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AN EMPIRICAL INVESTIGATION INTO THE DETERMINANTS OF TRADE POLICY BIAS

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ABSTRACT

There exists an extensive literature that attempts to identify important factors that determine trade policies. An understanding of these important factors could be useful when negotiating trade agreements, especially in agriculture, which is a relatively heavily supported industry. Limao and Panagariya (L&P, 2007) modify Grossman and Helpman's (G&H, 1994) lobbying model in an attempt to understand why anti-trade bias (as opposed to pro-trade bias, which is predicted by the G&H (1994) model) is the predominant pattern in observed trade policy. L&P (2007) propose that governments seek to reduce inequality between sectors by modifying trade policies in a way that reallocates gross revenue from the larger to the smaller sector. We use measures of trade bias calculated in the World Bank Distortions to Agricultural Incentives database (Anderson and Valenzuela, 2008) in an effort to explain trade bias in agriculture. We find little empirical evidence that governments pursue agricultural trade policies to reduce inequality between net-importing and net-exporting sectors in agriculture. Lagged trade policies are significant determinants of current trade-distorting policy, suggesting the presence of policy persistence. We conclude that it is difficult to generalise determinants of trade-distorting policy across a wide and long panel of countries, and that specific knowledge of governments' priorities are required to explain trade bias.

1. Introduction

The identification of factors that determine a country's choice of domestic support mechanisms is a persistent thread in international trade literature. This issue is particularly of interest in the agricultural industry, which receives relatively high levels of support. The Organisation for Economic Co-operation and Development's (OECD) aggregate Producer Nominal Protection Coefficient, a ratio of the average price that a producer receives to the border price (OECD, 2010b), was 1.13 in 2009 (OECD, 2010a). This suggests that the prices paid to agricultural producers in OECD countries are 13 percent higher than border prices, on average.

A better understanding of the determinants of agricultural trade-distorting policies could be informative in the development of international trade negotiations. Specifically, it may be helpful to gain a better understanding of potential trading partners' motivations for trade-restricting policies. A better understanding of the issue may improve the ability of negotiators to focus on product-specific restrictions that countries have weaker preferences for protecting. Such information may also provide insight into the identification of potential partners for bilateral trade agreements. For example, a country that seeks to expand its export market for specific products may be able to identify potential partners based on perceived preferences for protecting those goods.

As Rodrik (1995) points out, one of the most enduring puzzles in trade policy analysis is why anti-trade policies are used by governments more than policies that are biased in favour of trade. L&P (2007) present an interesting theoretical explanation of anti-trade (trade-restricting) bias in a framework similar to G&H (1994). L&P (2007) show that anti-trade bias emerges if the government seeks to reduce income inequality between production factors. This theoretical result suggests that reducing inequality is a potential determinant of trade-distorting policy. This project conducts an empirical assessment of inequality between net-imported agricultural goods and net-exported agricultural goods as a possible solution to the puzzle of anti-trade bias.

Our empirical model is estimated using panel data for 63 countries over a time series that dates as far back as the 1950s. Our dependent variable is the Trade Bias Index (TBI) from the World Bank's Distortions to Agricultural Incentives database (Anderson and Valenzuela, 2008). We also control for a number of factors including market power, welfare effects, preferential trade agreements (PTAs), and development level. Our use of panel data allows us to control for unobserved country-specific political, cultural, and institutional factors that may influence trade bias.

Another advantage of including data along a time series is the ability to estimate our empirical model dynamically. We recognize that policy persistence is likely to be an important determinant of trade bias. We control for this by introducing a lagged dependent variable into our empirical model with country fixed effects.

Our results provide little empirical support for the suggestion that gross revenue inequality between groups of net-imported and net-exported goods is a generally important determinant in governments' choice of agricultural trade-distorting policy across countries. Our results suggest that developed countries with a larger net-exporting sector exhibit preferences to support larger sectors. We find evidence that trade-distorting policy is persistent and that countries do not change their agricultural trade-distorting policy quickly.

The remainder of paper is organized as follows. The next section describes and motivates our empirical model, including descriptions of variables and expected results. Section three reports the results of the empirical estimation, including a discussion of our findings. The final section concludes the paper.

2. Empirical Models

2.1. Empirical Approach

We use a reduced form econometric model motivated by L&P (2007), who model their government objective function as follows:

$$G(U) \equiv \alpha\big(-I(U)\big) + (1-\alpha)W(U) \tag{1}$$

where $G(U)$ is the government's utility function, $I(U)$ denotes income inequality between economic sectors (factors, in the context of L&P (2007)), $W(U)$ is total welfare in the economy, and α is the relative weight that a government places on reducing inequality relative to increasing overall welfare.

We adapt the implications of L&P's (2007) theory into an econometric model. The starting point is the dependent variable. Since inequality between factors of production reduces government utility in L&P's (2007) model, then the government maximizes utility by putting into place policies that reduce inequality. If a reduction in inequality requires that gross revenue be transferred from net-exported goods to net-imported goods, then an import-protecting policy will be used; if the opposite transfer is required, then an export-promoting policy will be used. Now consider that the introduction of new policies shifts the policy set in either an anti-trade (more import-protecting policies) or pro-trade (more export-promoting policies) direction in response to a change in the level of inequality[1]. Thus, we require a dependent variable that measures the relative support to net-imported and net-exported[2] goods. We utilize a ratio of the rate of support for net-exported goods to the rate of support for net-imported goods for this purpose.

[1] The government could achieve the same net effect by reducing support to the sector that they wish to transfer income away from.

[2] The World Bank database (Anderson and Valenzuela, 2008) defines products as either net-imported or net-exported according to net trade status.

