

Explaining Agricultural Distortion Patterns: The Roles of Ideology, Inequality, Lobbying and Public Finance

Pushan Dutt
INSEAD
Singapore
pushan.dutt@insead.edu

Devashish Mitra
Syracuse University
Syracuse, NY
dmitra@maxwell.syr.edu

Agricultural Distortions Working Paper 84, May 2009

This is a product of a research project on Distortions to Agricultural Incentives, under the leadership of Kym Anderson of the World Bank's Development Research Group. The authors are grateful for very useful comments and discussions from seminar participants, particularly Jo Swinnen and Will Martin, and for funding from World Bank Trust Funds provided by the governments of Japan, the Netherlands (BNPP) and the United Kingdom (DfID). The authors would also like to thank Rob Feenstra for having strongly encouraged them to work on the political economy of agricultural protection. This paper will appear in *Political Economy of Distortions to Agricultural Incentives*, edited by K. Anderson (forthcoming 2010).

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Abstract

In this paper, we examine the political economy drivers of the variation in agricultural protection, both across countries and within countries over time. The paper starts by listing the key insights provided by both the theoretical and empirical literature on the political economy of trade policy formulation. We then set out a basic framework that allows us to put forth various testable hypotheses on the variation and evolution of agricultural protection. We find that both the political ideology of the government and the degree of income inequality are important determinants of agricultural protection. Thus, both the political-support-function approach as well as the median-voter approach can be used in explaining the variation in agricultural protection across countries and within countries over time. The results are consistent with the predictions of a model that assumes that labor is specialized and sector-specific in nature. Some aspects of protection also seem to be consistent with predictions of a lobbying model in that agricultural protection is negatively related to agricultural employment and positively related to agricultural productivity. Public finance aspects of protection also seem to be empirically important.

Keywords: Agricultural protection, political economy

JEL Classification Codes: Q17, D72, D78, F11, F13

Contact author details:

Pushan Dutt

INSEAD

1 Ayer Rajah Avenue

Singapore 138676

Phone: +65 6799 5498

Pushan.Dutt@insead.edu

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Pushan Dutt and Devashish Mitra

Barring very few exceptions, international trade has never and nowhere been free, even though only under extraordinary circumstances are deviations from free trade optimal. To explain this puzzle, an entire literature on the political economy of trade policy has emerged over the last three decades. In this literature, one common feature is that trade policies are chosen not with the aim of maximizing national economic efficiency and aggregate welfare, but set by politicians and policy makers whose objective functions diverge from aggregate welfare. Trade policies in this view, are often used as indirect tools to redistribute income to certain targeted groups. The identity of these groups depends on (a) the type of political-economy framework (lobbying or majority voting) assumed, (b) the actual economic, political and geographic characteristics of the various sectors in the economy that determine which of them are politically organized, and (c) the political and economic ideology of the government.

The objective of this chapter is to explain both the cross-country variations in agricultural protection and the within-country evolution of this protection over time. The general trend has been an increase in agricultural protection in developed countries over time as their per capita incomes have increased.¹ This protection has taken the form of tariff and non-tariff barriers on imports plus substantial subsidies provided by governments to their farmers. While membership in the GATT/WTO has attempted to control the growth of such protection in developed countries, it has so far not succeeded in eliminating or reducing it. In fact, agricultural support or protection is one of the primary reasons behind the current impasse in the Doha Round of trade talks. In developing countries, by contrast, the bias has been against agriculture and in favor of the manufacturing sector which has historically been highly protected. This has resulted in negative effective rates of protection for agriculture. This bias against agriculture has been reduced in recent times. It is these trends in agricultural

¹ For detailed theoretical and empirical analyses of the evolution of agricultural protection during the process of economic development, see Anderson, Hayami and Others (1986) and Hai (1991).

protection in developed and developing countries and the differences in their levels across countries that we are proposing to explain. In doing so, we draw upon the vast theoretical literature on the political economy of trade policy.

To examine the political-economy drivers of the variation in agricultural protection across countries and within countries over time, we set up a basic framework that allows us to put forth various testable hypotheses on the variation and evolution of agricultural protection. We find that both the political ideology of the government and the degree of income inequality are important determinants of agricultural protection. Thus, both the political-support-function approach as well as the median-voter approach can be used in explaining the variation in agricultural protection across countries and within countries over time. In other words, while the government's decision-making has some partisan elements, the concerns of the majority are also important.

We find that our results are consistent with the predictions of a model that assumes that labor is specialized and sector-specific in nature. The predictions of a model in which labor is assumed to be a general, intersectorally mobile factor do not hold. Finally, some aspects of protection also seem to be consistent with predictions of a lobbying model in that agricultural protection is negatively related to agricultural employment and positively related to agricultural productivity. Public finance aspects of protection also seem to be empirically important. Moreover, lobbying considerations are relatively more important in high-income countries, while public finance aspects are empirically relevant for developing countries.

This chapter is organized as follows. The next section provides a review of pertinent literature review, before we set up a theoretical framework where we lay out all the hypotheses that we are going to test. We then briefly discuss our data sources and econometric methodology and present the results, before drawing some conclusions.

Literature review

Political economy models of trade are of two main types. In the first type, called "median voter" models, the approach taken is one of majority voting. The second type, "lobbying models", may be further classified (following the typology in Rodrik 1995) into four approaches: (1) the tariff-formation function approach, (2) the political support function approach, (3) the political contributions approach and (4) the campaign contributions

approach. Within these lobbying models, (1) and (2) adopt a black-box approach to the modeling of lobbying in trade policy, while (3) and (4) have much stronger microfoundations.

Under the tariff-formation function approach, the tariff is a direct increasing function of resources going into lobbying in favor of the tariff and a decreasing function of lobbying resources devoted against the tariff. No microfoundations are provided for the function itself. Examples of this approach include Findlay and Wellisz (1982), Feenstra and Bhagwati (1982) and Rodrik (1986).

In models using the political support function approach, the government maximizes an objective function where different groups in the general population are given different weights depending on their political importance to the incumbent government (Hillman 1989, van Long and Vousden 1991).

