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A COLLECTIVE ACTION INQUIRY INTO THE POLITICAL ECONOMY OF FOOD PRICING

February, 1995

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A Collective Action Inquiry into the Political Economy of Food Pricing

by

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IRIS Summary

A Collective Action Inquiry into the Political Economy of Food Pricing

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Thierry van Bastelaer

In recent years, several studies have documented the magnitude of food pricing distortions in developing and industrial countries, as well as the economic impact of these distortions on food production and consumption. However, few studies have addressed the nature of the political forces that determine the levels of price protection granted to consumers and producers of food. As a stylized fact, food price distortions are biased toward food consumers in developing countries, and toward agricultural producers in industrial nations. Given that both of these groups constitute a minority of the population in their respective regions, there appears to be a growing need to test a paradigm that is able to elucidate how the political process drives majorities to subsidize minorities. The theory of collective action offers significant insights into the mechanism of this political process; it describes how the attributes of public goods, such as price protection, account for the difficulties inherent in the organization of successful lobbying by large interest groups.

This paper provides new insights into the role that interest groups play in influencing food policies to their benefit. It documents the first attempt, using pooled cross-sectional and time series data, to isolate and test the determinants of direct and indirect food pricing policies over a wide range of countries. The role of the theory of collective action in explaining recognized patterns of food pricing distortions is placed in a precise conceptual framework, and analyzed empirically, with the following results. First, and most importantly,

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the theory of collective action appears to be a major actor in exposing the political factors that account for the distortions in food prices. The relative size of farm interest groups is negatively correlated with the price protection they receive from governments, even when the level of national economic development is taken into account. This result casts doubts on the applicability of models of voting behavior to the dynamics of food pricing, since the minority group, be it constituted of food producers or consumers, distorts public policies to its advantage, and at the expense of the majority. Second, the role of collective action variables is valid both over time and across a wide spectrum of countries, but it is less relevant in industrial countries than in the developing regions. The third notable result is that richer countries offer their farmers higher price protection than do poorer countries, but that the exact components of income per capita that account for this result remain to be identified. The main policy implications of this research are the following: First, the ability of international donors to insure successful implementation of adjustment programs in recipient countries will require that these donors grant intensified attention to the role that interest groups play in supporting or opposing structural change. This consideration is particularly important when the adjustment programs include provisions that recommend significant reductions in the level of subsidies for food producers or consumers. Second, the prevalent partiality of policymakers toward food consumers in developing countries makes it very difficult for policymakers to offer production incentives to farmers in the form of higher prices without adversely affecting fiscal and trade balances, or social peace. Increasing local food production without inducing social unrest requires a combination of price policies more favorable to agricultural producers, and the use of precisely targeted measures of income support.

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"Siasa ni kilima" ("Politics is agriculture")

Tanzanian proverb

"There is, indeed, no such thing as an apolitical food problem"

Amartya Sen

I. Introduction

The proposition that industrialized countries protect their agricultural producers while less developed ones discriminate against them has gained widespread acceptance by agricultural economists and political scientists.[1] Several recent studies have documented the magnitude of these distortionary practices and their impact on food prices and production.[2] A small number of projects have also attempted to provide interpretations for these political behaviors that rely on interest group, or collective action, concepts.[3] These studies are characterized by a common postulate: the prices of food items are determined by political agendas at the national level, rather than by climatic conditions, or by variations in global food markets. The suggestion that new research is needed to challenge the conclusions of traditional models of voting behavior and price setting is justified by the observation of the following paradox: although agricultural producers in industrialized countries represent a

[1] Byerlee and Sain (1986) represent an exception by disputing the validity of this stylized fact.

[2] See, among others, Bale and Lutz (1979), Gulati and Sharma (1992), Knudsen, Nash and al. (1990), Krueger, Schiff and Valdés (1991), Pinstrup-Andersen (1993), Sah and Stiglitz (1987), and Schultz (1978).

[3] Anderson and Hayami (1986), de Gorter and Tsur (1991), Gardner (1987, 1989), Lindert (1991), Miller (1991), Swinnen (1994), and Timmer (1991) have contributed to this line of research.

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small proportion of the labor force, their political influence is such that they receive prices for their products which, on average, lie well above international prices.[4] Farmers in developing countries, on the other hand, constitute the majority of the labor force, yet they rarely have the upper hand in the struggle for influence over the government's policies that affect them. As a result, they face agricultural prices which are low, relative to the international standards. By relying on newly available figures, and on some of the latest developments in the handling of pooled data, this paper suggests that the dynamics of interest group competition offer an essential clue to the understanding of the political forces that shape this paradox.

The paper opens with a brief depiction of the magnitude of the distortions in food prices, and their impact on inter-sectoral transfers. After the presentation of a conceptual framework that applies collective action concepts to food pricing policies, the paper discusses the results of an empirical analysis that addresses simultaneously the time series and cross-sectional aspects of food pricing policies, over a wide array of industrial and developing countries. These results suggests that an interest-group approach contributes significantly to the understanding of the political mechanisms that generate food pricing policies, even when the level of economic development is taken into account. A conclusion discusses the implications for research suggested by the present results.

[4] While it contributes no more than 2 percent of the GDP, the farm industry in the United States is at the source of 8 percent of campaign funds. According to the Economist, the American sugar lobby is the third-largest contributor to campaign funds, following lawyers and doctors. In the 1980 campaign, the dairy industry contributed more than all the trade unions together.

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II. Food Pricing Distortions: The Evidence and Historical Outlook

The literature on food prices suggests that the interaction of country-specific political variables leads to distortions in the prices of food that are negative in most developing economies, and positive in most industrial nations. The levels of protection in a sample of 31 countries, as measured by the nominal total protection rate,[5] are presented in Table 1. The countries are classified by region, which are themselves listed in order of average protection level (with Sub-Saharan Africa at the lower end, and Japan and other food importers at the higher end.)

Direct protection rates vary between -26.9 percent in Ghana and 85.9 percent in Switzerland (i.e., the average price paid to farmers in Ghana during the 1955-80 period was 26.9 percent lower than world prices, and 85.9 percent higher in Switzerland.) Indirect protection is an important element of total protection in developing countries; it dominates the rate of direct taxation in all regional averages. Comparable information is not available for industrial countries (see page 15.)

Table 2 indicates the range of levels and changes in protection rates of rice and wheat over the 1960-80 period. Over time, some protection rates follow a clear upward trend, as in countries like Japan and Korea; others stay at permanently high levels, as in Switzerland, or show no constant trend over the period under review.

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[5] This indicator was introduced in Krueger, Schiff and Valdés (1991). It captures the distortions of incentives that result from direct and indirect pricing policies. The former is defined as the ratio of farm prices to border prices of traded goods; this indicator captures only the distortion of production incentives that result from discretionary management of farmgate prices. The latter indicator accounts for the effects of trade policies on non-agricultural products, and of real exchange rate overvaluation. Industrial protection policies consistently account for a larger portion of the indirect protection of agriculture than exchange rate overvaluation. Alternative indicators of price distortions, such as the consumer and producer subsidy equivalent, have recently been made available, but the largest datasets available as of this writing use the nominal total protection rate.

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As Tables 1 and 2 suggest, the positive protection of agricultural producers is more pervasive in more developed countries at any moment in time, and a similar evolution takes place in a large number of countries as their economies develop. Anderson (1986) suggests that all economies eventually reach a stage in their economic development where price protection of farmers shifts from negative to positive values. In Japan, agriculture was heavily discriminated against until 1868, under the Tokugawa shogunate. Implicit taxation was gradually reduced following the Meiji Restoration, and rice farmers started to be receive price protection in 1904. Notwithstanding a reduction over the 1918-27 period, Japanese rice farmers enjoyed an increase in the rate of their protection from 9 percent in 1903 to 84 percent in 1938. Support of farmers has kept increasing since World War II, in spite of half-hearted and short-lived attempts at price liberalization. In the United States, assistance to farmers was first introduced during World War I as a temporary measure to induce farmers to increase production. At the end of the 1920's, the Hoover administration created the Federal Farm Board, and endowed it with the explicit mission of increasing US agricultural prices above world prices. Today's farm policy still relies on the philosophy and most of the tools that were developed during the Great Depression. During the seventeenth and eighteenth centuries, France, Italy, and Germany were providing urban centers with low-cost food by the operation of large bureaucracies that bought grain directly from producers.[6] In these countries, the transition from implicit taxation to protection of agricultural producers took

[6] During the same period, England stood distinctly apart from Continental nations in the management of its agricultural policy. Under the Corn Laws, farmers were allowed to export grain when the border price was higher than the domestic price; imports were prohibited in the opposite situation. This policy effectively favored English farmers at the expense of urban consumers. See Bates (1988) for a discussion of the historical bias created by the perceived prominence of the English case in European agricultural policies.

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place between 1860 and 1930. The formation of the European Community institutionalized on a large scale the protection that already existed in the initial member states. The protection first granted to cereal farmers was extended to the producers of other commodities, and the Common Agricultural Policy has taken such a role in the European Union that it has become virtually non-negotiable. In most of the countries that have undergone radical economic reforms in the last 50 years, the welfare of farmers has been significantly, and positively, affected. In Korea, Taiwan, and Brazil, for example, the transition from negative to positive values of farm price protection took place in a much shorter period than in any of the developed countries. Most developing economies have not experienced political and institutional changes that lead to a fundamental transformation of the official attitude toward farmer interests. Especially in Africa, governments rely on a variety of instruments to keep food prices low,[7] to the benefit of urban dwellers and industries, and to the detriment of the majority of farmers. The food policies followed by these countries present striking similarities with the experience of Continental Europe before the nineteenth century.

An important finding of Krueger, Schiff and Valdés (1991) is the different treatment, in terms of relative prices, that governments accorded to import-competing and exportable commodities, as reflected in Table 3. While exportable commodities in developing countries are usually subject to negative protection, import-competing ones are almost always positively protected. Nevertheless, the total direct protection rate on all selected products is negative in all but two countries, and in all four developing regions, since the direct tax on exportables and the indirect taxation dominate any existing protection of importables.

[7] These mechanisms include price controls, government-owned monopsonies, and trade quotas.

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III. Impact of Pricing Distortions on Inter-Sectoral Transfers

The empirical section of this paper tests the hypothesis that the policies of food pricing are the outcome of the interaction of political pressure exerted by farmers and food consumers on the government. The present section briefly describes the impact of food pricing policy on these two interest groups in 18 developing countries, and in the OECD.[8]

On average, pricing distortions adversely affect the returns to farmers in developing countries, and reduce the welfare of food consumers in industrial countries. Table 4 reproduces estimates of annual transfers to and from agriculture in developing countries, as a percent of each country's agricultural GDP. Farmers receive (non-price) transfers in the form of irrigation, roads, and research and extension expenditures. Net transfers are therefore defined as the sum of the transfers resulting from price and non-price policies. Were it not for the presence of Brazil and Korea, countries whose food policies have increasingly reflected farmers' interests in the last thirty years, averages presented in Table 4 would indicate that pricing policies create net transfers from food producers to consumers in all developing regions.[9]

In industrial countries, the average annual transfers between 1984 and 1987 originate

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[8] The paper by Bale and Lutz (1979) has served as the reference for the effects of pricing distortions during most of the 1980s, until it increasingly came under attack for its oversimplified assumptions (i.e., consumer and producer surpluses calculated on the basis of linear demand and supply curve, and purely cross-sectional analysis.)

[9] For lack of information on land and wealth distribution, these numbers do not reflect the fact that small- and large-scale farmers are affected differently by pricing policies. Unless they are able to differentiate themselves from other producers, large farmers receive the same price for their tradable crops as small farmers. They do, however, benefit from an absolute advantage when it comes to receiving non-price benefits, for these can be selectively distributed by the government. Table 4 also does not exhibit the change in the direction in transfers over the 1960-84 period. For example, the protection afforded to Korean farmers resulted in a positive transfer to agriculture of 35 percent of the agricultural GDP at the end of the period, despite a period average of -12.5 percent.