Reducing inequality through trade policy, in the tradition of L&P (2007), motivates our empirical investigation and our independent variable of interest is a measure of inequality. L&P (2007) consider inequality between factors of production, while we measure inequality between net-imported and net-exported sectors. Though we are not directly testing the theoretical model of L&P (2007), our empirical model can be analogous to their framework under most conditions.[3] Consider an economy with two factors of production in which import-competing products are intensive in one factor and net-exported goods in the other factor, on average. Each factor will receive a higher share of the gross revenue earned by that group of goods (either imports or exports) that is intensive in that factor. Thus, if there is gross revenue inequality between imports and exports, then the factor from the larger gross revenue share group will have higher income than the other factor. Hence, if there is gross revenue inequality between the groups of goods, then there is income inequality between the factors of production. A government may attempt to reduce inequality between factors by protecting the group of goods with the smaller share of gross revenue, which would transfer gross revenue to the factor with the smaller income share. We assess a modified version of L&P's (2007) concept of inequality in our model by measuring gross revenue inequality between import-competing products and export-competing products.

Our baseline estimating equation is

$$TBI_{it} = \alpha_0 + \alpha_1 LagIneq_{it} \cdot MSmall_{it} \cdot Developed_{it} + \alpha_2 LagIneq_{it} \cdot XSmall_{it} \cdot Developed_{it} + \alpha_3 LagIneq_{it} \cdot MSmall_{it} \cdot Developing_{it} + \alpha_4 LagIneq_{it} \cdot XSmallit \cdot Developingit + \alpha 5LagWRIit + \alpha 6WTOit + \alpha 7LagMShareit + \alpha 8LagXShareit + \alpha 9Urbanizationit + \alpha 10Yearit + \alpha NPTAit + \varepsilon it \quad (2)$$

The data are available in panel form for a wide range of countries over a long time period, with i denoting country and t denoting year in equation (2). TBI_{it} denotes the trade bias of a country's agricultural policy, which is the ratio of support for net-exported goods relative to support for net-imported goods. $Ineq_{it}$ denotes the level of inequality in gross revenue between the net-exporting sector and the net-importing sector. $MSmall_{it}$ and $XSmall_{it}$ are binary variables taking the value of one if net-imported goods or net-exported

[3] Two scenarios cannot occur for this connection to hold. The first is when both sectors are intensive in the same factor overall and the smaller sector is relatively more intensive in the more abundant factor. If the government were to redistribute income from the larger sector to the smaller sector, then the more abundant factor would receive an even greater proportion of the redistributed income, exacerbating factor inequality. The second situation can arise if the difference in gross revenue accruing to the sectors is small enough, and the difference in factor intensities between the sectors is large enough, so that the factor in which the smaller sector is intensive earns more income. A policy that redistributes income towards the smaller sector exacerbates factor inequality in this case.

goods have the smaller relative gross revenue share, respectively. $Developed_{it}$ and $Developing_{it}$ are binary variables indicating whether a country is developed or developing, respectively. WRI_{it} denotes Welfare Reduction Index, a measure of the welfare cost of policy. WTO_{it} is a binary variable recording whether a country was a member of the General Agreement on Tariffs and Trade (GATT) or the World Trade Organization (WTO) in a given year.[4] $MShare_{it}$ and $XShare_{it}$ measure the country's share of world imports of its net-imported goods and world exports of its net-exported goods, respectively. $Urbanization_{it}$ is a measure of a country's share of urban population and $Year_{it}$ is a time trend. PTA_{it} is a vector of binary variables referring to one of five regional preferential trade agreements and α_N is a corresponding vector of parameters. We include the North American Free Trade Agreement (NAFTA), the Common Agricultural Policy (CAP) of the European Union (EU), the Andean Community, the *Mercado Común del Sur* (MERCOSUR), and the Association of Southeast Asian Nations (ASEAN). Each variable is described in more detail below.

The variables that are preceded by the Lag operator are calculated as the average of the first five lags of that variable[5]. We use lagged data for these variables as a control for possible endogeneity and as consideration of the fact that governments do not have information for the current year when making their policy choice. These variables, collectively L below, are computed using the following formula:

$$L_{it} = \sum_{j=1}^{5} \frac{L_{i,t-j}}{5} \tag{3}$$

We also recognize that policy persistence may be an important determinant in the choice of trade-distorting policy (Fernandez and Rodrik, 1991; Coate and Morris, 1999; Alesina and Drazen, 1991). Therefore we also estimate a dynamic version of our empirical model by including a one-period lag of TBI as an independent variable. Nickell (1981) and Roodman (2006) note that entering a lagged dependent variable into a standard fixed effects model can introduce endogeneity, or dynamic panel bias. Nickell (1981) and Roodman (2006) also argue, however, that this bias decreases as the time series lengthens. Judson and Owen (1999) test this empirically, and recommend that the least squares dummy variable (*i.e.* fixed effects) procedure be used for dynamic estimation with unbalanced panels with time series longer than 30. We have an unbalanced panel with an average time series of 32 observations per country, so we utilize fixed effects estimation for our dynamic model.

Our dynamic model is similar to equation (2), with the lagged dependent variable, $TBI_{i(t-1)}$, on the right hand side.

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[4] We also estimate the model with dummies for different rounds of WTO negotiations. See note 8.

[5] In cases where data do not exist for all of the previous five years, this average of lags is calculated for four years, in which case 5 is replaced by 4 in equation (3). This is the lowest number of observations that is used, however. Any cases where less than four of the previous five years are available is excluded from the empirical model.

$$TBI_{it} = \alpha_0 + \alpha_1 LagIneq_{it} \cdot MSmall_{it} \cdot Developed_{it} + \alpha_2 LagIneq_{it} \cdot XSmall_{it} \cdot Developed_{it} + \alpha_3 LagIneq_{it} \cdot MSmall_{it} \cdot Developing_{it} + \alpha_4 LagIneq_{it} \cdot XSmall_{it} \cdot Developing_{it} + \alpha_5 LagWRI_{it} + \alpha_6 WTO_{it} + \alpha_7 LagMShare_{it} + \alpha_8 LagXShare_{it} + \alpha_9 Urbanization_{it} + \alpha_{10} Year_{it} + \alpha_{11} TBI_{it-1} + \alpha NPTA_{it} + \varepsilon_{it} \quad (4)$$

We hypothesize that the coefficient on the lagged dependent variable is positive, as contemporaneous levels of TBI should be positively correlated with previous levels if policy persistence exists.