In political contribution models, policies are determined through contributions by lobbies to incumbent politicians (Grossman and Helpman 1994), whereas in campaign contribution models, political competition between parties is fully modeled and contributions are made to competing parties (Magee, Brock and Young 1989).

In the theoretical modeling of endogenous protection, Grossman and Helpman (1994) made the biggest advance in providing strong microfoundations to the behavior of lobbies and the government, where the government maximizes a weighted sum of contributions and aggregate welfare, taking as given contribution schedules provided by lobbies in a prior stage. Mitra (1999) endogenizes the formation of lobbies within this framework and analyzes its implications for sectoral tariffs.

Empirical implications of the median-voter approach

In the median voter approach to tariff formulation, preferences on tariffs are assumed to be “single peaked” and conditions are imposed such that the most-preferred policy of each individual is monotonic in a certain characteristic. Then, holding other individual characteristics constant across the population, the tariff chosen under two-candidate electoral competition is the median voter’s most preferred tariff. The median voter here is the median individual in the economy when all individuals in the economy are ranked according to the characteristic under consideration. Mayer (1984) applied this median-voter principle to the Heckscher-Ohlin and specific-factors trade models. In the Heckscher-Ohlin case, the political economy equilibrium tariff is the most-preferred tariff of the median individual in the

economy-wide ranking of the ratio of capital to labor ownership. If this median individual's capital to labor ratio is less than the economy's overall capital to labor ratio, that is, if the asset distribution in the economy is unequal, the equilibrium trade policy is different from free trade and is one that redistributes income from capital to labor. Hence it is pro-trade in a labor-abundant economy and anti-trade in a capital-abundant economy.

In the Heckscher-Ohlin version of the Mayer median-voter model, a simple comparative static exercise produces the following result which is the main hypothesis that is empirically tested in Dutt and Mitra (2002): *A rise in asset inequality will make trade policy more pro-trade in a labor abundant economy and more protectionist in a capital-abundant economy.*

Dutt and Mitra (2002) estimate the following protection equation using cross-country data on inequality, capital-abundance and diverse measures of protection:

$$t_c = \alpha_0 + \alpha_1(K/L)_c + \alpha_2(Inequality)_c + \alpha_3(Inequality)_c(K/L)_c + v_c$$

where the "c" is an index for country c. The theory predicts that $\alpha_2 < 0$ and $\alpha_3 > 0$ such that the partial derivative of protection with respect to inequality is positive if K/L is above a threshold, and negative if K/L is below that threshold. Dutt and Mitra (2002) find empirical support for this hypothesis.^{2, 3} Besides running the above regression cross-sectionally, Dutt and Mitra also run the regression in time differences (difference between the 1990s and 1980s) and find strong empirical support. Thus, not only does the above median-voter prediction help explain variations in overall trade protection levels across countries, it also can explain long-run policy changes within a country.

Empirical implications of the special-interest approach

The special-interest approach has evolved from the simple Findlay-Wellisz (1982) "tariff-formation function" approach to the state-of-the-art Grossman and Helpman (1994)

² In this context, it is also important to mention Milner and Kubota (2005) who use a median-voter approach to empirically investigate the relationship between democratization and trade reforms in developing countries.

³ Dutt and Mitra (2005) also perform a cross-country empirical investigation of the role of political ideology in trade policy determination. They use a political-support function approach within a two-sector, two-factor Heckscher-Ohlin model. See Milner and Judkins (2004) on this issue. Also, see Hiscox (2001) who performs a study of six western nations to look at how historically the nature and structure of partisanship on trade issues change over time and depend on the extent of intersectoral factor mobility. Hiscox (2002) looks at the same question exclusively for the US, analyzing major pieces of congressional trade legislation between 1824 and 1994.

“political-contributions” model. The latter is a very significant advance in several directions. Firstly, it is multisectoral. Secondly, it provides strong microfoundations to the behavior of the different actors in the model. A “menu-auctions” approach is used in modeling policy bidding by interest groups. Multiple principals, namely the various organized lobbies, try to influence the common agent, namely the government. The government's objective function is linear in political contributions and aggregate welfare, while each lobby maximizes its welfare net of political contributions. The level of protection for each industry is derived as an econometrically estimable function of industry characteristics and other political and economic factors. Most importantly, especially from an empirical perspective, the model provides the following hypothesis: *Holding everything else constant, organized sectors are granted higher protection than unorganized sectors. Further, protection to organized sectors is negatively related to import penetration and the (absolute value of the) import demand elasticity, while protection to unorganized sectors is positively related to these two variables.*

The following protection equation comes directly from the theory:

$$\frac{t_i}{1+t_i} = \frac{I_i - \alpha_L}{a + \alpha_L} \cdot \frac{z_i}{e_i}$$

where t_i denotes the ad valorem tariff (export subsidy in the case of an exportable) to sector i , z_i represents the output to import ratio (output to export ratio in the case of an exportable) in that sector, e_i its import demand elasticity (export supply elasticity in the case of an exportable), α_L the proportion of the total population of the economy that is politically organized and a is the weight placed by the government on aggregate welfare relative to political contributions in its objective function. I_i is an indicator variable that takes the value 1 if the sector is politically organized and 0 otherwise.

The predictions of the Grossman and Helpman (1994) model are very intuitive: If an industry is import-competing and is organized ($I_i = 1$) then it buys protection and receives a positive tariff. If an industry is an exporter and organized, it is able to “buy” an export subsidy. Next, a high import penetration ratio (high volume of imports relative to domestic output of importables) implies that specific-factor owners have less to gain from the increase in domestic price induced by the tariff and the economy has more to lose from protection. So we are likely to see lower levels of protection. Similarly, when the import elasticity is higher, the deadweight loss from protection is also higher, so the government will grant it lower levels of protection. Next, an unorganized sector gets negative protection according to this theory if $\alpha_L > 0$ and gets zero protection if $\alpha_L = 0$, which is the case where factor ownership

and political organization are concentrated in the hands of a few people that form a negligible proportion of the population. Thus, this theory leads to the estimation of the following estimating equation:

$$\frac{t_i}{1+t_i} = \frac{1}{a+\alpha_L} \cdot \frac{I_i z_i}{e_i} + \frac{-\alpha_L}{a+\alpha_L} \cdot \frac{z_i}{e_i} + u_i$$

where this equation can be linearly estimated with $\frac{1}{a+\alpha_L}$ and $\frac{-\alpha_L}{a+\alpha_L}$ as the two coefficients

that are directly estimated, and then a and α_L can be inferred from the two coefficient estimates. Alternatively, these parameters can be directly estimated by non-linear estimation.