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from the consumers/taxpayers and benefit the producers, as Table 5 shows. These transfers are equivalent to more than 70 percent of the total agricultural GDP in Japan, Sweden and Switzerland.[10]

The impact of price policies on sectoral welfare helps explain the intense political sensitivity of government actions that affect the price of food. The mechanism of this political action, and how it affects the outcome of public policies toward food producers and consumers is described next. A brief discussion of the relevant features of the theory of collective action is used to conceptualize the competition that farm and consumer interest groups engage in to bias the structure of price protection in their favor.

IV. Conceptual Framework

IV.A. Collective Action and Group Size

One of the main contributions of the theory of collective action to the fields of economics and political science is the distinction it draws between the rationality of economic agents observed individually, and collectively. This approach to the study of group behavior, as initiated by Olson (1965), starts from the observation that individual economic rationality is not a sufficient condition for collective rationality. The apparent incompatibility between this statement and the concept of the Invisible Hand is misleading, since the nature of the goods alluded to by Smith's concept differs fundamentally from those studied by Olson. The

[10] In addition to the transfers between farmer and consumer groups, other economic variables are affected by food pricing policies. These include the extent of evasion of controls and corruption, the reallocation of resources toward production of protected commodities that are often purchased by a minority of consumers, and wide variations in trade balances, fiscal deficits, rural unemployment, and internal migration.

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self-interested pursuit of public goods by an interest group can result in lower collective welfare. Public or collective goods exhibit two characteristics which account for most of the difficulties inherent in collective action. While they were not referred to as such in Olson, these properties are now known as the non-exclusion and the non-rivalry of consumption.[11] Private goods display neither of these properties, while "pure" public goods (which Olson calls "inclusive" goods) exhibit both. In the context of the present study, an example of an "inclusive" good would be the benefits farmers receive from a price-support program run by the government.[12] "Impure" public goods are characterized by imperfect non-exclusion and/or imperfect non-rivalry.[13] Among these, goods that are rival but non-excludable are called "exclusive" by Olson. The benefit any individual receives from an "exclusive" good is an inverse function of the size of the group; a price increase resulting from output restriction illustrates the concept.

The feature of public goods that is most relevant to the present study is their non-excludable nature. When a good available to the members of a group is non-excludable, each member is unlikely to bear a fraction of the total cost equal to the his/her share of the total benefit. Rather, the amount of time or resource that members commit to the provision of the

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[11] Benefits from a good are non-excludable if members who do not contribute to the provision of the good cannot be excluded from its consumption. A good exhibits non-rivalry if its consumption by one member does not affect the other members' consumption of it.

[12] To the extent that the government guarantees all farmers a given price, this price is by design non-rival and non-excludable on the producer side. Note that if the government finances this price support program by levying taxes on a fixed number of non-farmers, this tax is a rival but non-excludable public good for taxpayers, since an increase in the number of taxpayers reduces the per capita fiscal burden. The price support remains non-rival and non-excludable for the farmers.

[13] Among these, goods that are excludable but non-rival are known as "club goods." Examples of such goods, non-rival at low and middle levels of usage, include recreation facilities, open-air concerts, highways, and national parks.

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public good is generally smaller than the marginal-value they derive from its consumption. As a result, the amount of the public good provided is not Pareto-optimal for the group. It is therefore likely that most members of a group will benefit from a good provided by the group without contributing to its provision, unless "selective incentives," as Olson calls them, are directed at non-contributors. Such incentives are (positive or negative) reinforcements, which reward members who bear their portion of the total cost of collective action, and penalize members who fail to do so.

While small groups may provide their members with a (still suboptimal) amount of the public good without resorting to selective incentives, larger groups will not supply the same level of public good without extensive use of these incentives. Indeed, the larger the number of individuals in the group, the more serious the suboptimality will be, for three reasons. First, the likelihood that individual contribution to the provision of the public good will be perceptible decreases with group size; the incentive for individual action diminishes accordingly. Second, successful collective action requires a significant level of organization, communication, and coordination among members; the transaction cost associated with these arrangements increases with group size, and inhibits the efficacy of collective action.[14] Finally, the development and operation of selective incentives present more difficulties in large groups than in small ones. Olson's conclusion, that "the larger the group, the less it will further its common interest" (1965, p.36) has given rise to a number of critical

[14] Whether these costs increase at a higher or lower rate than group size is an important issue, which will be addressed later in this section.

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developments.[15] Of particular interest in this respect is Chamberlin's (1974) paper. Chamberlin's conclusions echo Olson's in the case of "exclusive" goods: the total quantity of the public good provided approaches zero as group size approaches infinity. Chamberlin submits, however, that when the collective good is "inclusive," the amount of the good **increases** with group size, and approaches a finite limit as the group size approaches infinity. He justifies this result by the fact that the decrease in the contribution of each individual (also acknowledged by Olson) is more than offset by the increase in group size. Chamberlin's analysis suggests that the relationship between group size and provision of "inclusive" public goods might not be inverse; it does not, however, establish that the only logical corollary of this result is a positive relationship between provision level and group size. As the following section suggests, the decrease in individual contribution and the increase in group size may well interact in ways which yield undetermined levels of provision of "inclusive" public goods.

IV.B. Collective Action and Food Pricing Policies

The theory of collective action, and particularly the role of interest group size in the provision of public goods, provides an appropriate theoretical setting for the analysis of pricing policies.[16] Assume the economy comprises two homogeneous groups, the urban

[15] Sandler (1992) and Chamberlin (1974) have pointed to the unspecific role that rivalry plays in Olson's theoretical construction; Olson's analysis does not specify whether it is concerned with the provision of "exclusive," or "inclusive" goods. (Both goods share the non-exclusion property, but only "inclusive" goods require perfect non-rivalry.)

[16] This section draws on Olson's (1985) and Peltzman's (1976) papers.

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coalition[17] and the farm group,[18] which engage in collective action to further the common interest of their mer. bers. The population in the economy is fixed and, because the government acts only as a redistributive agent, its budget is unaffected by its pricing policy.[19]. The government's objective function is to maximize the aggregate support it receives from the farm and the non-farm groups. An increase (decrease) in the agricultural protection rate creates larger (smaller) political support from farm interest groups, and in higher (lower) opposition from the urban coalition. The government grants protection to the most influential group, in the form of positive or negative markups in food price. The level of protection granted to farmers is an increasing function of the farm lobby's efficiency in pressuring the government for higher prices, and a decreasing function of the urban coalition's efficiency in lobbying for lower prices. The equilibrium level of protection is reached when the marginal benefit of additional support from the farmers is equal to the marginal cost of lost support from the urban coalition.[20]

In "The Logic of Collective Action," Olson does not stipulate whether he considers

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[17] The coalition includes the urban population and industry, whose interests coincide: low food prices allow manufacturers to put downward pressure on their wage bills; they also contribute to lower input costs, and increase the share of urban income available for spending on manufactured goods.

[18] The word "farmer" will be used throughout the rest of the paper as a substitute for the cumbersome, yet more correct, "member of the domestic agricultural labor force." This term refers to landowners as well as agricultural laborers, but these two groups often have differing interest. This prospect is addressed at the end of the econometric analysis.

[19] This assumption is tested in the econometric analysis.

[20] The protection granted by the government is a "pure," or "inclusive," public good for the members of both groups: all pay (receive) the same price for food bought (sold), no matter the size of the group membership. Note that if the government orchestrates a lump-sum cash transfer from the "losing" to the "winning" group, this transfer has the properties of an "exclusive" public good for both groups: a change in group size affects both the subsidy and the tax per capita. The lack of distinction between the different theoretical consequences of prices and lump-sum transfers on farm lobbying has been the cause of significant confusion in the literature, as exemplified in Timmer (1991) and Swinnen (1994).

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group size as an absolute or relative concept. This indetermination is justified in the context of Olson's book by the fact that its analysis does not specifically address competition among groups; an increase in the absolute size of a group is a sufficient condition for the decreased efficiency of its collective action. When two or more groups are involved, however, their comparative efficiency is a decreasing function of their relative, rather than absolute, size. As an example, suppose the farm lobby and the urban coalition in small country are competing with each other for price protection by the government. Assume there are one million members in the farm lobby and three million in the urban coalition. Disregarding for a moment the assumption that the total population is fixed, suppose that a large number of immigrants from a neighboring country, say one million people, joins the urban coalition. The political influence of the farmers (and therefore the level of protection they receive) is likely to increase as a result of the migration, even though the size of the farm group is unchanged. The political influence of the farm lobby increases because the urban coalition includes more members; there are still one million farmers after the immigration, but their share in the total population has decreased from 25 to 20 percent. The farmer group "wins" because the efficiency of its opponent's collective action has decreased. So the absolute number of members in a coalition is an incorrect indicator of the coalition's relative political influence; when two or more groups engage in collective action, a better determinant of their relative efficiency at organizing collective action is their relative sizes.[21]

[21] Anderson and Hayami (1992) and Lindert (1991) suggest that the function that relates political influence to relative group size is concave. A forthcoming paper establishes that, over a wide range of developed and developing countries, the function does not exhibit a global inflection point.

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Since price protection is an "inclusive" public good, the net effect of an increase in the share of farmers on the level of price protection is likely to be ambiguous, since two elements interact.[22] On one hand, the individual farmers' support for the government decreases when their relative number increases, because the cost per farmer of organizing the lobbying actions needed to exert more political influence than a shrinking urban coalition increases. On the other hand, the number of supporters of the government in rural areas increases. As a result, the net influence exerted by the whole farm group on the government, and the level of price protection, can either increase or decrease. This outcome has the same justification as Chamberlin's theoretical result. It does not, however, fully support Chamberlin, who asserts that the second effect always outweighs the first and that larger groups consistently provide higher levels of public goods to their members. There does not seem to be a theoretical ground to contend that the interaction of the two effects generates anything other than an ambiguous outcome. Empirical results, presented in the next section, suggest that the first effect actually outweighs the second one over the sample under review.

In addition to the relative size of farm groups, three collective action variables potentially affect the outcome of the interest group competition for the level of food prices. Lower political and social instability increases the efficiency of lobbying efforts in two ways: it allows the establishment of lasting channels of influence, and it reduces the role of consideration of popular reactions to higher food prices in the design of pricing policies. The efficacy of lobbying actions by farm groups, and the price protection that results, increase as farm areas become more densely populated, since shorter distances between farms facilitate

[22] See Chamberlin's commentary in the previous section.

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communication and coordination. Finally, the development of the communications and transportation infrastructure benefits the farm groups' political effectiveness more than the urban coalition's.

V. A Panel-Data Analysis of the Determinants of Food Pricing Distortions

The econometric analysis covers 31 countries on four continents,[23] over the 1960-82 period. The data used for the analysis is derived from a number of sources, which are listed in the appendix. This section describes the four variables presented in the conceptual framework, and introduces four control variables. A sign in parentheses next to each variable indicates the sign that the regression is expected to produce for the corresponding estimate, according to the above framework.

V.A. Description of the Variables

The total and direct nominal protection rates[24] are the dependent variables of the regression equation. Scholars generally consider that the nominal total protection rate in agriculture (NPRt) is an accurate estimate of the impact of food policies on the returns to farmers. However, these policies involve the use of instruments that are not exclusively designed to affect agriculture, such as exchange rate overvaluation and industrial protection. In comparison, the magnitude of direct pricing policies, as displayed in the nominal direct

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[23] In the developing regions: Argentina, Brazil, Chile, Colombia, Dominican Republic, Egypt, Morocco, Côte d'Ivoire, Ghana, Zambia, South Korea, Malaysia, Pakistan, Philippines, Sri Lanka, Thailand, Turkey and Portugal. In the industrial regions: Canada, United States, Denmark, France, Germany, Italy, Netherlands, United Kingdom, Sweden, Switzerland, Japan, Australia and New Zealand.