2.2. Variable Definitions and Data Description

We measure trade bias using the TBI from the Distortions to Agricultural Incentives database (Anderson and Valenzuela, 2008). This variable measures the amount of assistance to net exporting goods relative to net import-competing goods (as defined by the good's trade status in the World Bank database (Anderson and Valenzuela, 2008)), and is specific to agricultural products[6]. The index is calculated as:

$$TB = \left[\left({(1 + NRA\_X)} \middle/ {(1 + NRA\_M)} \right) - 1\right] \quad (5)$$

where NRA_X and NRA_M are the rates of assistance to export and import goods, respectively, effectively calculated as the distorted domestic price divided by the undistorted domestic price (Anderson *et al.*, 2008). These measures are weighted average aggregations of individual Nominal Rates of Assistance (NRA) for each product that falls under each trade status category (net-exported goods or net-imported goods). The individual product NRAs measure support to each product through border price controls, direct producer support, and support provided through production inputs. These measures capture import taxes (tariffs and quotas), export subsidies, direct production subsidies, and any distortions in the domestic market for inputs used in the production of a commodity (Anderson *et al.*, 2008). Therefore, a situation where net-exported goods are more heavily subsidized than import-competing products generates a larger number, and *vice versa*. Subtracting one from the ratio means that more support to net-

[6] Products can, and do, change trade status from one year to the next in the database. Furthermore, products are occasionally classified as non-tradable, and are left out of the trade bias measure in those years. We do not include information from non-tradable goods in our control measures that are based on sector-specific information. A more extensive description of the products covered in the database is given in Appendix A.

exported goods is a positive (pro-) trade bias, and more support to net-imported goods is a negative (anti-) trade bias.

The TBI is available in the World Bank database (Anderson and Valenzuela, 2008) for 63 countries, including both developed and developing nations. The panel is unbalanced, and the TBI is calculated from 1955 to 2007. Once the aforementioned lagging procedure is applied, the first three years of each time series is excluded, and the resulting average time series length is 32.

The explanatory variable of interest is inequality, which is calculated as:

$$INEQ_{it} = {(X_{it} - M_{it})}/{Val_{it}} \tag{6}$$

X_{it} is the total production value of net-exported goods and M_{it} is an equivalent measure for net-imported goods. Val_{it} is the total value of production of all measured agricultural goods for the same country in that year. Production values are obtained from the World Bank database (Anderson and Valenzuela, 2008).

This measure allows for a simple comparison of production values, and thus gross revenue levels, between the two sectors. The difference between production values is normalized by total production value to control for the inherent variability of agricultural production, as well as inflation in production values over time. As a result of normalizing the measure in this way, inequality ranges from negative one to one.

We extend the empirical model to consider the possibility that the effect of a change in inequality on trade-distorting policy will be different when the net-imported sector is smaller than the net-exported sector, and *vice versa*. We interact inequality with two binary variables, each taking a value of one under one of the aforementioned situations. Furthermore, we identify that there may be differing effects of inequality between developed and developing countries. Thus, we also interact inequality with two binary variables, one denoting developed countries, and one denoting developing countries. The information for these variables is obtained from the International Monetary Fund's (IMF) definition of developed and developing countries in the World Economic Outlook (WEO) (IMF, 2008)[7].

The coefficients on the four inequality variables can reveal the role that the level of inequality between sectors plays in determining the level of trade restrictiveness. The coefficients can be interpreted as the responsiveness of trade-distorting policy to changes in inequality between import-competing and exporting sectors. We hypothesize that these coefficients will be negative, based on L&P's (2007) theory that TBI should move in the opposite

[7] Countries denoted advanced economies in the WEO are considered developed, and countries denoted emerging and developing economies in the WEO are considered developing.

direction of inequality. For example, if inequality becomes more positive (net-imported goods become relatively smaller), then the government would implement more import-protecting policies, which would reduce the value of the TBI. The opposite is true if inequality becomes more negative (net-exported goods become relatively smaller).

Our empirical model makes use of another variable in the Distortions to Agricultural Incentives database (Anderson and Croser, 2009) to measure the effect of trade-distorting policy on welfare. The WRI captures the loss of welfare as a result of the trade-distorting policy for each product, as measured by a loss function that is based on the squared distortions that policy introduces to producer and consumer prices (Lloyd *et al.*, 2009). These commodity specific indices are aggregated into country-level values, which are used in the empirical model.

Lloyd *et al.* (2009) describe the WRI as representing the uniform import tariff or export subsidy rate that would need to be applied to all goods in order to generate the same welfare loss as the current set of trade policies. The resulting measure is a percentage, and is interpreted in the same way as a tariff rate.

The expected sign on the WRI is ambiguous. L&P's (2007) theory suggests that if a country has high lagged WRI levels, then the government will adjust trade policies so that the WRI falls and the value of its objective function increases. Such an adjustment could take the form of decreased support to either import-competing or export-competing products. We are not able to predict the sector to which the government will reduce to support to in this case, and thus cannot make a hypothesis about the coefficient's sign.

We include binary variables for PTAs because a country that has signed these agreements may have a restricted set of trade-distorting policy choices from which to choose. We include variables for membership in WTO or GATT, as well as five regional agreements; NAFTA, the CAP of the EU, MERCOSUR, the Andean Community, and ASEAN. Once again, we are unable to form a hypothesis about the sign of the coefficient for these variables, as these agreements may lead to reductions in support to both sectors. These variables are included to avoid omitting a possibly important factor in policy determination.