Goldberg and Maggi (1999) and Gawande and Bandyopadhyay (2000) estimate the Grossman-Helpman “Protection for Sale” tariff expressions using industry-level data from the United States. Using slightly different econometric specifications from each other, both papers confirm empirically the Grossman-Helpman prediction regarding the relationship of protection to import protection and import demand elasticity. Holding everything else constant, organized sectors are granted higher protection than unorganized sectors. Both these papers find that the weight on aggregate welfare in the government's objective function (a) is several times higher than that on contributions. This finding is somewhat puzzling and perhaps worrisome. Although the Grossman-Helpman model does not provide any indication on the expected magnitude of the parameter a , the higher the weight governments put on aggregate welfare, the less compelling seems the *raison d'être* for the entire political economy literature. Moreover, the estimates of the proportion of population who are organized are very high in both the Goldberg-Maggi and Gawande-Bandyopadhyay papers.

Mitra, Thomakos and Ulubasoglu (2002) and McCalman (2004) obtain similarly high parameter estimates of the Grossman-Helpman model for Turkey and Australia respectively. An interesting result that comes out of the empirical exercise by Mitra, Thomakos and Ulubasoglu is that the relative weight on aggregate welfare was higher in the democratic regime than under the dictatorial regime in Turkey for the period spanned by the dataset. Due to the panel nature of the dataset, this study is able to explain both the cross-industry as well as the time series variation in protection.

Gawande, Krishna and Robbins (2006) use a new dataset on foreign political activity in the US and extend the “Protection for Sale” model to include foreign lobbies. In line with the Grossman-Helpman prediction, they find that foreign lobbying activity has significantly reduced US trade barriers. As a result, foreign lobbying has increased consumer surplus and

overall welfare in the US. In another empirical application, through an extension of the Grossman-Helpman model, Gawande and Krishna (2006) investigate the effects of US trade policy lobbying competition between upstream and downstream producers. Their parameter estimates are a significant improvement over those in the earlier literature even though they do not completely resolve the puzzle.

Finally, the most relevant paper from the point of view of the present study is the recent paper by Gawande, Krishna and Olarreaga (2008). This paper looks at the cross-country and cross-industry variations in protection at the same time. The Grossman-Helpman tariff expression for an organized sector can be written as:

$$\frac{t_{ict}}{1+t_{ict}} = \frac{1-\alpha_{Lc}}{a_c + \alpha_{Lc}} \cdot \frac{z_{ict}}{e_{ict}}$$

where the subscript “*ict*” denotes industry *i* in country *c* at time *t*. Assuming ownership of specific factors and political organization to be fully concentrated among a negligible proportion of the population, we have:

$$\frac{t_{ict}}{1+t_{ict}} = \frac{1}{a_c} \cdot \frac{z_{ict}}{e_{ict}}$$

which in turn can be written as

$$\frac{t_{ic}}{1+t_{ic}} \cdot \frac{e_{ict}}{z_{ict}} = \frac{1}{a_c}$$

and can be estimated as

$$\frac{t_{ic}}{1+t_{ic}} \cdot \frac{e_{ict}}{z_{ict}} = \beta_c + \xi_{ict}$$

The variance of the disturbance term is allowed to vary by country and the coefficient $\beta_c = \frac{1}{a_c}$ is a measure of a government’s affinity for political contributions, and its inverse gives us the weight the government puts on aggregate welfare relative to contributions in its objective function. The ranking of countries on the basis of the estimates of *a* and *1/a* obtained by Gawande, Krishna and Olarreaga is quite realistic. The Spearman rank

correlation of this estimate with Transparency International’s corruption index turns out to be 0.67. Several political variables from the Database on Political Institutions (Beck et al. 2001), such as constraints on the executive, competition for executive, party concentration and number of government seats, do very well in explaining the variation in a and $1/a$. In addition, institutional variables such as the nature of the legal system also perform well. This study, therefore, provides useful insights into the institutional and political variables that may potentially explain the variation in protection to agriculture both across space and over time.

Empirical implications of the political ideology or partisan government approach

Dutt and Mitra (2005) use a reduced form special-interest approach (earlier referred to as the “political support function” approach) to study how variations in political ideology of governments can explain international and inter-temporal variations in protection. Ideology of the government is labeled as right, center and left. Using the same Stolper-Samuelson intuition as in their median-voter paper, they arrive at the following testable hypothesis: *A more left-wing government (i.e., that attaches a higher weight on the welfare of workers/labor) is more protectionist in the case of capital-abundant countries but is less protectionist in the case of capital-scarce countries.* That hypothesis results in the following estimating equation:

$$t_c = \alpha_0 + \alpha_1(K/L)_c + \alpha_2(\text{Ideology})_c + \alpha_3(\text{Ideology})_c(K/L)_c + v_c$$

Dutt and Mitra (2002) find support for their ideology hypothesis. In another paper, Dutt and Mitra (2006) combine both their ideology and their inequality (median-voter) hypotheses into the following umbrella model to show that protection is determined both by general-interest and special-interest concerns:

$$t_c = \alpha_0 + \alpha_1(K/L)_c + \alpha_2(\text{Ideology})_c + \alpha_3(\text{Inequality})_c + \alpha_4(\text{Ideology})_c(K/L)_c + \alpha_4(\text{Inequality})_c(K/L)_c + v_c$$

Again, these models provide some guidance for the present study of agricultural protection.