[24] See note 5, p.2.

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protection rate (NPRd), provides a more accurate indication of the disposition of governments toward farmers,[25] but it underestimates the impact of indirect distortions measures on food production and on welfare.

The protection variables used for the present analysis are weighted averages of the nominal and total protection rates of three major tradable crops: corn, wheat and rice. While this decision about the commodity coverage offers more consistency than an arbitrary and numerically unequal choice of commodities, it is not without cost. Given the wide heterogeneity of economic and agricultural structures included in the sample, the three commodities account for different fractions of each country's agricultural production.[26] The weights used for the calculation of the averages are the shares of each commodity in the total value of the yearly production of the three commodities, measured at producer prices.

The values of the indirect protection rate for the 13 industrial countries of the sample are set to zero, resulting in equal values of the direct and total protection rates for these countries. The indirect protection rate captures the effects of industrial protection and exchange rate overvaluation, and the magnitude of these policies has been negligible in the industrial countries of the sample, over the period under consideration.[27]

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[25] This conclusion is valid to the extent that direct pricing policies are not utilized to offset the effects of economy-wide macroeconomic policies. As Table 1 shows, however, both sets of policies reinforce each other in all but four of the 18 developing countries of the sample.

[26] See Table 19 for the share of each commodity in the countries' agricultural product.

[27] One caveat: even though exchange rate distortions were insignificant in the industrial countries of the sample over the 1960-82 period, the definition of the indirect protection rate by Krueger, Schiff and Valdés specifies that the reference (or equilibrium) value of the exchange rate is such that it equilibrates the current account. According to this definition, exchange rate distortions were indeed present in the industrial countries during the period covered by the sample, but their precise estimation would require an investment in time and resources that goes beyond the scope of this paper.

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Four variables are used as regressors:

- the **share of the agricultural labor force in the total domestic labor force** (-);
- the **farm population density** (+), defined as the ratio of agricultural labor force to square kilometers of arable land;
- the level of **political and social instability** (-), estimated by an index constructed by Gupta (1990);[28] and
- the development of the **communications and transportation** network (+).[29]

The literature suggests the inclusion of the following control variables in the analysis:

The value of the **net normalized food exports**[30] (-) accounts for the hypothesis that countries that are net importers of food protect their agriculture while net exporters implicitly tax it. This assertion is documented in Table 3. Olson (1985) and Anderson (1986) suggest that protecting farmers meets with less resistance if the country is a net importer of food, since assistance can be covertly provided through import controls. Protecting farmers when the country is a net exporter requires direct subsidies, which are more conspicuous (since they require budgetary approval) and therefore politically costlier. The introduction of this variable allows us to examine whether trade status can help explain the observed levels of agricultural protection.

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[28] A null value of the index indicates the total absence of political upheavals and social disturbances during the year under review. See the appendix for the sources and details on the construction of the variables.

[29] This variable is an index which takes the values 0 (poor network of communications and transportation) to 4 (extended and reliable network.)

[30] This variable is calculated by the following ratio:

$$\frac{(food\ exports - food\ imports)_t}{(food\ exports + food\ imports)_t}$$

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A loss of comparative advantage in agriculture resulting from the transfer of resources to industry is assumed to prompt higher demands for protection by farmer groups. An index of **comparative advantage of agriculture** (-), developed by Honma and Hayami (1986), is accordingly introduced in the regression analysis. A factor-endowment ratio is used as a proxy for the level of comparative advantage of agriculture.[31] [32]

The **Gross Domestic Product per capita** (+), measured in 1985 international prices, is used as a control variable to account for three effects. Firstly, as Engel's Law suggests, consumers spend a smaller proportion of an increasing income on food expenditures. Consequently, they have less incentive to collect information about the implicit tax they transfer to the farmers,[33] and their opposition to higher food prices decreases. Secondly, the demand for food is relatively price-inelastic in wealthier countries, and any increase in productivity results in larger price declines than in poorer countries, and in intensified calls for protection by the farm lobbies.[34] Thirdly, as incomes increase, a prosperous countryside can be regarded as a part of the national cultural heritage, prompting contributions by

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[31] See the appendix for the details of the construction of this variable, and comparison with another indicator of comparative advantage.

[32] Of all the variables used in the present regression analysis, the net exports and comparative advantage of agriculture are the most likely to be affected by a simultaneity bias. Higher price protection of farmers is expected to increase agriculture's comparative advantage, and to encourage exports and deter imports. The effects of simultaneity will be addressed later in this section.

[33] See Olson (1990) for the development of the "rational ignorance" argument and its implications for redistribution.

[34] Using pooled data for 17 commodities over a period of 69 years, Gardner (1987) suggests that low demand elasticity of demand for grains in the United States is associated with higher protection of cereal producers.

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consumers in the form of higher food prices.[35]

Finally, an **interaction term** (-) is included in the regressions to test an assumption of the conceptual framework: the government's role in the political confrontation that results in food price protection is that of a mere arbitrator, i.e. the government does not fiscally benefit from the protection it grants to the "winning" group. If this assumption is correct, the "size" of the government (measured by the share of government consumption in GDP) will not be correlated with the levels of agricultural protection. But the fiscal instruments used by the government vary according to the food trade status of the country: if the country is a net food importer, satisfying higher fiscal needs requires the imposition of tariffs on imported food, and thereby contributes to positive farmer protection. If the country is a net food exporter, however, rent-seeking by the government will result in higher taxes on food exports, and lower farmer protection. The interaction term is therefore specified as the product of the share of government consumption in GDP and the value of net food exports of the country.[36] Descriptive statistics of the variables are presented in Tables 6 to 8.

V.B. Econometric Specification

The few existing empirical analyses of food pricing policies have utilized simple econometric techniques.[37] These analyses were performed either on a purely cross-sectional

[35] In France, where concerns over the future of agriculture are particularly intense, consumers have repeatedly expressed in opinion polls their willingness to pay more for food in order to preserve the rural aspects of the national culture. A New York Times poll revealed that 55% of American customers are willing to pay more for their food to support farmers' incomes.

[36] The details of the construction of the interaction term are presented in the appendix.

[37] These analyses can be found in Honma and Hayami (1986), Miller (1991), and Lindert (1991.)

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basis, or with pooled data handled by ordinary least-squares (OLS) techniques. While these results offer support to the model of interest group competition, there are two main reasons to believe that OLS is not the correct specification for the analysis of food pricing distortions. First, a thorough examination of these earlier studies reveals that they have refrained from including in their regression equations the two independent variables which are shown here to carry most of the explanatory power. These variables, namely the size of farm interest groups and the level of development (approximated by the level of GDP per capita), are highly correlated with each other,[38] and their simultaneous inclusion in OLS regressions affects the significance levels of the coefficients to such an extent that no conclusion can be drawn about their relative empirical importance. Second, it is very likely that several unobserved characteristics of the countries and years of the sample, ignored by the OLS regression technique, influence the levels of agricultural protection. These country- and time-specific characteristics can be introduced in the econometric specification using the following format:

$$y_{it} = \bar{\beta}_1 + \mu_i + \lambda_t + \sum_{k=2}^{8} \beta_k x_{kit} + e_{it}$$

where k = 1, 2,...8 are the four collective action and the four control variables, i = 1, 2,...31 refers to the countries of the sample, and t = 1, 2,...23 are the years of the time period under review (1960-82); y_{it} is the value of the nominal direct (or total) protection rate, and x_{kit} is the value of the *k*th explanatory variable for country i at time t. The β_k are the coefficients of the corresponding explanatory variables. This model differs from the usual OLS specification in the following manner: $\bar{\beta}_1$ is a constant term, common to all countries

[38] The simple correlation between the GDP per capita and the share of farmers in the labor force is equal to -.849.

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and years, and the μ_i and λ_t represent the deviations from the common intercept for the *i*th country and the *t*th year, respectively. The error term e_{it} is assumed to have zero mean and constant variance. The deviations include the set of attributes that are specific to each country and year of the sample, and that are not inserted in the regression as independent variables either because they are not quantifiable, or because data for these effects is unavailable or insufficiently reliable.

The country-specific characteristics that affect the outcome of food policies include, among others, the following:

- the level of flexibility of the political process,
- the composition of electoral districts,
- the cultural and religious role of food and agriculture,
- the attitude of the urban public toward the countryside,
- the inequality in the distribution of arable land,[39]
- the personal, regional, or professional links of policymakers with the farming community,[40]
- the degree of the country's commitment to externally-imposed adjustment programs that require significant reductions, or elimination, in food subsidy programs,
- the recent occurrence of rural-urban migration,

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[39] Higher concentration of land ownership reduces the number of agents active in lobbying for higher food prices. See the end of section V.C.1 for an empirical test of this hypothesis.

[40] As described by Bates for Africa: "In Ghana and Zambia, for example, the parties which seized power [at Independence] had earlier broken away from and subsequently out-maneuvered more conservative political factions which had been based upon commercial agriculture... By contrast, in the Ivory Coast and Kenya, the political movements which seized power at the time of independence remained strongly centered on a political base made up of commercial farmers." (1983, p.113) Krueger (1992) has documented similar patterns of urban and rural allegiances in Sri Lanka, Pakistan, Malaysia, Argentina, and Chile.

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the existence, in developing countries, of an ideology of development aimed at industrializing the economy by transferring resources from agriculture,[41] and other institutional arrangements that affect the distribution of power among farmers and consumers.

Consideration of year-specific effects allows the analysis to account for factors that affect to all countries' agricultural sector during a given year. This added level of precision is particularly important, because the time series used for the regression analysis (1960-82) includes years of significant volatility in world energy and food prices.

The remainder of the econometric analysis addresses the following question: even though previous OLS results offer substantial endorsement of the role of collective action in explaining patterns of agricultural protection, does the conceptual framework presented in this paper acquire any empirical validation once the country- and time-specific effects are considered? In other words, are there identical factors that can help explain the behavior of governments toward farmers in all countries, or are national food policies fashioned only by factors that are specific to each country?

The first step in answering this question is to establish whether the country and time effects contribute significantly to the analysis. F-tests, which allow us to determine this, are reported in Tables 9 to 17. They indicate, in all regression equations, that the inclusion of

[41] Schultz, summarizing the views held by most development economists of the 1950s and 1960s (and applied by many newly independent governments), writes that "the opportunity for growth from agriculture is among the least attractive of the sources of growth; agriculture can provide a substantial part of the capital that is required to mount industrialization in poor countries; it also can provide an unlimited supply of labor for industry; it can even provide much labor at zero opportunity costs because a considerable part of the labor force is redundant in the sense that its marginal productivity is zero; farmers are not responsive to normal economic incentives but instead often respond perversely, with the implication that the supply curve of farm products is backward sloping; and large farms are required in order to produce farm products at minimum costs." (1964, p.8)

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country effects, and the addition of time effects to country effects, are econometrically justified; both types of effects are not statistically insignificant when considered together, and a correct specification of the model should include them.

The next step is to determine whether to model the country and time effects as fixed or random. If the effects are fixed, the μ_i and λ_t represent the coefficients of country-specific dummy variables, and "fixed effects"[42] is the appropriate estimation procedure; if not, the effects are assumed to be drawn from a stochastic distribution, and the "random effects"[43] specification should be used. Mundlak (1978) suggests that all country and time effects be treated as random, and that this decision will produce seriously biased estimates only if the unobservable effects are correlated with the independent variables used in the regression. Such a relationship is highly likely to be present, however: a lack of correlation between observed and unobserved characteristics is more prone to be an exception than the rule.[44] In such cases, the regression analysis will yield biased results if the random effects specification is used; using fixed effects will produce estimators that are best linear unbiased.[45] While

[42] This is also known as the least squares with dummy variable (LSDV), analysis of covariance (ANCOVA), or "within-units" approach.