The market share variables measure a country's market power with respect to total world trade of the agricultural products that they trade. The inclusion of these variables is motivated by standard trade theory, which suggests that a country with the ability to alter the world price of a good (*i.e.* a "large country") can pass off some of the welfare loss associated with a distortionary policy onto its trading partners. Broda *et al.* (2008) and Bagwell and Staiger (2011) find evidence that market power is a factor in the determination of non-cooperatively set trade policy, thereby providing empirical support for this variable's inclusion in our model.

We aggregate the values of imports of a country's net-imported goods, and exports of country's net-exported goods, individually by country, and by year. These values are aggregated across all reported countries for each country's net-imported goods and net-exported goods, and then divided by the world trade values to generate shares. The resulting variable represents a country's average market power across all goods in each sector.

Countries with larger world market shares for imported goods may be more inclined to support those goods, while countries with greater market share for exported goods may be more inclined to support those goods. This suggests that the coefficient on the import market share variable should be negative, and positive on the export market share variable.

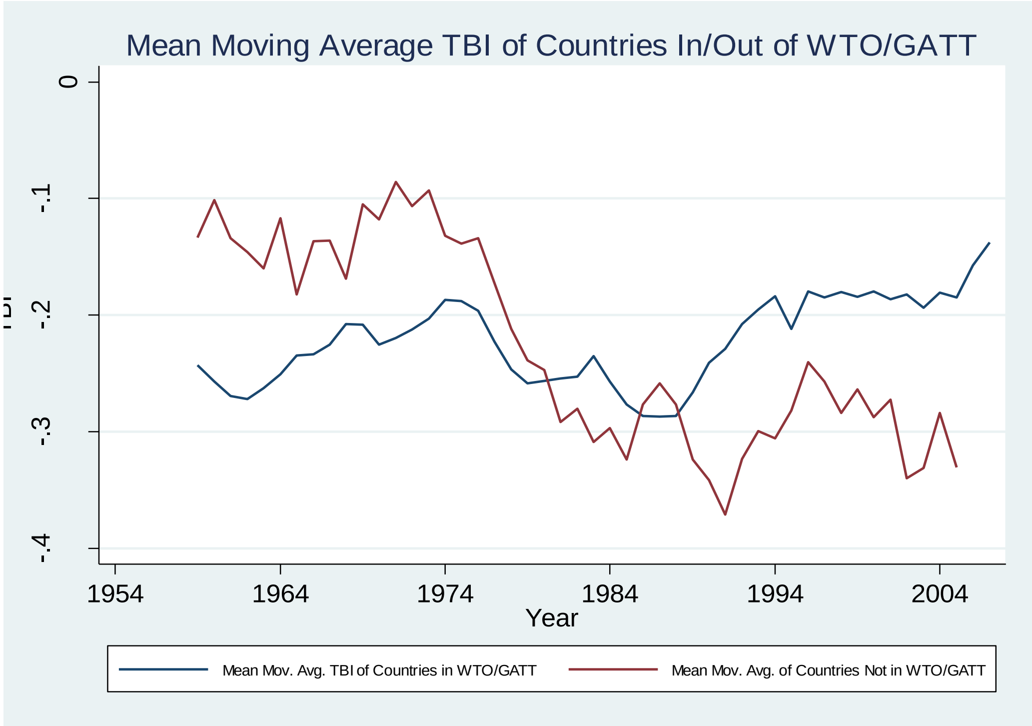
The rationale for including a development proxy, separate from the binary variables that divide the inequality effects, is to ensure that we capture the differing effects of inequality between the two sets (developing and developed) of countries. Without a further control for development, the results for the inequality variables may reflect the effect of low (high) development on policy choice, as opposed to the effect of inequality on policy choice in developing (developed) countries. This measure also allows us to differentiate between countries at different stages of development within sets. We use urbanization as this proxy based on previous literature (Carlino and Voith, 1992; Ades and Glaeser, 1999; Coulombe (2000)). Data are from the 2009 Revision of World Urbanization Prospects, compiled by the Population Division of the Department of Economic and Social Affairs of the United Nations (United Nations, 2010).

Evidence from Riezman and Slemrod (1987) and Kenny and Winer (2006) suggests that countries that have larger rural populations are more likely to use trade taxes (*i.e.* import tariffs and export taxes), which are anti-trade policies. This suggests that the coefficient on urbanization should be positive, as more urban countries may use more pro-trade policies.

The time trend is included to account for possible trends in trade policies across countries. Figure 1 compares the mean moving average TBI for countries that are in the WTO or GATT to that of countries that are not part of those agreements. The TBI trend for countries that are part of the WTO or GATT, which make up nearly 85 percent of our sample, has been moving up for the past 25 years. This trend supports the prediction of a positive coefficient on the year variable.

We also formulate our empirical model to incorporate G&H's (1994) lobbying hypothesis. The inclusion of a variable to control for the lobbying hypothesis is supported by empirical studies by Gawande and Bandyopadhyay (2000), Goldberg and Maggi (1999), Mitra *et al.* (2006), and Gawande and Hoekman (2006). Unfortunately, lobbying data are not widely available for most of the countries in our dataset, so we generate a proxy for lobbying effort. Gawande (1998) finds that spending by lobbying industries is highly correlated to the concentration of firms in an industry, and we therefore consider sectoral concentration as a proxy for lobbying capabilities. We are sceptical about whether a more concentrated sector (instead of industry) can be more effective in their lobbying efforts, as the goods within a sector may have different policy preferences, and may be disadvantaged by support to other goods in the same sector. Because of this uncertainty we include the Herfindahl indices only as a robustness check to our baseline model.