Lessons from the “first generation” empirical work

Unlike recent work described above, the early empirical literature, or what Gawande and Krishna (2003) call “first generation” empirical work on endogenous trade policy, is not

driven by formal models. Nevertheless, we believe it does provide very useful insights and guidance for future research. It is important here to note that there were some important correlations revealed between tariffs and a number of political and economic variables by this early literature. For example Baldwin (1985) found that tariffs are higher for industries that are labor intensive, have low wages, have a small number of firms and employ a large number of workers, and experience a high degree of import penetration. Also, he finds that tariff cuts from the GATT's Tokyo round were the lowest for the most unskilled labor intensive industries.

Another well-known empirical piece from the early literature on the political economy of trade policy is by Trefler (1993), who finds that import penetration and other comparative advantage measures are more important in the determination of the non-tariff barrier coverage ratios than industry concentration, scale and capital measures.

Other important papers in the old literature include Caves (1976), Saunders (1980), Ray (1981), Marvel and Ray (1983), Ray (1991) and Trefler (1993).⁴ The main finding of this early empirical literature is that protection is higher for sectors that are labor-intensive, low-skill and low-wage, for consumer-goods industries, for industries facing high import penetration when geographical concentration of production is high but that of consumers is low, and in sectors with low levels of intra-industry trade.⁵

Lessons from the literature on agricultural protection

A large proportion of the theoretical research on the political economy of trade policy prior to the Grossman and Helpman (1994) model was on agricultural protection. Noteworthy in this literature is Swinnen (1994), who uses a Hillman-type of political support function approach within a fairly rich structure of the economy (three factors, of which one is mobile and two are fixed), to study the relationship between agricultural protection and economic development.⁶

⁴ See Rodrik (1995) for a detailed survey of this literature.

⁵For an examination of the cross-national variation in average protection levels across industrialized countries, see Mansfield and Busch (1995). They find that non-tariff barriers are increasing in country size, unemployment rate and number of parliamentary constituencies and are higher for countries that use proportional representation as their electoral system.

⁶ For an application, see Swinnen, Banerjee and de Gorter (2001). The literature on the political economy of agricultural protection until the early 1990s is comprehensively surveyed in de Gorter and Swinnen (2002).

Honma (1993), who uses the Anderson and Hayami (1986) framework, finds support for the Anderson (1992) hypothesis that the shrinking of the agricultural sector makes opposition to agricultural protection more diffused and the lobbying for it more concentrated.⁷ Honma uses panel data from 14 industrial countries for the period 1955-87. He further finds that agricultural protection is inversely related to agricultural relative to industry productivity and positively related to deterioration in its terms of trade.

Olper (1998) tries to explain cross-country variations in agricultural protection among the European Union (EU) countries in the 1970s and 1980s. Specifically, he looks at the Common Agricultural Policy (CAP) of the EU. He shows that agricultural protection is countercyclical to market conditions and is positively related to the extent of comparative disadvantage in agriculture. Also, agricultural protection is greater in countries with a smaller number of farms, finding evidence for the free-rider problem in lobbying.⁸

Finally, a recent paper by Gawande and Hoekman (2006) tests a modified version of the Grossman and Helpman (1994) “Protection for Sale” model for US agriculture. The modification is the uncertain outcome of lobbying, and the dataset they use contains both agricultural protection (tariffs and subsidies) and PAC contributions in the US during the late 1990s. This is the first empirical piece in the agricultural protection literature that is completely structural in that the estimating equation is derived exclusively from theory.

Theoretical framework for the present study

In the theory we develop here, we recognize the existence of land as a factor that is of primary importance to agriculture. To do this, we make the extreme assumption that land is a factor of production specific to agriculture. We develop our hypotheses under two scenarios: one where labor is intersectorally mobile, and one where it is sector-specific.

Consider a two-sector specific-factors model. In the economy under consideration, assume there are two sectors, manufacturing and agriculture. The manufacturing sector uses capital (specific to manufacturing) and labor under constant returns to scale (CRS), while

⁷ For a CGE study, based on a similar argument, trying to explain the bias against agriculture in poor countries and high agricultural protection in rich countries, see Anderson (1995).

⁸ Also, see Olper (2007) where he looks at the interaction between ideology and inequality in the determination of agricultural protection. This work builds on Dutt and Mitra (2002, 2005, 2006).

agriculture uses land (specific to agriculture) and labor, also under CRS. An unconditional prediction of this set of assumptions is that an increase in agricultural protection increases the real incomes (welfare) of landowners, while it reduces the real incomes of capitalists. In this framework, if labor is also sector-specific and immobile across sectors, then the prediction gets modified to the following: An increase in agricultural protection increases the real incomes (welfare) of landowners and agricultural workers, while it reduces the real incomes of capitalists and manufacturing workers. On the other hand, if labor is mobile across sectors, then the effect of agricultural protection on labor's welfare is ambiguous – it depends on labor's share of expenditure on agricultural products (food).

Political ideology and inequality

Clearly, in the mobile labor framework described above, a right-wing government (one that puts a higher weight on the well-being of capitalists) will try to keep protection as low as possible for agriculture. In such a framework, what will a left-wing government do? Remember that a left-wing government has an affinity for workers, which means they attach a higher weight to labor's welfare than to the welfare of others in the country. Protecting agriculture raises the overall demand for workers in the economy and increases their real wages in terms of the manufactured good, but lowers real wages when measured in terms of the agricultural good (food). Thus, if the share of expenditure on food is small enough, workers will be made better off through agricultural protection. A left-wing government will in such situations want to protect agriculture. There will be labor-land coalitions formed in such situations. The opposite will be the case when the expenditure share of food is high. Since the expenditure share of food varies inversely with per capita income, a left-wing government will want to protect agriculture in rich countries and not in poor countries.