[43] The random effects estimator is a weighted average of the fixed effects estimate and the "between groups" estimator (the OLS estimate of the coefficients using country means.)

[44] Consider the following example, using farm production data in pooled format: the output of each farm is assumed to be a function of the quantity of labor, land, inputs, and of skill, the latter of which is unobservable. Since skilled farmers produce more, and use more inputs, input use and skill (a farmer-specific effect) will be correlated. In the present study, it is likely that such country-specific effects as land inequality and flexibility of the political process is correlated with the level of political and social instability. Moreover, the measure of income per capita can be correlated in a number of different ways with the country-specific effects.

[45] The efficiency of the fixed effects technique is reduced if some independent variables are time-invariant; in this case, the fixed effects analysis is not able to distinguish these variables from the dummy variables introduced to account for time and country effects. The present analysis shows that two independent variables are affected by this problem.

BEST AVAILABLE DOCUMENT

the fixed effects specification is costly in terms of degrees of freedom lost,[46] the literature on food pricing provides no a priori reason to assume that the country effects are uncorrelated with the regressors, as is assumed in the random effects model. The choice of the correct regression procedure will then rely on the outcome of the Hausman specification test.[47] In all regressions of the direct and total protection rate over the whole sample, the results of the Hausman tests reject the null of orthogonality between the country effects and the explanatory variables; fixed effects is therefore the proper specification for the analyses performed on the complete sample. Regression on the two sub-samples involve the use of the random effects model in a few cases, as indicated in the tables.

V.C. Results of Fixed Effects Regressions of the Nominal Total and Direct Protection Rates

The results of the regression analysis are presented in two parts. First, estimates resulting from fixed effects regressions on the whole 31-country sample are discussed. The sample is then divided in two, to examine separately the relevance of the interest-group model of food pricing in industrial and in developing countries.

V.C.1. Regressions over the Complete Sample

Tables 9a and 9b report the results of fixed effects regressions of the total protection

[46] The method increases the number of regressors by including (i - 1) country dummies and (t - 1) year dummies.

[47] In this test, the null hypothesis is that no correlation exists between the country and the regressors. If the test produces large values of the chi-squared statistic, the null is rejected, and fixed effects is assumed to be the correct specification.

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rate over the 31-country sample: the results of fixed-effects regressions of the direct protection rate can be found in Tables 10a and 10b. The signs and significance levels of most coefficients are almost identical in the regressions of the two measures of protection. The theoretically pivotal variable of the collective action model, the **share of farmers in the total domestic labor force**, enters with negative coefficients and high levels of significance in all regressions, and it affects the outcome of both direct and total pricing policies. On average, a 10 percent decrease in the proportion of agricultural workers in the national labor force is observed along with a 4.04 percent increase in the direct protection rate, and a 5.91 percent increase in the total protection rate. This result is especially robust: since the econometric technique used is a double fixed effects (on countries and years), the significance of the coefficient of the share of farmers suggests that the levels of protection reflect deliberate policies by the governments. The wedge between border and local prices is maintained even in periods of fluctuation in world prices: food price stability appears to be a lesser concern for the governments than the need to address the demands of the interest group that wields the most political influence in food markets.

The regression equations numbered 1 to 6 include different combinations of three variables which are highly correlated with each other. These variables are the share of farmers in the labor force, the communications index, and the GDP per capita. As Tables 9 and 10 indicate, the coefficients for share of farmers are negative and highly significant in all equations estimated by fixed effects, including the ones that contain highly collinear regressors: in addition to attributing the proper weight to unobservable time and country effects, the fixed effects specification also attenuates the effects of multicollinearity on the

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significance of the estimates.[48]

The role of the group size variable in the econometric analysis suggests that, in the area of food pricing, the sum of all individual costs inherent in collective action outweighs the voting power of large groups, as suggested in the previous section; Chamberlin's claim that larger interest groups provide higher levels of "inclusive" public goods does not find support in the data.[49]

The estimate of the **political/social instability** variable is positive and insignificant in both sets of regressions; consequently, this variable does not appear to contribute to the understanding of food price interventions.[50] On one hand, it is conceivable that the insignificant role of the instability variable in the analysis results more from errors of measurement or incorrect standards in the construction of the variable than from a conceptual misspecification. On the other hand, it is likely that the indeterminate sign of the estimate results from the fact that political and social instability is detrimental to successful lobbying by both urban and rural groups. The publication of data that distinguish the extent of instability on a regional basis would allow a fuller examination of the role of a variable that

[48] Kennedy (1985, p.154) suggests that the problem of high variance of the coefficients (and hence their low t-statistics) can be solved by adding variables that were incorrectly excluded from previous analyses. As F-tests for all regressions reveal, omitting time and country effects results in a faulty specification; the inclusion of these effects corrects for the misspecification, at the same time as it reduces the variance of the estimates.

[49] Reverse causation, if it is an element of the politics of food pricing, causes a bias that reinforces the present results. Indeed, while a **higher** share of farmers in the labor force is expected to result in lower food price protection, such a lower protection would, if the first objection is correct, result in a **smaller** share of farmers in the labor force: the direct and the reverse causations have opposite signs.

[50] Running the same regressions with a one-year lagged instability variable, while conceptually more correct, does not affect the estimates and their significance, in addition to reducing the size of the sample.

BEST AVAILABLE DOCUMENT

has historically been an important element of food-pricing policies.[51] The coefficient of the **farm population density** is negative and strongly significant each time it is introduced in the regressions; this counter-intuitive result calls for further research. The **development of the network of communications and transportation** does not appear to affect the levels of farm protection in a statistically significant way. However, the results of this significance test are valid only insofar as the variable exhibits sufficient change over the period considered,[52] and if one can be confident that the observation is relatively free of measurement error. The communication variable is suspect on both counts: it exhibits little inter-temporal variation, and as reported in the appendix, its value results from the aggregation of individual qualitative judgments. Therefore, the low significance of the estimate does not unambiguously lead to a rejection of the development of the communications network as a prominent factor in the politics of food pricing. The coefficients of the control variables suggest that accounting for the **comparative advantage of agriculture** and the level of **net food exports** does not contribute to the analysis. Over the whole sample of countries, and keeping all other factors equal, it does not appear that net food importers protect their agriculture more than net exporters do. This result is in opposition to Krueger, Schiff and Valdés' (1991) findings, presented in Table 3. It is conceivable that this conclusion is a direct result of the use of protection figures aggregated over three commodities whose trade status varies according to countries and years. Additional research on this issue would also

[51] The opposition to Arap Moi in Kenya and Kenneth Kaunda in Zambia, and the toppling of Presidents Busia of Ghana and Tolbert of Liberia were all at least partially caused by urban unrest that followed unanticipated increases in the price of staple commodities.

[52] If it doesn't, it is impossible to separate the effect of the regressor from that of the dummy variables.

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be welcome. The estimate for the **level of income per capita** is positive and strongly significant in most of the regressions in which it enters, and its elasticity is higher with respect to the total protection rate (.84) than with respect to the direct rate (.14.) All other things equal, richer countries protect their agriculture more than poorer ones. However, which attribute of high income levels accounts for this result is unclear; reliable figures for the price and income elasticity of the demand for food would help to refine the analysis of the influence of income per capita on food policies. Finally, the distortions of incentives which result from discretionary price decisions do not appear to be motivated by the satisfaction of fiscal needs: the coefficient of the **interaction term** is insignificant in all regressions. Certainly, rent-seeking behavior can be a function of more than the mere size of the public sector, as hypothesized here: in developing countries, the striving for rapid industrialization, starting at the time of independence, created a powerful incentive for taxing agriculture. This element is indirectly captured in the fixed effects analysis discussed earlier in this section.[53]

An additional step can be taken to specify the nature of the country-specific effects, by examining the role of the **number of agricultural holdings per capita** (-). This variable distinguishes the role of landowners from that of hired agricultural laborers, who are not actively involved in lobbying for higher food prices. The main variable of the regression analysis presented in this paper, namely the share of the agricultural labor force in the

[53] Even when governments regulate the price of food on a yearly basis, it is likely that they do so in the context of agricultural strategies that are characterized by a longer horizon than one or two years. In order to test this assumption, regressions of the total and direct protection rates were run on the same specifications, but using data consisting of five-year averages. The regressions produced estimates whose sign and level of significance are almost identical to those documented here.

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domestic labor force, does not distinguish between landowners and landless workers. However, it is likely that the degree of inequality in land distribution, or concentration index, affects the success of collective action by rural interest groups. Assume countries A and B have agricultural populations of equal size, in both absolute and relative terms; in country A all agricultural workers own the land they cultivate, while in country B only 10 percent of the rural labor force is constituted of landowners. All other things being equal, the theory of collective action suggests that organization by landowner groups would face fewer obstacles in country B, and that their members would enjoy higher price protection in that country. The variable used as a proxy for the distribution of land is the number of holdings per member of the agricultural labor force. A higher number of holdings per capita implies a more equal distribution of land, a dilution of political influence by rural groups, and lower price protection. In contrast to most country effects described earlier, the concentration variable is quantifiable, but only a few values are available for the period under review;[54] one would like to account for their role in pricing policies without bearing the cost of time invariance discussed earlier. This can be done by performing OLS regressions of the fixed effects on the concentration variable (in average value); the effects are computed by the analysis of the total and direct protection rates. The results of this procedure, for the complete sample, are presented in Tables 11 and 12. In nine of the fourteen regressions of the country effects, the distinction based on rural land distribution produces estimates consistent with the predictions of the theory of collective action: for a given absolute and relative number of rural inhabitants, price protection decreases when land is more equally

[54] Statistics on the number and size of holdings are collected every ten years for inclusion in the World Census of Agriculture of the Food and Agriculture Organization.

BEST AVAILABLE DOCUMENT

distributed, since a constant level of political influence requires the organization and mobilization of a greater number of landowners.[55] This result is consistent with the observation of a large decrease in food prices in Egypt that followed the land reform initiated by Nasser in 1952.[56] Further inquiries into the influence of land distribution on price protection would benefit from the collection, in panel format, of information on land tenure and sharecropping arrangements.[57]

The joint significance of the collective action and income per capita hypotheses is a major result of the research presented in this paper. Leaving one of the hypotheses out of the regression equations results in a theoretical misspecification, but including both of them in OLS analyses (as previous studies did) produces singularly large standard errors of the estimates, due to multicollinearity. The use of panel data techniques allows this paper to consider jointly the validity of both hypotheses. By permitting the correct consideration of the longitudinal variation in the data, panel techniques show that the significance of each hypothesis is not an artifact of excluding the other one from the analysis. The collective action and income per capita models are prominent features in the literature on food pricing;

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[55] Gardner's (1987) results offer some evidence that, in the United States, between 1912 and 1980, higher geographical concentration of farmers increased price protection of consumers.

[56] Hansen writes that in Egypt, "after the land reforms of 1952 and later and the accompanying destruction of landowner power.... agriculture not only was on the defense...but became the exploited underdog. With the big and middle-sized landlords eliminated, agriculture was left without any political clout... While thus, beyond all dispute, small farmers gained instantaneously from the redistribution of land, over time agriculture as a whole, including small farmers and landless labor, tended to lose from the destruction of the big and middle-sized landowner classes..." (1992, p. 532-5)

[57] Higher levels of educations probably increase the incidence and efficacy of collective action, via better understanding of price information, contractual arrangements and rights, easier collaboration with hired lobbyists, and higher likelihood of vote. Since higher educational achievements increase the political influence of both interest groups (consumers and farmers), an analysis of the country effects of the type presented in these pages is not expected to yield notable results until figures for rural and urban education levels are made available.

