9302
Year FE	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes

Standard errors in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Unlike the previous set of models where the rural percentage effect changed dramatically across specifications (from -0.0406*** in OLS to 0.367*** in country fixed effects), when experimenting with different specifications of the two-way fixed effects model, the rural coefficient is stable (consistently around 0.08-0.09), yet not significant. In the earlier models, tariffs had strong significant effects in the simpler specifications but lost significance with country fixed effects. Here, tariffs show weak or no direct significance across all specifications, suggesting their effect is genuinely weaker when controlling for both country and year effects. Both sets of models find a significant positive interaction between rural percentage and tariffs,

indicating that the inequality-reducing effect of tariffs diminishes in more rural countries. This finding appears robust across different specifications. It is also consistent with the hypothesis that low urbanization can act as a geographical friction to workers who seek to change industries due to the implementation of tariffs.

It is likely that the rural percentage of a country is highly correlated to the significance of agriculture production in a country, and it is highly (almost 80%) correlated with a country's employment in agriculture. If rural population percentage serves as a proxy for agricultural intensity in a country's economy and trade profile, then the positive interaction term indicates that as agricultural importance increases, tariffs become less effective at reducing inequality. This could reflect the following alternate mechanisms through which tariffs impact inequality: agricultural producers might be less able to capture the benefits of domestic protection compared to manufacturing firms, or the structure of global agricultural markets may limit producers' ability to translate tariff protection into higher wages or employment (Brooks, 1996). There may also be competing price and wage effects in agricultural economies, in that tariffs increase the income of certain sectors while simultaneously increasing the prices of imported goods, potentially hurting rural consumers more than helping rural producers in terms of inequality outcomes. Finally, depending on the agricultural industry structure of a country, the benefits secured through tariffs may go primarily to the landowners or corporations rather than agricultural workers, which might exacerbate within-rural inequality.

Thus, while the significant positive interaction term between rural percentage and tariff rate provides evidence for the geographic economic frictions affecting the distributional effects of tariffs, it may also be capturing a differential effect that arises from the agricultural importance of a country. While the specific mechanism through which the relationship exists is unclear, its existence is strongly evidenced.

5.4. Considering Tariffs and Labor Market Regulations Separately

Table 7

Dependent Variable: Gini Index				
	1	2	3	4
Mean Tariff Rate (MTR)	-0.908**	-1.208**		
	(0.436)	(0.464)		
Low Income	-1.576	-0.938	-0.822	-0.795
	(1.025)	(0.915)	(0.717)	(0.698)
Low Income x MTR		1.610***		
		(0.604)		
Labor Market Regulations (LMR)			0.762**	0.702**
			(0.308)	(0.340)
Low Income X LMR				0.360
				(0.535)
Observations	1467	1467	1560	1560
Adjusted R^2	0.9292	0.9302	0.9252	0.9252
Year FE	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes

Standard errors in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

The models in Table 7 separate the analysis of the effects of tariffs and labor market regulations on inequality, while still controlling for country and year fixed effects.

Model 1 isolates the effects of tariffs on inequality, estimating the coefficient of mean tariff rate to be -0.908** and statistically significant at the 5% level. This confirms that higher tariffs are associated with lower inequality when examined independently of labor market regulations. Low income countries have an insignificant coefficient of -1.576, which maintains the previously-observed pattern that low income countries tend to have lower inequality measures.

Model 2 includes an interaction between mean tariff rate and low income status. The main effect of tariffs strengthens (-1.208**), and the interaction term (1.610***) suggests that the inequality-reducing effect of tariffs is weaker in low-income countries. For non-low-income countries (the omitted reference group), the effect of tariffs on inequality is stronger than in Model 1, suggesting that in middle and high-income countries, higher tariffs are associated with

substantially lower inequality. The positive interaction term (1.610***) indicates that for low-income countries, the effect of tariffs on inequality is 0.402 (calculated as the tariff effect plus the interaction effect, -1.208 + 1.610), a positive result which suggests that in low-income countries, tariffs are associated with an increase in inequality. The direct effect of low income status remains non-significant in Model 2, indicating that the relationship between development level and inequality works primarily through its interaction with trade policy.

Model 3 isolates the effect of labor market regulations on inequality, estimating the coefficient to be 0.762*** and highly significant at the 1% level. This strongly confirms the finding that stricter labor market regulations are associated with higher inequality when examining within-country changes. The coefficient for low-income countries is -.822 and not statistically significant, suggesting that after controlling for labor market regulations, the inequality difference between low and non-low income countries becomes less pronounced.