In the immobile labor case, with a move from right-wing to centrist to left-wing governments, we will get an increase in agricultural protection if a large proportion of employment is in the agricultural sector. Since a left-wing government is pro-labor, it will support the sector that has relatively more workers. In general, the share of agriculture in employment is higher in poor countries. Therefore, the poorer a country the more likely it is that a left-wing government (relative to a right-wing or centrist government) will provide assistance to agriculture.

This brings us to **Competing Hypotheses 1:**

- (a) *Mobile Labor Case: Countries with left-wing governments will exhibit higher levels of agricultural protection when per capita income is high. At high levels of income, agricultural protection goes up when the political ideology of the government changes from rightist to centrist to leftist.*
- (b) *Immobile Labor Case: Countries with left-wing governments will exhibit higher levels of agricultural protection when per capita income is low. At low levels of income, agricultural protection goes up when the political ideology of the government changes from rightist to centrist to leftist.*

Majority voting and inequality

In a model where governments set policies that have the support of the majority of the population, agricultural protection will respond to income inequality. The predicted direction of response (to such changes in inequality) will once again depend on whether labor is intersectorally mobile or immobile.

In the mobile labor case, in a setting where the government tries to put in place policies that get majority support, agricultural protection will again be conditional on the food expenditure share. When this expenditure share is low, the majority, who are mainly workers, are likely to demand higher agricultural protection since this will increase the real incomes of workers in terms of their consumption baskets. When the expenditure share of food is low, which is the case when income is high, an increase in asset inequality will increase agricultural protection. This happens since, with an increase in inequality, the share of labor income in the incomes of the majority of the people goes up.⁹ The opposite is the case when income is low and the share of food in overall expenditure is high.

In the immobile labor case, with an increase in inequality, there will be a demand for inequality reduction and we will get an increase in agricultural protection if a large proportion of employment is in the agricultural sector. In general the share of agriculture in employment is higher in poor countries. Therefore, the poorer a country the more likely it is that an increase in inequality will lead to an increase in assistance to agriculture.

Therefore, we have **Competing Hypotheses 2:**

- (a) *Mobile Labor Case: Countries with higher levels of inequality will exhibit higher levels of agricultural protection provided income levels are high enough. Countries*

⁹ In the median voter model, it is common to assume that the median voter is labor rich and asset poor. From an empirical perspective as well, such an assumption seems plausible.

that experience an increase in inequality will increase their levels of agricultural protection over time, provided income levels are high enough.

- (b) *Immobile Labor Case: Countries with higher levels of inequality will exhibit higher levels of agricultural protection provided income levels are low enough. Countries that experience an increase in inequality will increase their levels of agricultural protection over time, provided income levels are low enough.*

Lobbying

With economic development and rising per capita incomes, agriculture's share in overall employment goes down. There are two main reasons for this. Firstly, in line with the traditional Engel effect, the share of expenditure on food goes down. Secondly, technological progress in agriculture means that fewer workers are required to produce a given level of output. As the employment share of agriculture goes down, agricultural workers and landowners will probably find it easier to organize and mitigate the inherent free-rider problem of lobby formation. As a result, a decline in the share of employment in agriculture is likely to be accompanied by an increase in agricultural protection. Second, if agricultural productivity goes up, lobbying becomes more beneficial and we are likely to see more agricultural protection.

This brings us to the following **non-competing (complementary) hypotheses 3:**

- (a) *Countries with a lower share of employment in agriculture and higher agricultural productivity will exhibit higher levels of agricultural protection.*
- (b) *Countries that experience a falling share of employment in agriculture and rising agricultural productivity will increase the levels of agricultural protection over time.*

Public finance

During the initial stages of development, a country's tax infrastructure to raise revenues through direct taxes is weak. So revenues are raised through indirect taxes including tariffs on imports, which at that stage of development are mainly manufactured goods (but could include some agricultural goods). Over time, incomes increase and the returns to having a strong direct tax infrastructure rise, which results in government investment in an effective internal revenue service. Most of the revenue now comes from income taxes. Some of these

revenues can now be used to give agricultural subsidies (especially since most rich countries have a comparative disadvantage in agriculture).

Thus, we have the following **non-competing (complementary) hypotheses 4**:

- (a) *Countries with a small direct tax base (income taxes as a proportion of total tax revenues or government expenditure) will exhibit higher levels of agricultural tariffs.*
- (b) *Countries whose direct tax revenues (as a proportion of total tax revenues or government expenditure) rise over time will exhibit a fall in their agricultural tariff rates and a rise in agricultural subsidies.*

Empirical results

To test these hypotheses we gather data on political variables from a variety of sources. Table 1 lists the data sources and the coverage for each of our explanatory variables.

We examine both the cross-country variations in agricultural protection as well as the within-country variation in agricultural protection over time. Table 2 shows the regressions that we run and the predicted coefficients on the independent variables to test our cross-country hypotheses as well as those which are within country and over time. To investigate cross-country variations, we use pooled ordinary least squares (OLS). For the within-country variation over time, we use panel data estimation techniques. This allows us to control for unobserved and time-invariant country-specific effects by using country-fixed effects.

Ideology, inequality and agricultural protection

To examine the role played by ideology and inequality in influencing agricultural protection we first estimate the following equations:

$$agprot_{ct} = \alpha_1(per\ capita\ income)_{ct} + \alpha_2(Ideology)_{ct} + \alpha_3(Ideology)_{ct}(per\ capita\ income)_{ct} + \varepsilon_{ct}$$

$$agprot_{ct} = \alpha_1(per\ capita\ income)_{ct} + \alpha_2(Inequality)_{ct} + \alpha_3(Inequality)_{ct}(per\ capita\ income)_{ct} + \varepsilon_{ct}$$

where the subscript “c” is for country and “t” denotes time. “Agprot” stands for agricultural protection. For the within-estimates, we add country (as well as time) fixed effects to the above specification.