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their interaction is shown in this study to be a major element of the political economy of food policies across continents.

V.C.2. Regressions over the Two Country Sub-Samples

Dividing the sample of countries in two groups, industrial and developing, highlights the different roles that the collective action and control variables play in the two groups of countries, even though the validity of the results described in this section is somewhat impaired by the relatively small size of the sub-samples. Tables 13 and 14 summarize the results of the regressions of the total and direct protection rate in the developing country sub-sample. The collective action variables behave similarly when the direct and total protection rates are used as dependent variables. In both cases, the share of farmers in the labor force enters negatively, with values of elasticity varying from .18 to .62, and with high levels of significance. The regressions on the developing country sub-sample yield a few results that resist simple explanation, particularly the behavior of the comparative advantage variable in Table 13 and the communication variable in Table 14.

Table 15 reports the results of the regressions of the direct protection rate in the industrial country sub-sample.[58] The high goodness of fit, and the importance of income per capita are particularly marked. Holding all other variables constant, higher incomes are associated with higher protection of agriculture in developed countries.[59] The importance of

[58] The values of the total and direct protection rates are assumed equal in the industrial group, since indirect protection is assumed to be insignificant in these countries.

[59] The elasticity of protection with respect to income per capita is, on average, equal to .58.

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this variable warrants future attention to further disaggregation of the three factors[60] which are associated with increasing income per capita. The size of farmer groups plays a smaller role in the understanding of food policies in industrial countries than it does in developing countries. Most of the countries included in the industrial sub-sample have in all likelihood reached a stage of development where the levels of agricultural protection are less the result of interest group competition in the food sector than of other variables, such as changes in income. The postulate that farmers are more highly protected in food-importing countries than in food-exporting countries finds support in these results; this observation is consistent with the behavior of countries like Japan and Switzerland in the former group, and the United States and Australia in the latter. The prevailing influence that groups of food producers and consumers exerts on the design of price policies suggests two major policy implications of this research. First, the ability of international donors to insure successful implementation of adjustment programs in recipient countries will require that these donors grant intensified attention to the role that interest groups play in supporting or opposing structural change. This consideration is particularly important when the adjustment programs include provisions that recommend significant reductions in the level of food subsidies. Second, the prevalent partiality of policymakers toward food consumers in developing countries makes it very difficult for policymakers to offer production incentives to farmers in the form of higher prices without adversely affecting fiscal and trade balances, or social peace. Increasing local food production without inducing social unrest requires a combination of price policies more favorable to agricultural producers, and of precisely targeted measures of income support.

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[60] These factors are: food is a smaller proportion of larger households' budgets, increases in productivity face an inelastic food demand, and farm support is a normal good.

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VI. Conclusion

The research conducted for this paper produced a number of important findings. First, and most importantly, the theory of collective action appears to be a major actor in exposing the political factors that account for the distortions in food prices. The relative size of farm interest groups is negatively correlated with the price protection they receive from governments, even when the level of overall economic development is taken into account. This result casts doubts on the applicability of models of voting behavior to the dynamics of food pricing, since the minority group, be it constituted of food producers or consumers, distorts public policies to its advantage, and at the expense of the majority. Second, the role of collective action variables is valid both over time and across a wide spectrum of countries, but it is less relevant in industrial countries than in the developing regions. The third notable result is that richer countries offer their farmers higher price protection than do poorer countries, but the exact components of income per capita that account for this result remain to be identified. Finally, the paper suggests that, in addition to their individual significance, the collective action and the income per capita hypotheses contribute jointly to the understanding of the politics of food pricing. Additional research will contribute to a better understanding of distortions in food markets in the following areas. Although the analysis performed for this paper highlights the pivotal role of interest group competition in the design of pricing policies, evidence and case studies of the extent, functions, and effects of collective action among rural groups are lacking. Additional time and resources should also be devoted to the identification of the country-specific effects that account for an important part of food policies, as well as the development of appropriate empirical instruments to capture these

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effects. Such additional information would contribute to a better understanding of the political backdrop of price reforms, and to the design of policy recommendations which are precisely calibrated.

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TABLE 1: Nominal rates of agricultural protection, sample countries, sorted by protection level (percent)

Country	Period	NPRi	NPRd	NPRt
Côte d'Ivoire	1960-82	-23.3	-25.7	-49.0
Ghana	1958-76	-32.6	-26.9	-59.5
Zambia	1966-84	-29.9	-16.4	-46.3
AVERAGE[61]	1960-84	-28.6	-23.0	-51.6
Argentina	1960-84	-21.3	-17.8	-39.1
Colombia	1960-83	-25.2	-4.8	-30.0
Dominican Republic	1966-85	-21.3	-18.6	-39.9
Egypt	1964-84	-19.6	-24.8	-44.4
Morocco	1963-84	-17.4	-15.0	-32.4
Pakistan	1960-86	-33.1	-6.4	-39.5
Philippines	1960-86	-23.3	-4.1	-27.4
Sri Lanka	1960-85	-31.1	-9.0	-40.1
Thailand	1962-84	-15.0	-25.1	-40.1
Turkey	1961-83	-37.1	5.3	-31.8
AVERAGE	1960-86	-24.2	-12.0	-36.4
Brazil	1969-83	-18.4	10.1	-8.3
Chile	1960-83	-20.4	-1.2	-21.6
Malaysia	1960-83	-8.2	-9.4	-17.6
AVERAGE	1960-83	-15.7	-0.2	-15.9
Korea	1960-84	-25.8	39.0	13.2
Portugal	1960-84	-1.3	9.0	7.7
AVERAGE	1960-84	-13.6	24.0	10.4
Australia	1955-80	n.a.[62]	2.8	n.a.
Canada	1955-80	n.a.	2.5	n.a.
New Zealand	1955-80	n.a.	-1.0	n.a.
United States	1955-80	n.a.	4.5	n.a.
AVERAGE	1955-80	n.a.	2.2	n.a.

[61] Unweighted average for this and the other protection group averages.

[62] Values of the indirect and total protection rates are unavailable for the 13 industrial countries in the sample. The levels of exchange rate distortions and industrial protection in these countries suggest that indirect protection can at little cost be assumed to be insignificant, and that direct and total protection rates are roughly equal. See note 27, p. 15 for justifications of this assumption.

BEST AVAILABLE DOCUMENT

Country	Period	NPRi	NPRd	NPRt
Denmark	1955-80	n.a.	12.3	n.a.
France	1955-80	n.a.	32.5	n.a.
Germany	1955-80	n.a.	45.2	n.a.
Italy	1955-80	n.a.	54.5	n.a.
Netherlands	1955-80	n.a.	28.3	n.a.
United Kingdom	1955-80	n.a.	27.5	n.a.
AVERAGE	1955-80	n.a.	33.4	n.a.
Japan	1955-80	n.a.	60.5	n.a.
Sweden	1955-80	n.a.	49.2	n.a.
Switzerland	1955-80	n.a.	85.9	n.a.
AVERAGE	1955-80	n.a.	65.1	n.a.

Source: Krueger, Schiff, and Valdés (1991), Anderson and Hayami (1986)

Notes:

1. NPRi = Nominal Indirect Protection Rate;
   NPRd = Nominal Direct Protection Rate;
   NPRt = Nominal Total Protection Rate (sum of the previous two).
   Details of the coverage and the computation of these indicators are presented in note 5, p.2, and in the appendix.

2. The developing countries of the sample are ranked in four groups, according to the degree of negative protection of farmers. The industrial countries are classified in the three following groups: food exporters, members of the European Union, and food importers.

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TABLE 2: Nominal direct rates of protection of rice and wheat, selected countries, 1960-80 (percent)

Rice	1960	1965	1970	1975	1980
Japan	47.0	99.0	135.0	124.0	192.0
Korea	-16.0	-5.0	30.0	45.0	156.0
Sri Lanka	101.7	35.9	62.7	29.9	-3.9
Philippines	21.9	22.3	1.4	-12.8	-19.3
Ghana	-7.3	55.7	44.1	94.0	-131.5
Egypt	-16.9	-40.8	-21.8	-74.4	-59.4

Wheat	1960	1965	1970	1975	1980
Japan	51.0	82.0	134.0	142.0	261.0
Switzerland	112.0	114.0	112.0	109.0	177.0
United States	3.0	19.0	22.0	-16.0	-18.0
Pakistan	1.8	1.2	25.9	-25.7	-17.6
Egypt	15.6	-12.2	21.5	-36.5	-41.9

Source: Krueger, Schiff, and Valdés (1991), Anderson and Hayami (1986)

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TABLE 3: Indirect and direct nominal protection rates of importable and exportable commodities, selected countries, 1960-84 (percent)

Country/Region	NPRi	NPRd importables	NPRd exportables	NPRt
Argentina	-17.0	n.a	-23.0	-40.1
Brazil	-20.0	25.0	7.0	-8.0
Chile	-20.0	-2.0	17.0	-21.0
Colombia	-24.0	19.0	-11.0	-30.0
Dominican Republic	-16.0	24.0	-32.0	-40.0
LATIN AMERICA[63]	-21.3	13.2	-6.4	-27.8
Cote d'Ivoire	-23.3	26.2	-28.7	-49.9
Ghana	-32.6	42.9	-29.8	-59.5
Zambia	-29.9	-16.4	-3.1	-46.2
SUB-SAHARA	-28.6	17.6	-20.5	-51.6
Egypt	-19.6	-5.1	-32.8	-44.4
Morocco	-17.4	-8.2	-18.5	-38.4
Turkey	-37.1	4.5	4.4	-32.7
Portugal	-1.3	28.2	16.1	23.4
MEDITERRANEAN	-18.9	3.2	-11.8	-25.2
Pakistan	-33.1	-6.9	-5.6	-39.5
Sri Lanka	-31.1	39.0	-18.4	-40.1
Malaysia	-8.2	23.6	-12.7	-17.6
Philippines	-23.3	17.4	-11.2	-27.4
Thailand	-15.0	n.a.	-25.1	-40.1
Korea	-25.8	39.0	n.a.	13.2
ASIA	-22.9	22.4	-14.6	-25.2

Source: Krueger, Schiff, and Valdés (1991)

[63] Unweighted average for this and the other protection group averages.

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TABLE 4: Annual average patterns of income transfers to (+) and from (-) agriculture as a result of direct price and non-price interventions, 18 developing countries, 1960-84 (percent of agricultural GDP)

Country/Region	Transfers resulting from		
	Direct price policy	Non-price policy	Net of direct price and non-price policy
Argentina	-16.0	0.0	-16.0
Brazil	19.5	12.0	31.5
Chile	0.5	4.0	4.5
Colombia	-5.0	4.0	-1.0
Dominican Republic	-19.0	12.0	-7.0
LATIN AMERICA[64]	-4.0	6.4	2.4
Côte d'Ivoire	-48.5	13.0	-35.5
Ghana	-63.0	3.0	-60.0
Zambia	-17.5	5.0	-12.5
SUB-SAHARA	-43.0	7.0	-36.0
Egypt	-15.0	7.0	-8.0
Morocco	-9.0	8.0	-1.0
Turkey	-22.0	4.0	-18.0
Portugal	10.5	1.0	11.5
MEDITERRANEAN	-8.9	5.0	-3.9
Pakistan	-22.5	14.0	-8.5
Sri Lanka	-13.0	19.0	6.0
Malaysia	-13.5	9.0	-4.5
Philippines	-9.0	4.0	-5.0
Thailand	-24.5	8.0	-16.5
Korea	25.5	7.0	32.5
ASIA	-9.5	10.2	0.7

Source: Schiff and Valdés (1992a)

[64] Unweighted average for this and the other protection group averages.