Figure 1: Comparison of TBI Between Countries Part of and Not Part of the WTO or GATT



Herfindahl indices measure the concentration of goods in the import-competing and exporting sectors, and are calculated using the following formula:

$$Herf = \sum_{i=1}^{N} s_i^2 \quad (7)$$

In this formula s denotes the share of good i of the total production value of all N goods in either the net-imported or net-exported sector, calculated from the production values reported in Anderson and Valenzuela (2008). Because the shares are squared, the index falls as the sector becomes less concentrated and has a range of zero to one. We hypothesize that more concentrated sectors are able to obtain greater support for their sectors through lobbying. This means that higher concentration in the net-imported sector results in more support to the net-imported sector, and thus we hypothesize a negative coefficient on the Herfindahl index for the net-imported sector. The opposite is true for the net-exported sector.

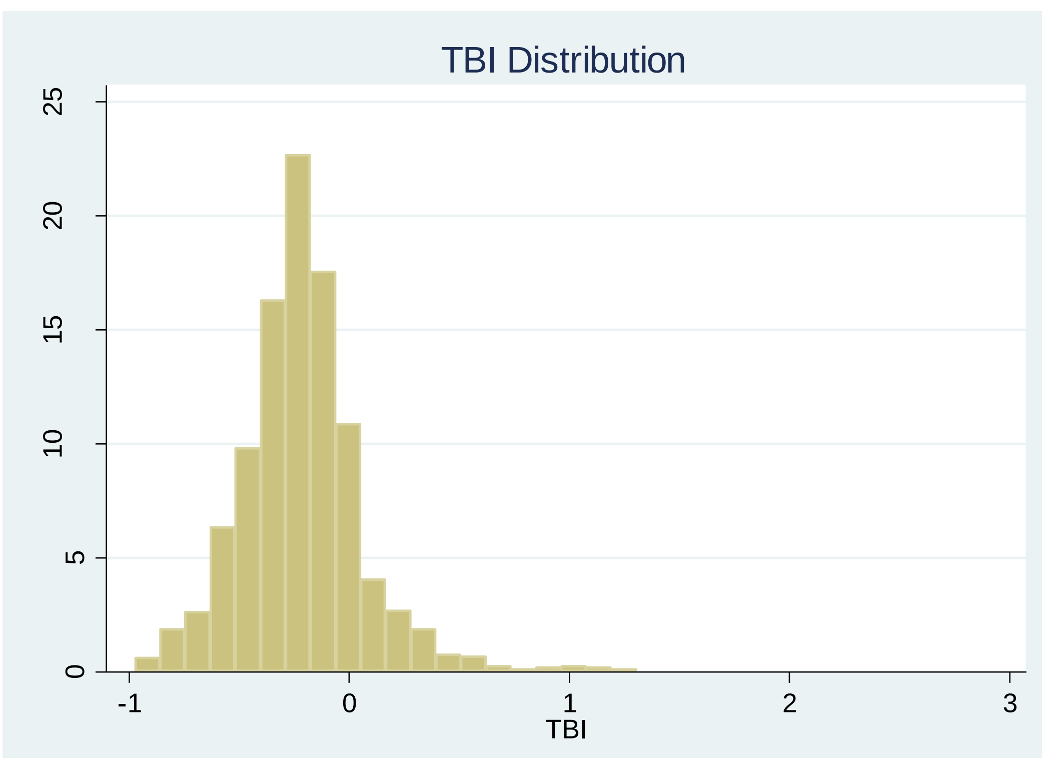
Table 1 reports summary statistics for our data. The mean values for both the TBI and inequality are consistent with our expectations, as the average TBI is anti-trade (negative) and the net-exported sector has a larger production value than the import-competing sector. Figure 2 shows the distribution of the trade bias variable.

Table 1: Summary Statistics of the Entire Dataset

Variable	Observations	Mean	Standard Deviation	Minimum	Maximum
Trade Bias Index	2383	-0.213	0.286	-0.971	2.788
Inequality	2383	0.080	0.505	-1.000	1.000
Net-Imported Sector Smaller	2383	0.558	0.497	0.000	1.000
Net-Exported Sector Smaller	2383	0.441	0.497	0.000	1.000
Developed Country	2383	0.379	0.485	0.000	1.000
Developing Country	2383	0.621	0.485	0.000	1.000
Welfare Reduction Index	2383	55.991	48.188	0.064	435.629
Share of Total World Imports of Net-Imported Goods	2383	0.035	0.061	0.000	0.962
Share of Total World Exports of Net-Exported Goods	2383	0.093	0.140	0.000	1.000
WTO/GATT	2383	0.847	0.360	0.000	1.000
Urbanization	2383	51.469	23.079	4.620	88.550

NAFTA	2383	0.018	0.132	0.000	1.000
CAP	2383	0.170	0.375	0.000	1.000
MERCOSUR	2383	0.005	0.071	0.000	1.000
Andean Community	2383	0.030	0.171	0.000	1.000
ASEAN	2383	0.066	0.249	0.000	1.000
Herfindahl Index for the Import-Competing Sector	2383	0.442	0.279	0.000	1.000
Herfindahl Index for the Exporting Sector	2383	0.480	0.273	0.000	1.000

Figure 2: Distribution of Trade Bias



3. Results

Table 2 presents the results of our estimated model. The specifications reported are:

I) the base model, as represented in equation (2);

II) the base model with a lagged dependent variable included, as in equation (4);

III) the base model in equation (2) with Herfindahl indices included; and

IV) the dynamic model in equation (4) with Herfindahl indices included[8].