In table 3, we see how political ideology and inequality affect the Relative Rate of Assistance (RRA) to agriculture. In column 1, the coefficient on the ideology variable is

positive and significant, while the coefficient on the interaction of ideology with per capita income is negative and significant. The signs of the ideology term and its interaction with per capita income suggest that the intersectoral mobility of labor is quite low and so the immobile labor model is a better approximation to reality than the mobile labor model. Column 2 shows that this finding is robust to the addition of three political institution controls: constraints on the executive which captures checks and balances on the chief executive (higher in democracies); a dummy equal to one for Presidential systems; and a dummy equal to one if the ruling party can be classified as rural. Columns 3 and 4 present within-estimates, where again we see that political ideology influences agricultural protection. The signs of the estimated coefficients are compatible with the immobile labor scenario.

The coefficient of the ideology term divided by the absolute value of the coefficient of the interaction term gives us the critical per capita income at which the relationship changes sign. Per capita income is measured in natural logarithms and the threshold is about 8.7 in column 1, which in levels is about \$6000. When we add country-fixed effects, we observe a decline in the magnitude of the coefficient estimates. However, the critical per capita income remains substantively unchanged in column 3 (equal to 9).

Table 4 presents regressions analyzing the effects of inequality in table 4. Columns 1-3 show pooled OLS estimates while columns 4 and 5 present within-estimates. All columns use the income Gini coefficient as the measure of inequality, except column 2 which uses the land inequality measure from Li, Squire and Zou (1998). The estimated coefficient on the Gini coefficient is positive and significant and its interaction with per capita income is negative and significant. As with political ideology, these signs are consistent with the immobile labor scenario. The threshold per capita income is only \$3000 in this case, except for column 2 (where the land Gini is used) where the threshold is even lower. The results hold for the within-estimates as well, with the critical per capita income rising to \$3500.

We next explore whether it is actually the relative size of agricultural employment that is driving these results. In table 5, instead of per capita income we use the share of agriculture in total employment. As expected from the first set of regressions, we now have the political ideology coefficient negative and significant. The coefficient of the interaction between political ideology and the share of agriculture in employment is positive and significant in column 1 (where no fixed effects are used) but insignificant in column 2 where country and year fixed effects are used. When inequality is used in place of ideology in these regressions (columns 3, 4 and 5), the inequality variable is positive and significant and the interaction of inequality with the share of agricultural employment is negative and

significant, both in the absence and presence of country and year fixed effects. In other words, these results hold in both cross-sectional and within-country, across-time variations in the data.

Lobbying and agricultural protection

As the employment share of agriculture goes down, agricultural workers and landowners will probably find it easier to organize, as a result of which protection to agriculture is likely to go up. In table 6 the negative and significant coefficient of the employment share of agriculture provides support for this hypothesis. This is true for all countries pooled together (column 1), when we restrict the sample to only OECD countries (column 2), and when we restrict the sample to OECD but exclude the Cairns group of countries.¹⁰ We see that this variation is both cross-sectional as well within-country across time. The positive and significant coefficients of agricultural productivity in table 6 provide support for the hypothesis that as agricultural productivity rises, lobbying becomes more beneficial and we are likely to see more agricultural protection. The rise in the magnitude of the coefficient between columns 2 and 3 suggests that lobbying plays a more important role in rich OECD countries.

Revenue motive for agricultural protection

In table 7, the variable of interest is direct taxes as a percentage of total tax revenue. If the government has a well developed tax infrastructure, it can raise revenue through direct taxes, and it can use some of this revenue to provide agricultural subsidies. In this case there should be a complementarity between the government's ability to raise direct taxes and agricultural assistance. On the other hand, if the government is not able to raise direct tax revenues, it might have to resort to indirect taxation which can take the form of import tariffs. If these tariffs are agricultural tariffs, then we might see some substitutability between direct taxes and agricultural assistance. Whether the ability to raise direct taxes negatively or positively affects agricultural assistance is therefore an empirical question. All but one of our regressions in table 7 show a negative sign for the coefficient of direct taxes as a share of total tax revenues. This result holds both for nominal and relative rates of assistance to agriculture. For the latter, it is driven primarily by non-OECD countries.

¹⁰ The Cairns countries are those who favor free trade and open market access in agriculture.

Conclusion

Our main objective in this chapter is to identify the political-economy drivers in the evolution of international trade policies with respect to agriculture. Understanding these determinants should not only help provide deeper insights into trade policy formulation in general, but also allow us to understand what makes agriculture a particularly contentious issue in recent trade talks.

We have set up a basic framework that allows us to put forth various testable hypotheses on the variation and evolution of agricultural protection. We find that both the political ideology of the government and the degree of inequality are important determinants of agricultural protection. Thus, both the political-support-function approach as well as the median-voter approach can be used in explaining the variation in agricultural protection across countries and within countries over time. The results are consistent with the predictions of a model that assumes that labor is specialized and sector-specific in nature. Some aspects of protection also seem to be consistent with predictions of a lobbying model in that agricultural protection is negatively related to agricultural employment and positively related to agricultural productivity. Public finance aspects of assistance to agriculture also seem to be empirically important.

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Table 1: Data description

Variable	Years	Description
<i>Relative Rate of Assistance to agriculture (RRA)</i>	1955-2007	Anderson and Valenzuela (2008). (Methodology in Anderson et al. 2008.)
<i>Nominal Rate of Assistance to agriculture (NRA)</i>	1955-2007	Anderson and Valenzuela (2008). (Methodology in Anderson et al. 2008.)
<i>Political Ideology</i>	1975-2000	Political Ideology of chief executive (the President for Presidential systems and largest ruling party for Parliamentary system). Source: Database of Political Institutions 2004 (update of Beck et al. 2001).
<i>Income Inequality</i>	1960-1999	Gini coefficients from Dollar and Kraay (2002) and Deininger and Squire (1996, 1998). Data for the latter at www.worldbank.org/research/inequality/data.htm
<i>Land Inequality</i>	One year	Land Gini from Li, Squire and Zou (1998).
<i>Per capita GDP</i>	1960-2000	GDP per capita on a PPP basis. Source: World Bank (2007).
<i>Share of agriculture in employment</i>	1960-2000	Total workers employed in agriculture as a proportion of labor force. Source: World Bank (2007).
<i>Comparative Disadvantage in Agriculture</i>	1960-2000	Measured as $(X-M)/(X+M)$ where X is exports of agricultural products and M is the imports of agricultural products.
<i>Direct taxes (% of total taxes)</i>	1970-2000	Direct taxes include income taxes, profits and capital gains tax. Source: World Bank (2007).
<i>Constraints on Executive</i>	1960-2000	Extent of institutionalized constraints on the decision-making powers of chief executives, whether individuals or collectivities. Source: Polity IV Project, (Marshall, Jaggers and Gurr 2000).
<i>Rural party</i>	1975-2000	Dummy equals 1 if chief executive's party can be classified as rural. Source: Database of Political Institutions 2004 (update of Beck et al. 2001).