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TABLE 5: Annual average patterns of income transfers to (+) and from (-) agriculture as a result of direct price interventions, selected OECD countries, 1984-87 ($US bn and percent of agricultural GDP)

Country	Transfers from taxpayers and consumers ($US bn)	Transfers from taxpayers and consumers (ratio of agricultural GDP)
Australia	.42	4.54
Japan	54.30	92.55
New Zealand	.10	3.41
Sweden	3.22	93.76
Switzerland	4.55	74.86
United States	26.98	32.13

Source: Derived from OECD (1990)

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TABLE 6: Descriptive statistics of the variables. 31 developing and industrial countries

Variable and unit of measurement	Mean	Standard Deviation	Minimum	Maximum
Nominal direct protection rate (percent)	19.9246	51.1871	-127.0883	325.1826
Nominal total protection rate (percent)	-8.7621	54.0036	-80.5685	325.1629
Share of farmers in total labor force (percent)	41.0108	23.2023	2.6029	84.7530
Political/social instability (index)	0.6792	0.7330	0.0000	5.6380
Farm population density (farmer per square kilometer)	50.8030	65.8876	0.0895	250.5257
Development of network of communications and transportation (index)	2.2235	0.7590	0.6000	3.9000
Net normalized food exports (index)	0.0070	0.5460	-0.9781	0.9607
Comparative advantage in agriculture (index)	0.5598	1.2836	0.0076	13.6930
GDP per capita (1985 international dollars)	3700.8945	3029.9798	555.0000	15310.0000
Government size (share of government consumption in GDP) (percent)	0.13519	0.0459	0.0384	0.2911

NB: number of observations = 531 (512 for the Nominal Total Protection Rate)

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TABLE 7: Descriptive statistics of the variables. 13 industrial countries

Variable and unit of measurement	Mean	Standard Deviation	Minimum	Maximum
Nominal direct protection rate (percent)	46.5365	68.4431	-37.8058	325.1826
Share of farmers in total labor force (percent)	12.4498	7.2023	2.6029	33.0637
Political/social instability (index)	0.3395	0.5456	0.0010	3.1570
Farm population density (farmer per square kilometer)	38.8229	63.7051	0.0895	246.0300
Development of network of communications and transportation (index)	3.3067	0.3475	1.8000	3.9000
Net normalized food exports (index)	-0.2325	0.5223	-0.8679	0.8645
Comparative advantage in agriculture (index)	0.6131	2.0973	0.0076	13.6930
GDP per capita (1985 international dollars)	8005.2083	2279.0200	2701.0000	15310.0000
Government size (share of government consumption in GDP) (percent)	0.1613	0.0462	0.0743	0.2911

NB: number of observations = 144.

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TABLE 8: Descriptive statistics of the variables. 18 developing countries

Variable and unit of measurement	Mean	Standard Deviation	Minimum	Maximum
Nominal direct protection rate (percent)	10.0225	38.7253	-127.0883	250.6483
Nominal total protection rate (percent)	-30.1342	25.2157	-80.5685	91.2739
Share of farmers in total labor force (percent)	51.6382	17.3899	12.0197	84.7525
Political/social instability (index)	0.8055	0.7539	0.0000	5.6380
Farm population density (farmer per square kilometer)	55.2606	66.2097	0.7472	250.5257
Development of network of communications and transportation (index)	1.8205	0.3817	0.6000	2.6000
Net normalized food exports (index)	0.0961	0.5281	-0.9781	0.9607
Comparative advantage in agriculture (index)	0.5399	0.7945	0.0127	3.2241
GDP per capita (1985 international dollars)	2099.2894	1094.5771	555.0000	4931.0000
Government size (share of government consumption in GDP) (percent)	0.1255	0.0419	0.0384	0.2829

NB: number of observations = 383 (368 for the Nominal Total Protection Rate)

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TABLE 9a: Results of fixed effects regressions of the total protection rate, 31 developing and industrial countries (Part I)

	1	2	3	4
Share of farmers in total labor force	-2.1246*** (-4.5979)	-2.1253*** (-4.5987)	-3.2529*** (-6.5167)	-.9594** (-2.2455)
Political/social instability	.7748 (.4051)	.7006 (.3665)	1.1956 (.5619)	1.1833 (.6920)
Farm population density				-1.2458*** (-10.8065)
Development of network of communications and transportation	6.6614 (1.0665)		2.9077 (.4198)	
Net normalized food exports	-.0882 (-.0147)	.8812 (.1491)	-20.4201 (-1.5479)	-5.3362 (-.5038)
Comparative advantage in agriculture	7.2196 (1.4074)	7.6505 (1.4958)	2.5178 (.4423)	1.3620 (.2951)
GDP per capita	.0165*** (10.3086)	.0163*** (10.2523)		.0054*** (3.1275)
Interaction term (net normalized food exports x government size)			100.074 (1.2383)	55.9790 (.8608)
Adjusted R^2	.2553	.2551	.0912	.4123
F-test (fixed effects on countries vs. OLS)	24.736 (.0000)	31.991 (.0000)	14.490 (.0000)	30.415 (.0000)
F-test (fixed effects on countries and years vs. fixed effects on countries)	32.505 (.0000)	41.199 (.000)	13.785 (.0000)	33.127 (.0000)
Hausman specification test (fixed vs. random effects)	71.070 (.0000)	57.665 (.0005)	66.826 (.0001)	174.56 (.0000)

NB: t-values of coefficients in parentheses, with level of significance shown as *** = (99%) ** = (95%), and * = (90%); P-values of specification tests in parentheses; number of observations = 531.

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TABLE 9b: Results of fixed effects regressions of the total protection rate, 31 developing and industrial countries (Part II)

	5	6	7
Share of farmers in total labor force	-3.1820*** (-6.3634)	-2.2487*** (-4.8880)	-.9851** (-2.2841)
Political/social instability	.8905 (.4195)	.8006 (.4200)	1.3116 (.7599)
Farm population density			-1.4539*** (-15.2949)
Development of network of communications and transportation	.7120 (.1031)		
Net normalized food exports	-6.0407 (-.9143)		-8.0264 (-.7531)
Comparative advantage in agriculture	2.3748 (.4188)		-.7426 (-.1611)
GDP per capita		.0161*** (10.2556)	
Interaction term (net normalized food exports x government size)		16.3030 (.4513)	66.3086 (1.0111)
Adjusted R^2	.0826	.2613	.4009
F-test (fixed effects on countries vs. OLS)	22.072 (.0000)	24.639 (.0000)	46.016 (.0000)
F-test (fixed effects on countries and years vs. fixed effects on countries)	23.861 (.0000)	32.561 (.0000)	51.866 (.0000)
Hausman specification test (fixed vs. random effects)	42.900 (.0268)	69.258 (.0000)	157.41 (.0000)

NB: t-values of coefficients in parentheses, with level of significance shown as *** = (99%), ** = (95%), and * = (90%); P-values of specification tests in parentheses; number of observations = 531.

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TABLE 10a: Results of fixed effects regressions of the direct protection rate. 31 developing and industrial countries (Part I)

	1	2	3	4
Share of farmers in total labor force	-3.3600*** (-5.2109)	-3.3594*** (-5.2123)	-4.1911*** (-6.4461)	-2.0762*** (-3.2904)
Political/social instability	1.8621 (.7058)	1.8409 (.6988)	2.1909 (.7962)	2.5148 (1.0025)
Farm population density				-1.2497*** (-7.4356)
Development of network of communications and transportation	2.2433 (.2522)		-3.2072 (-.3481)	
Net normalized food exports	-.8175 (-.1978)	-.4774 (-.0579)	-25.0510 (-1.4853)	-11.2811 (-.7319)
Comparative advantage in agriculture	6.6503 (.9173)	6.7934 (.9408)	4.8874 (.6504)	1.9388 (.2811)
GDP per capita	.0136*** (6.1386)	.0135*** (6.1456)		.0028 (1.0955)
Interaction term (net normalized food exports x government size)			147.740 (1.4319)	91.9595 (.9721)
Adjusted R^2	.1852	.1868	.1282	.2748
F-test (fixed effects on countries vs. OLS)	15.360 (.0000)	15.999 (.000)	10.218 (.0000)	15.053 (.0000)
F-test (fixed effects on countries and years vs. fixed effects on countries)	19.697 (.0000)	20.757 (.0000)	11.076 (.0000)	16.763 (.0000)
Hausman specification test (fixed vs. random effects)	66.897 (.0000)	67.199 (.0000)	77.651 (.0000)	144.50 (.0000)

NB: t-values of coefficients in parentheses, with level of significance shown as *** = (99%), ** = (95%), and * = (90%); P-values of specification tests in parentheses; number of observations = 531.

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TABLE 10b: Results of fixed effects regressions of the direct-protection rate, 31 developing and industrial countries (Part II)

	5	6	7
Share of farmers in total labor force	-4.2784*** (-6.5683)	-3.3291*** (-5.1836)	-2.1028*** (-3.3343)
Political/social instability	1.5455 (.5644)	2.1300 (.8089)	2.5265 (1.0070)
Farm population density			-1.3535*** (-9.7497)
Development of network of communications and transportation	-2.4120 (-.2621)		
Net normalized food exports	-4.7476 (-.5487)		-13.2221 (-.8633)
Comparative advantage in agriculture	3.2057 (.4272)		.9601 (.1404)
GDP per capita		.0134*** (6.1629)	
Interaction term (net normalized food exports x government size)		18.4414 (.3658)	102.284 (1.0864)
Adjusted R^2	.1220	.1918	.2745
F-test (fixed effects on countries vs. OLS)	14.604 (.0000)	13.066 (.0000)	17.104 (.0000)
F-test (fixed effects on countries and years vs. fixed effects on countries)	17.167 (.0000)	17.237 (.0000)	19.237 (.0000)
Hausman specification test (fixed vs. random effects)	49.760 (.0048)	88.383 (.0000)	140.23 (.0000)

NB: t-values of coefficients in parentheses, with level of significance shown as *** = (99%), ** = (95%), and * = (90%); P-values of specification tests in parentheses; number of observations = 531.

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TABLE 11: Results of OLS regressions of the country-specific effects on the number of agricultural holdings per capita, 31 developing and industrial countries. Effects generated by fixed effects regressions of the total protection rate.

	1	2	3	4
Constant term	118.251*** (3.02619)	124.725*** (3.28429)	176.276*** (5.72122)	116.843** (2.28128)
Number of agricultural holdings per capita	-575.457*** (-2.65894)	-526.052*** (-2.50827)	-220.881 (-1.483)	-136.612 (-.553819)
Adjusted R^2	.135081	.119025	.020976	-.025536

	5	6	7
Constant term	161.726*** (5.28201)	149.388*** (4.16458)	121.200** (2.20816)
Number of agricultural holdings per capita	-202.108 (-1.34497)	-513.038*** (-2.59273)	-.307296 (-.00148689)
Adjusted R^2	.013045	.132255	-.034483

NB: t-values of coefficients in parentheses, with level of significance shown as *** = (99%), ** = (95%), and * = (90%); number of observations = 31.

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TABLE 12: Results of OLS regressions of the country-specific effects on the number of agricultural holdings per capita, 31 developing and industrial countries. Effects generated by fixed effects regressions of the direct protection rate.

	1	2	3	4
Constant term	268.976*** (5.3475)	271.127*** (5.4317)	294.720*** (6.5196)	233.253*** (4.1728)
Number of agricultural holdings per capita	-869.176*** (-3.3614)	-852.551*** (-3.3273)	-594.612** (-2.7482)	-494.463* (-1.7996)
Adjusted R^2	.1796	.1762	.1159	.0441

	5	6	7
Constant term	311.913*** (7.0212)	262.067*** (5.3735)	236.942*** (4.1632)
Number of agricultural holdings per capita	-574.032*** (-2.7527)	-857.262*** (-3.3656)	-427.421 (-1.5453)
Adjusted R^2	.1119	.1868	.0251

NB: t-values of coefficients in parentheses, with level of significance shown as *** = (99%), ** = (95%), and * = (90%); number of observations = 31.