Model 4 adds an interaction between labor market regulations and low income. The main effect of regulations remains positive and significant (0.702**), and the interaction term is positive but not statistically significant (0.360), suggesting the relationship between regulations and inequality may be somewhat stronger in low-income countries, though not definitively.

The effects of advanced education percentage and rural percentage have also been examined in this format, but no coefficients are significant.

The following conclusions can be drawn from these models: both tariffs and labor market regulations maintain their directional effects when examined separately (tariffs reduce inequality as shown by the consistently negative MTR coefficients across models, while regulations increase inequality as evidenced by the positive LMR coefficients). The mean tariff rate coefficient of -1.208** in Model 2 and labor market regulations coefficient of 0.762** in Model 3 both remain statistically significant at the 5% level even with fixed effects, indicating robust independent relationships.

When comparing the relative impacts of these variables, it is important to consider their different scales. While the labor market regulations coefficient (0.762) appears smaller in absolute terms than the mean tariff rate coefficient (-1.208), their economic significance is better understood by examining how inequality changes when moving from the 25th to the 75th percentile of each variable. Based on the interquartile ranges in the data, a move from the 25th to 75th percentile in labor market regulations (2.09) is associated with approximately a 1.59 point

(2.09 * 0.762) increase in inequality, while a similar move in mean tariff rates corresponds to approximately a -1.81 (1.5 *-1.208) point decrease in inequality. This percentile-based comparison suggests that both factors have economically significant impacts on inequality, with tariffs potentially having a somewhat stronger effect when considering typical variation in the sample.

The interaction term between low income and MTR (1.610) is highly significant in Model 2, suggesting that the inequality-reducing effect of tariffs is substantially weakened in low-income countries. Similarly, while not statistically significant, the positive coefficient for the low income and LMR interaction (0.360) in Model 4 suggests that the inequality-increasing effect of labor market regulations may be amplified in low-income countries. These interaction effects highlight the importance of considering a country's development level when implementing trade and labor policies.

Overall, these results help to distinguish the mechanisms through which tariffs and labor market regulations each influence inequality. The significant negative coefficient on tariffs supports theories that tariffs can reduce inequality by protecting domestic industries and reducing wage pressure from international competition, and that this effect outweighs the potentially inequality-increasing effects through regressive consumer effects, or losses of efficiency (Harden, 2023). The strong positive coefficient on labor market regulations supports the hypothesis that certain types of labor regulations might increase inequality by creating or reinforcing insider-outsider dynamics in labor markets, increasing the cost of formal employment and thus expanding informal sectors, essentially protecting already-advantaged workers more than vulnerable ones (Lindbeck & Snower, 2002).

While the results do not provide evidence that labor market regulations can explain heterogeneity in the effect of tariffs on inequality, the significant coefficients of interaction terms between advanced education and tariff rate as well as rural percentage and tariff rate provide robust evidence that these factors mediate how tariffs affect inequality in a country.

By accounting for fixed effects, as well as time/country specific omitted variables, the relationship between tariffs and inequality becomes negative, specific, consistent, and robust. While labor market regulations may not be a cause of heterogeneity, education and rural levels are likely to be, and overall, the results demonstrate a consistent effect of tariffs on inequality across a wide range of countries over time, which in and of itself helps reconcile conflicting

findings in the literature that may have been due to methodological differences or limited samples. In short, perhaps with the correct controls (for stable country characteristics that might influence both tariff policies and inequality and for time effects like global economic conditions affecting all countries simultaneously), heterogeneity in the *direct* effect of tariffs does not exist at all.

5.5. Effects on GDP per Capita

Thus far, this paper has only considered the tariffs through the outcome measure of inequality. However, looking at inequality alone does not actually consider if people are *better off*. For example, everyone in a country becoming poorer could still decrease inequality, if it lowers the gap between the richest and the poorest. To fully investigate the effects of tariffs and how they are affected by economic frictions, this section considers the relationship between tariffs and GDP per capita, conducting two-way fixed effects regressions separated by low and non-low income countries to distinguish the relationships by development level.