Table 2: Hypotheses and predicted signs

Hypotheses	Description	Predicted signs
1: <i>Political Ideology</i>	Regress agricultural protection on left-wing ideology and leftist ideology*per capita income	Mobile labor case: Negative on leftist ideology and positive on the interaction term. Immobile labor case: Positive on leftist ideology and negative on the interaction term.
2: <i>Inequality</i>	Regress agricultural protection on income inequality and inequality*per capita income	Mobile labor case: Negative on inequality and positive on the interaction term. Immobile labor case: Positive on inequality and negative on the interaction term.
3: <i>Lobbying</i>	Regress agricultural protection on share of agriculture in employment and agricultural productivity	Negative on employment share and positive on agricultural productivity
4: <i>Public Finance</i>	Regress agricultural protection on share of direct taxes in total taxes/expenditure	Negative on direct tax share

Table 3: Ideology and agricultural protection: per capita GDP

	(1)	(2)	(3)	(4)
	RRA	RRA	RRA	RRA
<i>Left-wing ideology</i>	0.555*** (0.148)	0.726*** (0.177)	0.270** (0.124)	0.240* (0.133)
<i>Ideology*per capita GDP</i>	-0.064*** (0.017)	-0.082*** (0.021)	-0.030** (0.013)	-0.027* (0.014)
<i>per capita GDP</i>	0.528*** (0.046)	0.562*** (0.057)	0.385*** (0.054)	0.376*** (0.063)
<i>Constraints on executive</i>		-0.002 (0.002)		0.001** (0.000)
<i>Presidential system</i>		-0.091*** (0.018)		0.097*** (0.026)
<i>Rural party in power</i>		0.634*** (0.221)		0.446*** (0.144)
<i>Constant</i>	-4.444*** (0.408)	-4.687*** (0.508)	-3.328*** (0.513)	-3.265*** (0.576)
<i>Observations</i>	1261	1077	1261	1077
<i>R²</i>	0.39	0.43	0.17	0.22
<i>Number of countries</i>	60	58	60	58
<i>Country-fixed effects</i>	No	No	Yes	Yes
<i>Year-fixed effects</i>	No	No	Yes	Yes

Robust standard errors in parentheses; * significant at 10%; ** significant at 5%; *** significant at 1%

The dependent variable is the relative rate of assistance (RRA) calculated as $((1+NRA_{ag})/(1+NRA_{nonag})-1)$ where NRA_{ag} is the nominal rate of assistance to tradable agricultural products and NRA_{nonag} is the nominal rate of assistance to tradable non-agricultural products. Ideology is coded as 1 for Right wing governments; 2 for Centrist and 3 for Left-Wing governments. We use the political ideology of the executive for Presidential systems; of the largest governing party in the parliament for parliamentary system and average of the Executive and largest party for mixed systems. Columns 1, and 2 present pooled OLS estimates; columns 3 and 4 present within-estimates with country and time fixed effects.

Table 4: Inequality and agricultural protection: per capita GDP

	(1)	(2)	(3)	(4)	(5)
	RRA	RRA	RRA	RRA	RRA
<i>Inequality</i>	0.109*** (0.020)	0.054* (0.029)	0.107*** (0.021)	0.049** (0.023)	0.050** (0.023)
<i>Inequality*per capita GDP</i>	-0.014*** (0.002)	-0.008** (0.003)	-0.014*** (0.002)	-0.006** (0.003)	-0.006** (0.003)
<i>per capita GDP</i>	0.800*** (0.084)	0.792*** (0.237)	0.768*** (0.088)	0.484*** (0.110)	0.488*** (0.111)
<i>Constraints on executive</i>			-0.004*** (0.001)		0.001 (0.001)
<i>Presidential system</i>			-0.063** (0.025)		0.037 (0.028)
<i>Rural party in power</i>			0.068 (0.187)		0.205 (0.227)
<i>Constant</i>	-6.308*** (0.724)	-6.091*** (1.993)	-6.031*** (0.755)	-3.680*** (0.854)	-3.944*** (0.948)
<i>Observations</i>	450	43	441	450	441
<i>R²</i>	0.46	0.67	0.46	0.31	0.30
<i>Number of countries</i>	62	43	62	62	62
<i>Country-fixed effects</i>	No	No	No	Yes	Yes
<i>Year-fixed effects</i>	No	No	No	Yes	Yes

Robust standard errors in parentheses; * significant at 10%; ** significant at 5%; *** significant at 1%

The dependent variable is the relative rate of assistance (RRA) calculated as $((1+NRA_{ag})/(1+NRA_{nonag})-1)$ where NRA_{ag} is the nominal rate of assistance to tradable agricultural products and NRA_{nonag} is the nominal rate of assistance to tradable non-agricultural products. Columns 1, and 2 present pooled OLS estimates; columns 3 and 4 present within-estimates with country and time fixed effects. Column 2 uses Land Gini as the measure of inequality. All others use income Gini.