Table 2: Results for country-fixed effects estimation of models I through IV

	(I) Base Model	(II) Dynamic Model	(III) Base with Herfindahls	(IV) Dynamic with Herfindahls
Variables	**Coefficient (Std. Error)**	**Coefficient (Std. Error)**	**Coefficient (Std. Error)**	**Coefficient (Std. Error)**
Inequality, Net-Imported Sector Smaller, Developed	0.653*** (0.200)	0.237** (0.107)	0.639*** (0.206)	0.243** (0.110)
Inequality, Net-Exported Sector Smaller, Developed	-0.020 (0.115)	-0.000 (0.070)	-0.066 (0.162)	0.006 (0.088)
Inequality, Net-Imported Sector Smaller, Developing	-0.146 (0.197)	-0.045 (0.125)	-0.164 (0.203)	-0.041 (0.129)
Inequality, Net-Exported Sector Smaller, Developing	-0.181 (0.144)	-0.019 (0.068)	-0.181 (0.152)	-0.020 (0.068)
Welfare Reduction Index	-0.001 (0.001)	-0.000 (0.000)	-0.001 (0.001)	-0.000 (0.000)
Share of Total World Imports of Net-Imported Goods	0.122 (0.286)	0.093 (0.129)	0.121 (0.287)	0.096 (0.125)

[8] We also estimate our model with a binary variable indicating membership in the WTO from the implementation of the Uruguay Round Agreement on Agriculture in 1995. Our results are quantitatively and qualitatively robust to this alternative specification.

Share of Total World Exports of Net-Exported Goods	-0.028	0.020	-0.026	0.019
	(0.208)	(0.102)	(0.216)	(0.104)
WTO/GATT	-0.084	-0.042	-0.084	-0.042
	(0.066)	(0.030)	(0.065)	(0.030)
NAFTA	-0.070	-0.028	-0.066	-0.028
	(0.094)	(0.045)	(0.094)	(0.045)
CAP	-0.085	-0.053	-0.087	-0.052
	(0.059)	(0.032)	(0.060)	(0.032)
MERCOSUR	0.135***	0.051**	0.135***	0.050**
	(0.044)	(0.021)	(0.044)	(0.021)
Andean Community	0.070	0.009	0.060	0.010
	(0.049)	(0.022)	(0.052)	(0.024)
ASEAN	-0.065	-0.054	-0.072	-0.052
	(0.077)	(0.056)	(0.074)	(0.057)
Urbanization	0.001	0.001	0.002	0.001
	(0.004)	(0.002)	(0.004)	(0.002)
Year	0.001	0.001	0.000	0.001
	(0.002)	(0.001)	(0.002)	(0.001)
Lagged TBI	-	0.557***	-	0.557***
		(0.040)		(0.040)
Herfindahl Index for Import-Competing Sector	-	-	0.017	-0.013
			(0.120)	(0.067)
Herfindahl Index for Exporting Sector	-	-	-0.055	0.007
			(0.116)	(0.050)
Constant	-0.197	-0.120	-0.180	-0.115
	(0.168)	(0.087)	(0.213)	(0.109)
Observations	2001	1997	2001	1997
Overall R^2	0.055	0.518	0.060	0.517
Within R^2	0.071	0.330	0.072	0.330
Between R^2	0.037	0.800	0.044	0.795

Note: *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

A diagnostic Wald test suggests the presence of groupwise heteroskedasticity in the data. The standard errors reported in Table 2 are modified using the clustered heteroskedasticity robust standard error correction defined by Froot (1989) and Williams (2000).

It is worth noting the difference in the number of observations between the static and dynamic specifications. The cause of this difference is a small number of cases where a single year is missing from a country's time series. In these cases, when the lagged dependent variable is included, no measure of the lagged dependent variable is available for the following year. This results in an additional year being excluded each time this situation arises. Furthermore, the number of observations used in estimation is short of what is reported in Table 1. This is due to the use of a five year moving average lag for some variables.

The base model (model I), provides little support for the hypothesis of a negative coefficient on the inequality variables. The coefficients for both variables representing developing-country inequality, as well as when the net-exported sector is smaller in developed countries are negative, though insignificant. The coefficient for inequality when the net-imported sector is smaller in developed countries is significant and positive. Together, these results suggest that inequality cannot be identified as a general factor in the determination of policies that governments use to support the agricultural industry.

A possible explanation for the positive coefficient on the inequality variable for developed countries when the exporting sector is larger is that governments of developed countries with large agricultural industries are motivated to increase their shares of world exports. The results also suggest that developing countries and developed countries with larger net-importing agricultural industries are less influenced by a motive to increase their share of world exports.

We also do not find support that market power increases the relative level of support provided to sectors. This is a surprising result, as we are confident in our hypothesis on these variables, and recent research provides empirical evidence that market power is a determinant of trade support levels (Bagwell and Staiger, 2011; Broda *et al*., 2008). The signs on the coefficients are counterintuitive, but are not significantly different from zero. These results suggest that a country does not increase its support to the net-imported sector when its share of world's imports of their net-imported goods increases (or support to the net-exported sector when it has a greater share of the world's exports of their net-exported goods). If our market power variable is representative of a country's ability to influence world prices, then the results suggest that countries may not be taking advantage of potential gains from trade policies.

It is worth noting that there is a difference between our methods and those of Broda *et al.* (2008) and Bagwell and Staiger (2011), both of whom investigate the effects of market power on trade barriers. Broda *et al*. (2008) find evidence that market power is an important determinant of tariff rates for non-WTO countries and non-tariff barriers and statutory tariffs (erected against countries that are not granted most favoured nation status) for the United

States. Broda *et al.* (2008) argue that their results imply that market power is a significant determinant of trade policies that are not constrained through the WTO. Similarly, Bagwell and Staiger (2011) find a relationship between the size of tariff cuts that are negotiated for accession into the WTO and the import levels of those countries prior to accession. This result also suggests that market power is a determinant of trade policies that are not constrained by the WTO (unbound tariff rates). Almost 85 percent of our observations represent countries that are members of the WTO or the GATT, and our measure of support includes import tariffs. Thus, we are estimating the effect of market power on support levels that have at least partially been set cooperatively. Broda *et al.*'s (2008) conclusion that market power only influences trade policies that are not constrained by the WTO goes some distance in explaining our empirical results.