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TABLE 13a: Results of panel regressions of the total protection rate, 18 developing countries (Part I)

	1	2	3	4
Constant term		.7633[65] (.0407)		
Share of farmers in total labor force	-1.9180*** (-3.7694)	-.5226** (-2.1451)	-2.3460*** (-5.8485)	-2.1086*** (-3.8669)
Political/social instability	.02405 (.0163)	.0292 (.0199)	.3686 (.2516)	.6356 (.4281)
Farm population density				-.2062 (-1.2715)
Development of network of communications and transportation	-18.7145*** (-3.3383)		-17.0166*** (-3.0530)	
Net normalized food exports	15.4225*** (3.2214)	6.6166* (1.7048)	.4756 (.0492)	-3.2057 (-.3289)
Comparative advantage in agriculture	18.4675* (1.84517)	-5.2471 (-1.2711)	15.9713 (1.6341)	16.4713 (1.5989)
GDP per capita	.0032 (.9719)	.0068*** (2.5711)		.0020 (.5935)
Interaction term (net normalized food exports x government size)			100.233* (1.6901)	95.8182 (1.5913)
Adjusted R^2	.1427	.0715	.1602	.1387
F-test (fixed effects on countries vs. OLS)	12.396 (.0000)	16.866 (.0000)	11.775 (.0000)	15.291 (.0000)
F-test (fixed effects on countries and years vs. fixed effects on countries)	13.771 (.0000)	17.497 (.0000)	14.088 (.0000)	15.556 (.0000)
Hausman specification test (fixed vs. random effects)	55.553 (.0015)	34.309 (.1573)	64.096 (.0002)	45.963 (.0313)

NB: t-values of coefficients in parentheses, with level of significance shown as *** = (99%), ** = (95%), and * = (90%); P-values of specification tests in parentheses; equations 1,3,4 estimated by fixed effects, equation 2 estimated by random effects; number of observations = 387.

[65] The fixed effects technique does not include an intercept, since the observations it utilizes are constituted of the individual data minus the unit mean. Coefficients produced by the random effects technique are a weighted average of the fixed effects estimates and the "between-group" coefficients, which result from the regression of unit means on unit means. Since the latter regression produces an intercept, random effects techniques also do.

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TABLE 13b: Results of panel regressions of the total protection rate, 18 developing countries (Part II)

	5	6	7
Constant term		10.6561 (.5283)	
Share of farmers in total labor force	-2.2223*** (-5.5401)	-.5987** (-2.2846)	-2.3049** (-5.3218)
Political/social instability	.0680 (.0460)	.0139 (.0096)	.6831 (.4612)
Farm population density			-.2130 (-1.3181)
Development of network of communications and transportation	-19.6117*** (-3.5470)		
Net normalized food exports	15.2241*** (3.1832)		-3.7671 (-.3888)
Comparative advantage in agriculture	16.1511* (1.6617)		14.8785 (1.4974)
GDP per capita		.0059** (2.1476)	
Interaction term (net normalized food exports x government size)		60.1202** (2.3248)	97.8636 (1.6296)
Adjusted R^2	.1429	.0849	.1404
F-test (fixed effects on countries vs. OLS)	12.807 (.0000)	19.281 (.0000)	18.980 (.0000)
F-test (fixed effects on countries and years vs. fixed effects on countries)	14.945 (.0000)	22.891 (.0000)	21.451 (.0000)
Hausman specification test (fixed vs. random effects)	58.096 (.0005)	30.434 (.2950)	44.199 (.0351)

NB: t-values of coefficients in parentheses, with level of significance shown as *** = (99%), ** = (95%), and * = (90%); P-values of specification tests in parentheses; equations 5,7 estimated by fixed effects, equation 6 estimated by random effects; number of observations = 387.

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TABLE 14a: Results of panel regressions of the direct protection rate, 18 developing countries (Part I)

	1	2	3	4
Constant term			93.4289*** (3.3480)	37.0104 (1.1817)
Share of farmers in total labor force	-4.7684*** (-4.9112)	-4.7562*** (-4.8722)	-.8891*** (-3.1813)	-.6011* (-1.6677)
Political/social instability		1.6164 (.5837)	-.7791 (-.2934)	-.8300 (-.3106)
Farm population density	1.3064 (.4737)			-.0276 (-.3378)
Development of network of communications and transportation	-23.5092** (-2.1782)		-21.0911*** (-2.4189)	
Net normalized food exports	12.9390 (1.4248)	7.7203 (.8826)	-11.9946 (-.7586)	-18.1076 (-1.1513)
Comparative advantage in agriculture	17.7937 (1.0237)	20.0366 (1.1485)	-12.2913** (-2.0611)	-12.4299* (-1.9347)
GDP per capita	-.0087 (-1.4382)	-.0068 (-1.1176)		.0025 (.5373)
Interaction term (net normalized food exports x government size)			185.081* (1.7642)	189.416* (1.7891)
Adjusted R^2	.1175	.1078	.0747	.0588
F-test (fixed effects on countries vs. OLS)	7.3166 (.0000)	6.9650 (.0000)	7.3056 (.0000)	7.3889 (.0000)
F-test (fixed effects on countries and years vs. fixed effects on countries)	9.2942 (.0000)	8.9605 (.0000)	9.3030 (.0000)	8.8863 (.0000)
Hausman specification test (fixed vs. random effects)	37.764 (.1029)	37.910 (.0793)	36.572 (.1575)	38.229 (.1440)

NB: t-values of coefficients in parentheses, with level of significance shown as *** = (99%), ** = (95%), and * = (90%); P-values of specification tests in parentheses; equations 1 and 2 estimated by fixed effects, all others estimated by random effects; number of observations = 387.

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TABLE 14b: Results of panel regressions of the direct protection rate, 18 developing countries (Part II)

	5	6	7
Constant term	112.166*** (4.089)	26.5092 (.8686)	49.5580*** (2.3599)
Share of farmers in total labor force	-.8789*** (-3.1576)	-.5898 (-1.5390)	-.7291** (-2.6753)
Political/social instability	-1.5151 (-.5684)	-1.4629 (-.5514)	-.8342 (-.3123)
Farm population density			-.0390 (-.4945)
Development of network of communications and transportation	-19.5705** (-2.2324)		
Net normalized food exports	9.7515 (1.4505)		-18.5545 (-1.1821)
Comparative advantage in agriculture	-13.2278** (-2.2518)		-12.7231** (-1.9865)
GDP per capita		.0031 (.6782)	
Interaction term (net normalized food exports x government size)		89.7434** (1.9794)	193.834* (1.8378)
Adjusted R^2	.0557	.0554	.0609
F-test (fixed effects on countries vs. OLS)	7.3668 (.0000)	8.4137 (.0000)	7.4295 (.0000)
F-test (fixed effects on countries and years vs. fixed effects on countries)	9.3617 (.0000)	11.012 (.0000)	8.9387 (.0000)
Hausman specification test (fixed vs. random effects)	35.045 (.1377)	35.680 (.1472)	37.649 (.1303)

NB: t-values of coefficients in parentheses, with level of significance shown as *** = (99%), ** = (95%), and * = (90%); P-values of specification tests in parentheses; all equations estimated by random effects; number of observations = 387.

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TABLE 15: Results of OLS regressions of the country-specific effects on the number of agricultural holdings per capita, 18 developing countries. Effects generated by fixed effects regressions of the total protection rate.

	1	2	3	4
Constant term	101.685*** (3.5719)	-2.5464 (-.6339)	145.700*** (4.8054)	109.810*** (3.4632)
Number of agricultural holdings per capita	37.8521 (.3350)	-30.7623* (-1.8755)	3.4688 (.0291)	9.5117 (.0775)
Adjusted R^2	-.0581	.0298	-.0625	.0002

	5	6	7
Constant term	131.253*** (4.4802)	10.5658 (.7910)	128.979*** (4.0010)
Number of agricultural holdings per capita	17.6390 (.1514)	-100.1820 (-1.6348)	-4.2362 (-.0339)
Adjusted R^2	-.0616	.0565	-.0624

NB: t-values of coefficients in parentheses, with level of significance shown as *** = (99%), ** = (95%), and * = (90%); P-values of specification tests in parentheses; number of observations = 18.

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TABLE 16: Results of OLS regressions of the country-specific effects on the number of agricultural holdings per capita, 18 developing countries. Effects generated by fixed effects regressions of the direct protection rate.

	1	2	3	4
Constant term	350.484*** (5.9238)	299.485*** (4.7918)	52.3712 (1.3426)	-3.6649 (-.0942)
Number of agricultural holdings per capita	-53.7925 (-.2197)	-38.2566 (-.1433)	-209.462 (-1.4946)	102.012 (.4699)
Adjusted R^2	-.0601	-.0614	-.0054	-.0483

	5	6	7
Constant term	-11.0189* (-1.8874)	7.6343 (.3681)	56.4280 (1.4723)
Number of agricultural holdings per capita	22.3149 (.6830)	5.5661 (.0458)	-228.199 (-1.6359)
Adjusted R^2	-.0308	-.0624	.0081

NB: t-values of coefficients in parentheses, with level of significance shown as *** = (99%), ** = (95%), and * = (90%); P-values of specification tests in parentheses; number of observations = 18.

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TABLE 17a: Results of panel regressions of the direct protection rate, 13 industrial countries (Part I)

	1	2	3	4
Constant term		-73.0322* (-1.8582)	104.213*** (2.5930)	
Share of farmers in total labor force	-2.4222* (-1.7535)	.1932 (.1892)	-1.6030** (-2.2147)	2.3379* (1.8954)
Political/social instability	.5147 (.0863)	-4.4723 (-.7980)	-3.5554 (-.6164)	-4.5592 (-.8532)
Farm population density				-1.4187*** (-7.3941)
Development of network of communications and transportation	14.8021 (1.2859)		13.6062 (1.4063)	
Net normalized food exports	-24.6185 (-1.0479)	-61.9070*** (-4.5140)	-99.7069*** (-4.0410)	-16.0112 (-.5811)
Comparative advantage in agriculture	-1.3616 (-.2596)	.7367 (.2659)	-.2601 (-.1295)	-.1907 (-.0447)
GDP per capita	.0219*** (4.2174)	.0149*** (3.8014)		.0121*** (2.6057)
Interaction term (net normalized food exports x government size)			345.633*** (2.3742)	13.1443 (.0897)
Adjusted R^2	.7645	.6933	.7211	.8439
F-test (fixed effects on countries vs. OLS)	14.708 (.0000)	15.801 (.0000)	8.8156 (.0000)	15.457 (.0000)
F-test (fixed effects on countries and years vs. fixed effects on countries)	19.799 (.0000)	23.136 (.0000)	8.3851 (.0000)	18.525 (.0000)
Hausman specification test (fixed vs. random effects)	42.605 (.0380)	32.730 (.2061)	20.049 (.8914)	74.763 (.0000)

NB: t-values of coefficients in parentheses, with level of significance shown as *** = (99%), ** = (95%), and * = (90%); P-values of specification tests in parentheses; equations 1,4 estimated by fixed effects, all others estimated by random effects; number of observations = 144.