Table 8. GDP per Capita, Low Income Countries

Dependent Variable: GDP per Capita				
	1	2	3	4
Mean Tariff Rate (MTR)	26.81	26.89	37.72*	
	(20.37)	(20.42)	(20.23)	
Labor Market Regulations (LMR)		-12.29	-33.82	-4.684
		(29.87)	(21.80)	(16.03)
MTR x LMR			-33.85**	
			(13.07)	
Constant	820.2***	816.1***	826.7***	833.1***
	(11.85)	(18.18)	(16.67)	(5.735)
Observations	633	633	633	828
Adjusted R^2	0.9398	0.9399	0.9434	0.9318
Year FE	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes

Standard errors in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

The constant term (~820-833) represents the baseline GDP per capita value in low income countries, which is low as expected. The mean tariff rate coefficient is positive (37.72*) in Model 3, suggesting that higher tariffs are associated with slightly higher GDP per capita. The interaction term between tariffs and labor market regulations is negative and significant (-33.85**), indicating that the positive effect of tariffs diminishes as labor market regulations increase, or that stricter labor market regulations make tariffs less effective at increasing GDP per capita. This is consistent with the hypothesis that with stricter labor market regulations, workers may have more difficulty transitioning industries to take advantage of protected sectors.

Table 9. GDP per Capita, Excluding Low Income Countries

Dependent Variable: GDP per Capita				
	1	2	3	4
Mean Tariff Rate (MTR)	-467.7**	-454.8**	-475.1**	
	(227.5)	(225.6)	(229.7)	
Labor Market Regulations (LMR)		417.9	440.5	267.3
		(369.9)	(362.4)	(270.1)
MTR x LMR			-72.95	
			(162.3)	
Constant	17375.1***	17260.5***	17300.6***	16587.1***
	(96.03)	(131.2)	(171.4)	(61.00)
Observations	2668	2668	2668	2886
Adjusted R^2	0.9836	0.9837	0.9837	0.9833
Year FE	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes

Standard errors in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

The non-low income countries expectedly start from a much higher baseline GDP per capita, represented by the much higher constant term (~16,587-17,375). For non-low income countries, tariffs have a substantial negative association with GDP per capita (-467.7**, -454.8**, -475.1**); this effect is much larger in magnitude than the positive effect in low income countries. While not statistically significant, labor market regulations show a positive coefficient for non-low income countries, unlike the negative coefficient seen in low income countries. Unlike for low-income countries, the interaction term between tariffs and labor market regulations is not significant.

These results suggest that tariffs have fundamentally different effects on the average citizen depending on a country's development/income level, and imply the following: in low income countries, tariffs work better when labor markets are more flexible, and the costs of protectionism increase with development level (the negative effect of tariffs in non-low income countries is over ten times larger in magnitude than the positive effect in low income countries).

The stark contrast in tariff effects between low and high income countries likely stems from several differences between how tariffs are utilized. For low income countries, tariffs are often implemented to protect infant industries that are not yet globally competitive, but can be given enough time and experience (Melitz, 2005). Additionally, tariffs are often employed to broadly protect agricultural sectors that serve as the livelihoods for broad swaths of the population. In contrast, high income countries are highly integrated into global trade systems of production, and tariffs disrupt these networks, which create redundancies and resource inefficiencies. Further, protective tariffs are more often used to preserve globally uncompetitive industries, rather than infant industries that later can become competitive. In doing so, it preserves capital and labor misallocations. The third difference between tariff utilization in low and higher income countries is that higher income countries often face retaliatory tariffs that target high-value and politically-sensitive export sectors (Fajgelbaum et al 2019, Blanchard et al 2024).

While running the same regressions for advanced education percentage and rural percentage for high and low income countries do not yield significant interaction terms, the results are still interesting. For advanced education percentage in high income countries, the tariff rate has a strong negative effect on GDP per capita (coefficient ranging from -467.7 to -620.4**), advanced education percentage a positive effect (ranging from 42.54* to 53.09**), and the interaction term is positive but not significant (estimated at 4.859). For low income countries, mean tariff rate has a significant positive effect (ranging from 77.20*** to 83.37***), advanced education percentage has a slight positive but insignificant effect (ranging from 0.203 to 1.024), as does the interaction term (estimated at 2.507).

For rural percentage in high income countries, tariff rate maintains a strong negative effect on GDP per capita (ranging from -467.7 to -514.8**), rural percentage has a high positive association (ranging from 214.5 to 240***), and the interaction term is negative but insignificant (estimated at -8.757). For low income countries, none of the variables are significant, but tariff

rate is estimated to have a positive effect on GDP per capita, percent rural a negative effect, and the rural tariff interaction term a negative effect as well.

Thus, these results demonstrate that labor market regulations primarily affect *GDP per capita* in conjunction with tariffs, whereas education and rurality affect *inequality* in conjunction with tariffs. In almost all two-way fixed effect models, tariffs are negatively associated with GDP per capita in high income countries but positively associated in low income countries. This is likely a result of the different ends to which high and low income countries implement tariffs (such as low income countries protecting infant/nascent industries and high income countries protecting inefficient/globally uncompetitive industries).