Table 5: Ideology, inequality and agricultural protection: share of employment

	(1)	(2)	(3)	(4)	(5)
	RRA	RRA	RRA	RRA	RRA
<i>Left-wing ideology</i>	-0.119*** (0.040)	-0.036* (0.021)			
<i>Ideology*share of agriculture in employment</i>	0.002** (0.001)	0.001 (0.001)			
<i>Gini</i>			-0.026*** (0.005)	-0.038*** (0.010)	-0.015** (0.007)
<i>Gini* share of agriculture in employment</i>			0.000*** (0.000)	0.002* (0.001)	0.000* (0.000)
<i>share of agriculture in employment</i>	-0.018*** (0.002)	-0.026*** (0.004)	-0.031*** (0.005)	-0.018*** (0.005)	-0.032*** (0.010)
<i>Constraints on executive</i>	-0.011*** (0.001)		-0.014 (0.016)	-0.055 (0.048)	0.009 (0.015)
<i>Presidential system</i>	-0.243*** (0.027)		-0.119*** (0.038)	-0.064 (0.074)	0.031 (0.040)
<i>Rural party in power</i>	0.784*** (0.282)		0.084 (0.240)	0.000 (0.000)	0.276 (0.271)
<i>Constant</i>	1.137*** (0.095)	0.749*** (0.108)	1.691*** (0.222)	2.065*** (0.480)	1.159*** (0.342)
<i>Observations</i>	645	645	284	27	284
<i>R²</i>	0.25	0.31	0.37	0.63	0.33
<i>Number of countries</i>	49	49	50	27	50
<i>Country-fixed effects</i>	No	Yes	No	No	Yes
<i>Year-fixed effects</i>	No	Yes	No	No	Yes

Robust standard errors in parentheses; * significant at 10%; ** significant at 5%; *** significant at 1%

The dependent variable is the relative rate of assistance (RRA) calculated as $((1+NRA_{ag})/(1+NRA_{nonag})-1)$ where NRA_{ag} is the nominal rate of assistance to tradable agricultural products and NRA_{nonag} is the nominal rate of assistance to tradable non-agricultural products. Ideology is coded as 1 for Right wing governments; 2 for Centrist and 3 for Left-Wing governments. We use the political ideology of the executive for Presidential systems; of the largest governing party in the parliament for parliamentary system and average of the Executive and largest party for mixed systems. Columns 1, 3, and 4 present pooled OLS results; the rest present results with country and time fixed effects. Column 4 uses Land Gini as the measure of inequality. Columns 3 and 5 use income Gini.

Table 6: Lobbying and agricultural protection

	(1)	(2)	(3)	(4)
	RRA (all countries)	RRA (all countries)	RRA (OECD only)	RRA (OECD excl. Cairns group)
<i>Employment in agriculture (% of total employment)</i>	-0.913*** (0.134)	-2.712*** (0.406)	-2.991*** (0.821)	-3.423*** (0.894)
<i>Agricultural productivity</i>	0.069*** (0.021)	0.194*** (0.035)	0.261*** (0.082)	0.269*** (0.101)
<i>Constraints on executive</i>	-0.005* (0.003)	0.003* (0.001)	0.004 (0.003)	0.004 (0.003)
<i>Presidential system</i>	-0.134*** (0.022)	-0.005 (0.028)	0.020 (0.066)	0.023 (0.071)
<i>Rural party in power</i>	0.389*** (0.150)	0.385*** (0.095)	0.398*** (0.114)	0.405*** (0.121)
<i>Constant</i>	0.052 (0.198)	-0.908*** (0.330)	-1.577** (0.794)	-1.469 (0.967)
<i>Observations</i>	746	746	376	313
<i>R²</i>	0.30	0.28	0.43	0.48
<i>Number of countries</i>	58	58	20	17
<i>Country-fixed effects</i>	No	Yes	Yes	Yes
<i>Year-fixed effects</i>	No	Yes	Yes	Yes

Robust standard errors in parentheses; * significant at 10%; ** significant at 5%; *** significant at 1%

Column 1 presents pooled OLS results; columns 2-4 present results with country and time fixed effects. Columns 1 and 2 include all countries; column 3 includes only OECD countries; from which Column 4 excludes the Cairns group of countries (Australia, Canada and New Zealand).

Table 7: Revenue motive for agricultural protection

	(1)	(2)	(3)	(4)	(5)	(6)
	NRA	NRA	RRA	RRA	RRA (OECD only)	RRA (non-OECD only)
<i>Direct taxes (% of total taxes)</i>	-0.002** (0.001)	-0.003** (0.001)	-0.002* (0.001)	-0.003** (0.001)	0.005 (0.009)	-0.004*** (0.001)
<i>Revealed comp adv in agriculture</i>		-0.047 (0.057)		-0.091 (0.057)	-0.182 (0.270)	-0.023 (0.051)
<i>Constraints on executive</i>		0.001*** (0.000)		0.001*** (0.000)	0.000 (0.000)	0.001** (0.000)
<i>Presidential system</i>		0.114*** (0.023)		0.172*** (0.027)	0.000 (0.000)	0.124*** (0.019)
<i>Constant</i>	0.223*** (0.055)	0.356*** (0.084)	0.132** (0.064)	0.285*** (0.069)	0.943* (0.477)	-0.049 (0.047)
<i>Observations</i>	554	301	531	285	100	185
<i>Number of countries</i>	64	50	64	49	19	30
<i>R²</i>	0.13	0.14	0.13	0.14	0.51	0.34
<i>Country-fixed effects</i>	Yes	Yes	Yes	Yes	Yes	Yes
<i>Year-fixed effects</i>	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses; * significant at 10%; ** significant at 5%; *** significant at 1%

The dependent variable in columns 1 and 2 is the nominal rate of assistance to agriculture. The dependent variable in columns 3-6 is the relative rate of assistance to agriculture (RRA) calculated as $((1+NRA_{ag})/(1+NRA_{nonag})-1)$ where NRA_{ag} is the nominal rate of assistance to tradable agricultural products and NRA_{nonag} is the nominal rate of assistance to tradable non-agricultural products. Direct taxes include income taxes, profits and capital gains tax. Revealed comparative advantage in agriculture is defined as $(X-M)/(X+M)$ where X is exports and M is imports of agricultural products. All columns include country and time fixed effects. Column 5 shows results with only OECD countries; column 6 shows results with only non-OECD countries.