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TABLE 17b: Results of panel regressions of the direct protection rate, 13 industrial countries (Part II)

	5	6	7
Constant term	8.1911 (.2107)	65.0870 (1.5731)	
Share of farmers in total labor force	-1.3523 (-1.6438)	-.4555 (-.4885)	1.3306 (1.1051)
Political/social instability	-5.3770 (-.9138)	-11.6003** (-2.1383)	-4.7661 (-.8769)
Farm population density			-1.5460*** (-8.1057)
Development of network of communications and transportation	12.5305 (1.1806)		
Net normalized food exports	-53.0925*** (-4.1941)		-15.2822 (-.5395)
Comparative advantage in agriculture	.3462 (.1338)		-1.2604 (-.2889)
GDP per capita		.0086*** (2.4725)	
Interaction term (net normalized food exports x government size)		-261.849*** (-4.2141)	63.1211 (.4228)
Adjusted R^2	.6505	.7009	.8350
F-test (fixed effects on countries vs. OLS)	20.484 (.0000)	9.6561 (.0000)	18.273 (.0000)
F-test (fixed effects on countries and years vs. fixed effects on countries)	16.251 (.0000)	13.194 (.0000)	17.806 (.0000)
Hausman specification test (fixed vs. random effects)	35.215 (.1335)	36.086 (.1134)	66.234 (.0001)

NB: t-values of coefficients in parentheses, with level of significance shown as *** = (99%), ** = (95%), and * = (90%); P-values of specification tests in parentheses; equation 7 estimated by fixed effects, all others estimated by random effects; number of observations = 144.

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TABLE 18: Results of OLS regressions of the country-specific effects on the number of agricultural holdings per capita, 13 industrial countries. Effects generated by fixed effects regressions of the direct protection rate.

	1	2	3	4
Constant term	-85.9743 (-1.5471)	-24.4800 (-1.2959)	-.918945 (-.0057)	18.1857 (.1852)
Number of agricultural holdings per capita	-219.370 (-.8182)	49.7722 (.5497)	-194.488 (-.3049)	-328.745 (-.7344)
Adjusted R^2	-.06320	-.06512	.08829	-.06201

	5	6	7
Constant term	16.3497 (1.4604)	18.4736 (.1333)	131.682 (1.3776)
Number of agricultural holdings per capita	-148.143* (-1.8429)	-523.009 (-.5500)	-316.872 (-.7228)
Adjusted R^2	.1969	-.0606	-.0626

NB: t-values of coefficients in parentheses, with level of significance shown as *** = (99%), ** = (95%), and * = (90%); P-values of specification tests in parentheses; number of observations = 13.

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TABLE 19: Share of cereals in world trade and in the agricultural output of the countries of the sample (percent)

Country	Share of cereal exports in world trade	Share of cereal imports in world trade	Share of corn, rice and wheat in agricultural output
Argentina	5.62	0.00	23.98
Australia	7.86	0.00	27.49
Brazil	0.07	3.04	20.20
Canada	9.97	0.46	34.12
Chile	0.01	0.68	17.97
Colombia	0.03	0.43	9.27
Côte d'Ivoire	0.00	0.18	9.53
Denmark	0.61	0.18	5.70
Dominican Republic	0.00	0.15	12.87
Egypt	0.06	2.92	24.00
France	8.27	0.71	21.59
Germany (Federal Republic)	1.07	2.86	12.17
Ghana	0.00	0.13	5.85
Italy	0.72	4.23	17.64
Japan	0.23	11.67	47.53
Korea (Republic)	0.01	2.13	45.31
Malaysia	0.00	0.70	11.58
Morocco	0.01	0.86	23.50
Netherlands	1.06	2.80	3.11
New Zealand	0.04	0.02	3.12
Pakistan	0.47	0.42	35.26
Philippines	0.07	0.45	23.09
Portugal	0.00	1.54	10.85
Sri Lanka	0.00	0.50	28.83
Sweden	0.48	0.05	7.22
Switzerland	0.00	0.64	8.57
Thailand	2.12	0.08	37.44
Turkey	0.70	0.01	28.04
United Kingdom	1.29	3.13	16.28
United States	49.90	0.09	35.33
Zambia	0.02	0.14	29.98

NB: share of cereal exports and imports in world trade: 1978-80 average; share of corn, rice and wheat in agricultural output: 1967-86 average.

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Appendix: Construction of the Dependent and Independent Variables, and Source of the Data

The dependent variables used for the empirical analysis presented in this paper are the **nominal direct protection rate** and the **nominal total protection rate**. The derivation of these variables, which follows Krueger, Schiff and Valdés (1991), is presented below.

The nominal direct protection rate is equal to the ratio

$$NPRd = \frac{\frac{P_A}{P_{NA}} - \frac{P'_A}{P_{NA}}}{\frac{P'_A}{P_{NA}}} \times 100 \qquad (1)$$

where P_A is the producer price of a weighted average of a basket of agricultural commodities, and P'_A is the border price equivalent of the same basket of commodities, measured at the official nominal exchange rate and adjusted for transport, storage, other costs, and quality differences. P_{NA} is a price index for the non-agricultural sector. The nominal indirect protection rate is defined as follows:

$$NPRi = \frac{\frac{P_A}{P_{NA}} - (\frac{E^*}{E_0} \times \frac{P_A}{P^*_{NA}})}{(\frac{E^*}{E_0} \times \frac{P_A}{P^*_{NA}})} \times 100 \qquad (2)$$

which can be simplified to

$$NPRi = ((\frac{P^*_{NA}}{P_{NA}} \times \frac{E_0}{E^*}) - 1) \times 100 \qquad (3)$$

P^*_{NA} is the value of the non-agricultural price (P_{NA}) that would be observed in the absence of trade taxes, and at the equilibrium exchange rate E^*. E^* is the exchange rate that equilibrates the current account in the absence of trade restrictions; there is currency overvaluation, and therefore indirect taxation of export farmers, if the observed exchange rate, E_0, exceeds the equilibrium rate. Therefore,

$$P^*_{NA} = P_{NA} \times \frac{E^*}{E_0} \qquad (4)$$

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$$\frac{P'_A}{P_{NA}} = \frac{P'_A}{P^*_{NA}} \times \frac{E^*}{E_0} \tag{5}$$

The left hand side of (5) is the denominator of (1), the expression for the direct protection rate, which can be rewritten as

$$NPRd = \frac{\frac{P_A}{P_{NA}} - \frac{P'_A}{P_{NA}}}{\frac{E^*}{E_0} \times \frac{P'_A}{P^*_{NA}}} \times 100 \tag{6}$$

Multiplying both numerator and denominator of (2) by $\frac{P'_A}{P_A}$ yields

$$NPRi = \frac{\frac{P'_A}{P_{NA}} - (\frac{E^*}{E_0} \times \frac{P'_A}{P^*_{NA}})}{\frac{E^*}{E_0} \times \frac{P'_A}{P^*_{NA}}} \times 100 \tag{7}$$

The nominal total protection rate is the sum of the direct and indirect nominal protection rates. Adding equations (6) and (7) and simplifying produces

$$NPRt = \frac{\frac{P_A}{P_{NA}} - (\frac{E^*}{E_0} \times \frac{P'_A}{P^*_{NA}})}{\frac{E^*}{E_0} \times \frac{P'_A}{P^*_{NA}}} \times 100 \tag{8}$$

Data for the nominal direct protection rate is obtained by computing the weighted average of the direct protection rate of rice, corn and wheat for the 1960-82 period. The weights used are the share of the value of each commodity in the total value of the three commodities. In the developing countries, data for the protection rate on the three commodities is obtained from the appendix to Schiff and Valdés (1992a). Anderson and Hayami (1986) provide the corresponding data for industrial countries. Domestic prices are estimated as the average prices received by farmers, including government subsidies such as deficiency payments for specific commodities, but excluding indirect taxes. Since Anderson and Hayami report only values for every five year of the sample used for this study, missing

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deficiency payments for specific commodities, but excluding indirect taxes. Since Anderson and Hayami report only values for every five year of the sample used for this study, missing values are computed using price information published in the FAO Production Yearbook. Border prices are provided by the FOB unit export value or the CIF unit import value, depending on whether the country is a net exporter or importer of the commodity. The values of the nominal total protection rate (not available for industrial countries) are computed by the same technique as for the direct protection rate in developing countries.

The **share of farmers in the total labor force** is calculated using data from the FAO Production Yearbook, the FAO Report on the State of Food and Agriculture, the World Tables, and the ILO Yearbook of Labour Statistics.

The index of **political and social instability** is defined by Gupta (1990) as:

$$PI = 1.14 + .0007PD + .0049RT + .0086PS + .43\times10^{-5}D + .13AS + .0008AA + .0033PX + 1.38CD + .264UCD + .92GP$$

where PI = index of political instability;
PQ = number of political demonstrations;
RT = number of riots;
PS = number of political strikes;
D = number of political violence events;
AS = number of assassinations;
AA = number of armed attack events;
PX = number of political executions;
CD = dummy variable for occurrence of coups d'état;
UCD = dummy variable for occurrence of unsuccessful coups d'état;
GP = government profile (0 if democracy, 1 otherwise).

The **communication and transportation** index is published three times a year by BERI S.A. in its Operations Risk Index. It measures "the facilities for and ease of communication between headquarters and the operation, and within the country", as well as quality of transportation. The value of the index is qualitatively assessed by a panel of 100 executives in banking, other businesses, and government officials.

The index of **net normalized food exports** is obtained by computing the following ratio:

$$\frac{(food\ exports - food\ imports)_t}{(food\ exports + food\ imports)_t}$$

Food export and import values are available in the FAO Trade Yearbook.

Figures for the **GDP per capita** are obtained from Summers and Heston (1991), and are expressed in 1985 international prices.

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Following Honma and Hayami (1986), the analysis utilizes a factor endowment ratio as a proxy for **comparative advantage in agriculture**. This endowment is defined as the ratio of agricultural land area per farm worker to industrial and service capital per non-farm worker. Real GDP per capita is used as proxy for the amount of capital per non-farm worker, under the assumption that income per capita is determined by the per-capita endowment of physical and human capital. According to the specific-factors theory of comparative advantage, this ratio is higher the greater the economy's comparative advantage in agriculture. Data on agricultural land per farm worker is obtained by dividing the total arable land area by the number of male farm workers. Arable land figures are published by the FAO, and data on GDP per capita are from Summers and Heston. Comparative advantage in agriculture can also be approximated by the ratio of labor productivity in agriculture to labor productivity in industry. The constraints on the collection of the data series necessary for the construction of this variable are too serious to allow its use in panel data analysis. The simple correlation between the labor productivity and factor endowment ratios has been estimated at .78 for a sample of 15 industrial countries (Honma and Hayami, 1986, p. 42.)

The **interaction term** is constructed as follows:
y_{it} is defined as the level of food price protection in country i at time t. Assume x_{1it} is the food trade status of country i in year t ("net food exports" variable), with $x_{1it} > 0$ if the country is a net food exporter and $x_{1it} < 0$ if it is a net importer; β_1 is the regression coefficient of x_{1it}. In addition, x_{2it} is defined as the size of the government of country i in year t (approximated by the share of total government consumption in GDP); its coefficient is β_2. Let $(x_{1it}x_{2it})$ be an multiplicative interaction term, with coefficient β_3. β_0 is the constant term, and e_{it} the error term. This simple model (which ignores for convenience the other independent variables used in this study) can be written as follows:

$$y_{it} = \beta_0 + \beta_1 x_{1it} + \beta_2 x_{2it} + \beta_3 x_{1it} x_{2it} + e_{it}$$

If the assumption that governments pursue rent-seeking goals when they set food prices is correct, β_2 will be negative when x_{1it} is positive and vice-versa (larger government size means lower farmer protection in net food-exporting countries, and higher protection in food-importers.) The partial derivation of the model with respect to x_{2it} yields

$$\frac{\partial y_{it}}{\partial x_{2it}} = \beta_2 + \beta_3 x_{1it} + e_{it}$$

which can be signed only if β_3 is negative.
Data for the share of government consumption in GDP is available in the World Tables.

Data on the number of **agricultural holdings per farm worker** is computed with information published in the FAO World Census of Agriculture.

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