We find mixed results for the regional PTAs. The variables for NAFTA, the CAP of the EU, and ASEAN all have negative coefficients, but are insignificant. The Andean Community has a positive and insignificant coefficient. These results suggest that none of these agreements have a clear effect on the use of policies directed towards a certain sector. On the other hand, MERCOSUR has a positive and significant coefficient. Brazil is the only MERCOSUR country in our panel so our results imply that Brazil reduced relative support to its import-competing sector after signing onto MERCOSUR.

Several other control variables are insignificant in our regressions. The measures for WRI, WTO/GATT membership, urbanisation and the time trend are all insignificant. These results point to the difficulty of generalising determinants of trade-distorting policy across countries, even when controlling for important factors and country fixed effects.

Table 2 presents estimation results from model (II), the dynamic version of our base model, as described by equation (4). As discussed earlier, we predict that the estimated coefficient on the lagged dependent variable is positive because current TBI should be partially determined by previous TBI. Consistent with this hypothesis, we find a positive and highly significant coefficient. This suggests that policy persistence is an important determining factor in the choice of which agricultural industry receives support and, given the lack of significance for many of the other estimated coefficients, may be the primary factor determining the level of the TBI. There is clearly inertia that restricts the range of policy choices that a country has in a given year.

The remainder of the parameters in model (II) are robust to the inclusion of a lagged dependent variable. There is only one sign change (export market share for net-exported goods), and all changes to the coefficients are smaller than 0.1 from the baseline specification. Results from the dynamic model do not change our interpretation in any appreciable manner. We are left with a positive and significant coefficient on inequality in developed countries when the import-competing sector is smaller, and the remainder of the inequality parameters are negative and insignificant.

Model (III) includes the Herfindahl indices for each sector in the base static model as a robustness check against the inclusion of a control for lobbying power. Once again, we are sceptical about the accuracy of this measure of lobbying power, hence the inclusion as a robustness check only.

The coefficients on the Herfindahl indices in model (III) have counterintuitive signs and are insignificant. The remainder of the coefficients in model (III) are robust to the inclusion of the Herfindahl indices compared to model (I). If we were confident in the accuracy of the Herfindahl indices as measures of lobbying power, we would take this result as evidence that lobbying is not an important determinant of trade bias.

Model (IV) includes the Herfindahl indices in the dynamic model. Similar to model (III), the dynamic model is robust to inclusion of the Herfindahl indices. Note, however that the Herfindahl indices are not as robust to the inclusion of a lagged dependent variable as are other variables. Coefficients on both of the Herfindahl indices change signs (though the changes in the values are small), and match our predictions. Given the lack of significance, this does not affect our interpretation.

Our empirical results provide little support for the notion that inequality is an important determinant of trade-distorting policy, as measured by trade bias. We recognize that our inability to accurately measure the effect of lobbying in our model could introduce a bias, though we are not able to identify what coefficients are biased, and in what direction.

Perhaps the most intriguing result from our empirical estimation is that the effect of inequality appears appreciably different when the net-imported sector is smaller in a developed country. Our results suggest that developed countries with larger net-exported sectors actually increase support to net-exported goods as they get relatively larger. This suggests a desire to expand exports instead of protecting the smaller net-imported sector. A possible explanation is that developed countries with larger net-exported sectors promote specialization by supporting goods that it produces most efficiently. On the other hand, developing countries, and developed countries with larger net-imported sectors, exhibit no significant effects of inequality on support to either the larger or smaller sector.

Another interesting result is the lack of significance on the estimated parameters of many control variables. We are not surprised by the insignificance of the WRI or PTAs variables, as we did not predict a significant effect. These variables were included to limit potential omitted variable bias. We are surprised by the coefficients on our proxies for market power, though, as we have reason to be confident that they are important factors in determining trade-distorting policy. Our method of estimating market shares is imperfect, as we lack trade information from countries outside of our data set; our market shares therefore may overstate a country's actual market power. But considering the range of important agricultural countries that are included in the data set, we feel that the measurement error should be small.

Our model strongly suggests that a country's historical trade-distorting policy is an important factor in the choice of current agricultural trade-distorting policy. The significance of this factor, combined with the lack of significance for many other variables, suggests that policy persistence may be the predominant determining factor in the decision to restrict or promote trade. There may be strong resistance to change in agricultural support structures, or it may be that it is logistically difficult to implement large changes to support structures on a year to year basis. We argue that the effect is a mixture of both factors, as it is unrealistic to expect large-scale changes to policy from one year to the next, and it is intuitive that a government faces political pressure from groups with vested interests. The set of available agricultural trade policies from which a government can choose in any given year appears to be restricted to a set of policies that are similar to the previous year's set.

Despite the importance of past policies in determining current policies, we still expect other factors to play roles in determining the direction of bias in agricultural trade-distorting policy. However, we find that whether a country shifts its support to net-exported or net-imported goods is not significantly determined by factors for which we are able to control in our empirical model. Our results imply that trade-distorting policy changes are somewhat *ad hoc* across a wide sample of countries. This suggests that there is no general way to explain why a cross-section of countries changes their relative support to different sectors. The country-specific factors that are controlled with country fixed effects in the empirical model are likely a key element in explaining trade-distorting policy changes. There does not appear to be an identifiable factor that is important across a wide range of countries.

What do these results mean? We are not able to conclusively determine why countries continue to use trade restrictive (anti-trade) policies instead of trade-promoting policies. The goal of trade negotiations is primarily to reduce trade barriers on net-imported products and move towards specialization in net-exported goods. If we had observed negative and significant coefficients on the inequality variables, then we could argue that governments are hesitant to remove trade barriers that act as safety nets for smaller agricultural industries. This would suggest that trade negotiations might be more successful if the focus were turned towards relatively larger sectors that governments are less motivated to protect. However the insignificant results in our empirical model do not support such a refocusing of efforts. Inertia is the consistent obstacle in changing the policy set that we observe. If the reason for policy inertia is domestic opposition to change, then the focus of negotiations may have to turn to either providing incentives for governments to make changes in the face of opposition, or to reduce the opposition of industries that have important political economy strength.