6. Discussion

6.1. Findings in Context

The findings reveal several important relationships between policy variables and income inequality as measured by the Gini index (scaled in this analysis from 0-100), where 0 represents perfect equality. This section interprets these relationships in terms of their practical significance for national inequality levels.

Labor Market Regulations

The analysis indicates that labor market regulations have a statistically significant relationship with inequality levels (0.971**, Table 1, Model 4). This effect appears independent of tariff policies, as the interaction term was not significant. This suggests that for each one-unit increase in the labor market regulation index, a country's Gini index increases by approximately 0.971 points.

To contextualize this magnitude, consider that the difference in Gini indexes between relatively equal economies like Denmark (Gini ≈ 28) and moderately unequal economies like the United States (Gini ≈ 41) is about 13 points. A one-unit change in labor market regulations from the 0-10 scale represents approximately 7.5% of this difference.

Education

The most robust finding is the highly significant interaction between advanced education percentage and mean tariff rate (-0.0511***, Table 3, Model 4). This negative coefficient

indicates that higher levels of educational attainment substantially improve the ability of tariffs to reduce inequality.

In practical terms, this means that in a country where an additional 10% of the population has advanced education, a 1 percentage point increase in mean tariff rate would reduce the Gini index by approximately 0.511 points (10 × -0.0511) in addition to the baseline effect of the tariffs. For context, even modest changes in Gini indexes of 1-2 points are often considered meaningful in inequality research, as they represent substantial shifts in income distribution across large populations.

Rurality

The interaction term between rural population percentage and tariff rates (0.0345*, Table 5, Model 4) indicates that tariffs tend to have less of an inequality-mediating effect in countries with larger rural populations. For example, take two countries, one with a rural population 20 percentage points higher than the other, and both increase their tariffs by 5 percentage points. Aside from the base effect of the tariff, the country with a higher rural population would see a 3.45 point larger increase in Gini (5 × 20 × 0.0345) compared to the less rural country, given the same tariff change. This becomes quite substantial when considering that many developing countries have rural populations exceeding 50% and often implement double-digit tariff rates.

6.2. Limitations

Data Availability

There exist several potential limitations to this analysis. First, as previously discussed, there is a lack of data availability for low income countries, and thus the analysis was truncated to 2000 and onward to avoid the selection bias related to unbalanced panels. However, limiting the data to the twenty-first century means that the 1980-90 period of mass trade liberalization is not included in the analysis. While there is therefore less variation in tariff rate to explore, this actually is beneficial in terms of endogeneity concerns, since this period of mass reform coincided with many other policies such as austerity measures and currency devaluation, which would also affect inequality and thus impede the isolation of the tariff effect.

Time Lag

It makes intuitive sense that the effects of tariffs on inequality would not be immediate as my regressions assume, but instead materialize over the period of months or years. To address this, I ran various versions of long differences regressions, which use differences in values over a period of time as the independent and dependent variables (regressing the difference of Gini index on the difference of mean tariff rate, for example). Despite the theoretical foundations of this approach, three different versions (averaging the early value from 1995-2000, 1970-1995, and 1970-1980 and the late value from 2015-2020) yield no meaningful results aside from confirming the negative association of tariffs with a country's Gini index. This is also likely due to data availability limitations, as there is such little data in earlier years, and so to calculate an "early" value, I must average over a long period of years which introduces noise into the data. Additionally, since each country now only has two data points (early and late) as opposed to a data point for every year of existing data, the sample size of these regressions diminishes greatly—while the panel regressions use over 1000 observations, the long-difference approach reduced this to just 30-60. Therefore, this analysis is not robust and does not provide any interesting results.

Endogeneity

A final limitation of this analysis is endogeneity—countries do not create trade policy randomly, but as a response to domestic concerns. If, for example, a country has a failing industry which leads to inequality, and implements a tariff to protect that industry, the data may show an increase in tariff rate associated with an increase in inequality when the mechanism is instead reversse causal. Additionally, past literature has postulated that skilled-unskilled wage inequality or relative factor endowments may inform trade policy, with "more egalitarian" labor-abundant countries choosing to increase trade openness faster than "less equal" land/natural resource-abundant nations (Tavares, 1998; Mamoon & Murshed, 2007). It is therefore difficult to isolate causation from correlation, and this potential endogeneity may lead to biased and inconsistent coefficient estimates.

Using two-way fixed effects addresses some, but not all, concerns about the endogeneity of trade policy. Country fixed effects control for time-invariant country characteristics that might influence both tariff policies and inequality outcomes, eliminating bias from stable country

factors like geographic location, historical institutions, or cultural attitudes toward redistribution. Year fixed effects control for global shocks and trends that affect all countries simultaneously, addressing concerns about global recessions or trade agreement waves. Thus, unobserved heterogeneity, either country or time-invariant, are controlled for. However, time-varying country-specific factors, such as countries changing policies in response to economic conditions that also affect inequality, are not addressed through two-way fixed effects. Thus, the results could possibly pick up reverse causality if governments adjust tariff policies in response to changing inequality, creating a bidirectional relationship.

6.3. Policy Implications

Ultimately, the results demonstrate that the inequality and welfare effects of tariffs and trade openness will differ depending on a country's development level, labor market institutions, education level, and rurality. Most broadly, these results reject the practicality of a one size fits all approach to trade policy.

Trade *openness* is associated with increasing inequality in both high and low income countries, but has differential effects on GDP per capita across development levels, harming low-income countries while benefiting high-income countries. This is likely attributable to the different ways in which countries utilize tariffs—with low income countries usually using them to protect infant industries and high income countries to protect inefficient industries. The magnitude difference of the effect of tariffs reflects how economic complexity and integration amplify the costs of trade barriers as countries develop. This helps explain why the development trajectory of many countries has historically involved higher tariffs in early stages followed by progressive liberalization as they industrialize and integrate into global markets. It is notable that in high income countries, tariffs help reduce inequality, but at the expense of making the average person poorer.

In low income countries, the negative effect of trade openness (or the positive effect of tariffs) on GDP per capita diminishes with stricter labor market regulations, implying that flexible labor markets improve the effectiveness of tariffs, consistent with the theory that workers can better adjust into different sectors according to which are protected. While labor market regulations alone would not transform a highly equal economy into a highly unequal one, substantial regulatory changes could meaningfully shift inequality over time.

Advanced education was found to be a significant mediator of the effect of trade openness in increasing inequality; the inequality-increasing effect of trade openness is stronger in countries with lower levels of advanced education. This is consistent with the hypothesis that education better enables workers to shift sectors and benefit from trade openness, or that lack of education acts as an economic friction that can force workers to stay in noncompetitive or exposed industries. This finding suggests that investing in equitable access to advanced education is an effective tool for countries concerned about the distributional consequences of their trade policies.

Rurality was also found to significantly affect how trade openness impacts inequality, with trade openness increasing inequality more in more rural countries. Rurality essentially acts as a geographic and sectoral (agriculture) friction, which limits how workers can take advantage of trade opportunities or transition out of harmed industries. Additionally, the implementation of trade openness may expose export-heavy agricultural sectors to increased competition. Thus, countries with large rural populations should be particularly cautious about implementing liberal trade policies without complementary measures to address potential distributional concerns, whether that is investing in rural-urban infrastructure, job transition programs, or even agricultural subsidies. Without such measures, trade openness may inadvertently contribute to widening the rural-urban divide and increasing overall inequality.

7. Conclusion

By exploring over 20 years of data on inequality, tariff rates, labor market regulations, education levels, and rurality for 162 countries, this paper sought to determine why previous literature failed to reach a consensus on the effects of tariffs on inequality. I hypothesized that although most trade models assume perfect factor adjustment, certain country-specific factors act as economic frictions that impact how workers can transition to industries protected by tariffs or away from industries that are hurt by them (through increasing input costs, inspiring retaliatory tariffs, or disrupting global supply chains), and thus interact with tariffs to increase inequality. The findings generally provided robust support for this effect—even with two-way fixed effects, tariffs tend to reduce inequality, and are more effective at doing so in countries with higher advanced education levels, and less effective in more rural countries. While labor market regulations were not found to significantly interact with tariffs to affect inequality, they do

significantly interact with tariffs to affect GDP per capita; stricter labor markets reduce the ability of tariffs to improve GDP per capita, specifically in low income countries. Additionally, while tariffs are associated with an increase in GDP per capita in low income countries, they very dramatically reduce GDP per capita in middle and high income countries, which can be attributed to their distortionary role in more integrated economies. Without controlling for all of these factors, it is expected that previous literature, specifically individual country case studies, would reach different conclusions on the effects of tariffs.

These findings underscore the importance of contextual factors in trade policy outcomes and caution against universal prescriptions for tariff implementation. Future research would benefit from examining the temporal dynamics of these relationships through longer-term panel studies and exploring the specific mechanisms through which education and rural levels mediate the relationship between trade protection and inequality. Ultimately, this study suggests that effective trade policy must be tailored to a country's specific developmental stage, institutional capacity, and socioeconomic structure to achieve equitable outcomes.

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