Beyond policy inertia, it appears that an understanding of trade-distorting policy requires close consideration of country-specific preferences. Some countries, though our results suggest not many, may have government utility functions that resemble L&P's (2007), and inequality in the agricultural industry is an important consideration. Alternatively, some countries may prefer to promote larger sectors in attempts to increase market power in exports. For many countries, the key factors may be individual country effects that are invariant along ideological, political, and cultural lines. For example, if a country is a net importer of a good that it has historically produced, one that may have deep traditional value, it may protect that product even if the country has no other incentive to protect a small net-imported good. Similarly, a country may be ideologically motivated to protect smaller industries across competing political parties, and so policy does not change as the governmental structure changes. There appears to be no way to generalize the effect that these factors have across countries, nor is there a way to identify the individual effect for a specific country beyond extensive knowledge of the priorities of a specific country's government.

4. Conclusion

This paper provides empirical insights into the general determinants of agricultural trade-distorting policy across a wide range of countries. Specifically, we examine an extension of the theory proposed by L&P (2007), which argues that a possible explanation for the predominant use of anti-trade policies is that governments seek to reduce the level of income inequality between factors of production. We test a modification of this theory in a reduced form empirical model with unbalanced panel data on agricultural trade-distorting policy for 63 countries. We estimate a static fixed effects model and a dynamic model in recognition that trade-distorting policy choice may be influenced by country-specific factors and policy persistence. We control for a number of other determinants that have been supported in the literature, including market power, a motive to maximize societal welfare, the effect of PTAs, and development level.

The coefficients on our inequality variables are mostly insignificant, and the coefficient on inequality for developed countries with larger net-exported sectors is positive and highly significant. This suggests that governments do not exhibit preferences for reducing the level of inequality between sectors when setting agricultural trade-distorting policy, and that developed countries with larger net-exported sectors show a preference for supporting the larger sector. We also find little significance on many of our control variables, suggesting that it is very difficult to identify generally important factors in the choice of agricultural trade-distorting policy. We do find that policy persistence is prevalent, which implies that any change in the policy set is slow, and that the choice of policy set in one year is largely restricted to be similar to the previous year's set.

Because of the difficulties in identifying the types of goods to which countries will generally be willing to reduce support, negotiating agreements between a wide range of countries may be difficult. This suggests that agreements between pairs or small groups of countries may be more tractable. If a country such as Canada wishes to increase its market access for certain goods, then it could benefit from identifying potential partners based on knowledge of individual countries' preferences. For example, if Canada wants better market access for corn, it would appear difficult to negotiate such access through multilateral agreements where support to corn would have to be reduced in several countries, each of which may have different motivations for existing trade barriers. Alternatively, Canada may be able to identify specific countries that have a low preference for supporting corn for idiosyncratic reasons, and make bilateral agreements with those countries. The latter point may be especially true if Canada has a low preference for supporting the products for which the potential partner seeks better market access.

There are a number of possible directions for future research. First, since we are sceptical about our ability to accurately measure the lobbying capabilities of sectors, there is an opportunity for future research to assess the importance of this factor under L&P's (2007) theoretical framework. Unfortunately, a measure such as lobbying contributions, or accurate information on the level of political organization within sectors was not available for this research. In time, this information may become available for a wider range of countries and years, providing future researchers the capability to better identify a factor that is well documented as an important factor in previous empirical literature (for example, Goldberg and Maggi (1999), Gawande and Bandyopadhyay (2000), Gawande and Hoekman (2006), Gawande (1997), and Mitra et al. (2006)).

Another interesting extension would be to break the data set into groups of countries, which might allow for better measurement of some of the explanatory variables (*e.g.* lobbying effort). We are only able to include those theoretically important factors that can be measured across the broad range of countries and years for which we have TBI data. Furthermore, a closer look at a geographical or political group of countries may allow for the consideration of factors that are specific to that group; factors that could become apparent with more intimate knowledge of the group of countries being examined.

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Appendix A: Commodity Coverage in the Dataset

Each country's TBI is calculated every year based on calculations of nominal rates of assistance for all covered agricultural products. These rates are weighted by production value and summed within each sector (net-exported or net-imported) to compile the overall sectoral rates of assistance, which are then entered into equation (5) (Anderson *et al.*, 2008). The list of products covered in the database varies widely across countries; the complete list and aggregate groupings that appear at least once are listed in table A.1. Some products in the list are not defined as net-exported or net-imported every year, with the trade status in these cases reported as non-tradable.

Table A.1. Products Covered in the Database

Apple	Coconut	Mandarin	Pig Meat	Spinach
Banana	Coffee	Milk	Plantain	Strawberry
Barley	Cotton	Millet	Potato	Sugar
Bean	Cucumber	Oat	Poultry	Sunflower
Beef	Egg	Oilseed	Pulse	Sweet Potatoes
Cabbage	Fruit & Vegetable	Olive	Pyrethrum	Tea
Camel	Fruits	Onion	Rapeseed	Teff
Cashew	Garlic	Orange	Rice	Tobacco
Cassava	Grape	Other Crops	Rubber	Tomato
Chat	Groundnut	Other Grains	Rye	Vanilla
Chickpea	Gum Arabic	Other Roots & Tubers	Sesame	Vegetables
Chillies	Hazelnut	Palm Oil	Sheep Meat	Wheat
Clove	Hides & Skins	Pear	Sisal	Wine
Coarse Grains	Jute	Peas	Sorghum	Wool
Cocoa	Maize	Pepper	Soybean	Yam

Source: Compiled by authors from Anderson and Valenzuela (2008).