INTERNATIONAL DIFFERENCES IN THE AGRICULTURAL PRICE LEVEL:

FACTOR ENDOWMENTS, TRANSPORTATION COSTS, AND THE POLITICAL ECONOMY OF AGRICULTURAL PROTECTION

Christopher Clague
University of Maryland at College Park

and

Arna Desser
Mount Holyoke College

In a world of free trade and zero transport costs, the prices of agricultural goods would be the same around the world. That is, when prices in local currency were converted to a common currency at the market exchange rate, the price for a given commodity would be the same everywhere. Obviously in the world we inhabit trade in agricultural products is inhibited by both natural and manmade barriers. It is plausible, therefore, that such barriers play an important role in the explanation of the international variation in agricultural price levels.

Consider first the effect of transport costs under a régime of free trade. Suppose that apples are shipped from Australia to Japan, where they are sold in competition with apples grown domestically. We would expect that Australian apple growers would receive lower prices than their Japanese counterparts, when both prices are expressed in a common currency. Generalizing beyond a particular commodity, we would expect that countries whose agricultural exports exceed their agricultural imports (i.e. countries with positive agricultural trade balances) would tend to have lower agricultural price levels than countries with negative agricultural trade balances.

According to standard trade theory, agricultural trade balances depend on countries' factor endowments. Countries relatively well endowed with land are expected to export agricultural products in exchange for nonagricultural ones, while the reverse should hold for countries relatively well endowed with labor, mineral resources, and physical and human capital. Thus under a régime of free trade we would expect land-abundant countries to have low agricultural price levels and land-scarce countries to have high ones.

Eastern Economic Journal, Vol. 24, No. 3, Summer 1998

However, government interventions in agricultural markets may alter the picture. Subsidies to Australian apple growers would raise their producer prices, and Japanese restrictions on apple imports would raise producer prices in Japan. In general we would expect that higher levels of agricultural protection would lead to higher producer prices for agriculture.

Thus to explain agricultural price levels we need to explain both the structure of a country's trade and the level of protection given to agriculture. These two variables may also influence each other. Standard trade theory says that a country's agricultural trade balance is affected by the level of protection against imports and the extent of subsidies to agricultural exports. At the same time the political economy forces that determine a country's level of protection may include the structure of its agricultural trade. It may be politically easier to protect farmers when the costs of doing so can be hidden in higher bills to consumers rather than paid out in explicit subsidies from the budget.

The international variation in agricultural price levels is striking. For example, in 1980 with the world average indexed to 100, agricultural prices for particular countries varied as follows: Japan 216, South Korea 160, Brazil 55, Australia 70, France 109, and the United States 73. To what extent can such figures be explained by factor endowments, transportation costs, and the political economy of agricultural protection? Answering this question is the goal of this paper. We proceed next with the theoretical model, followed by the empirical tests.

THE MODEL

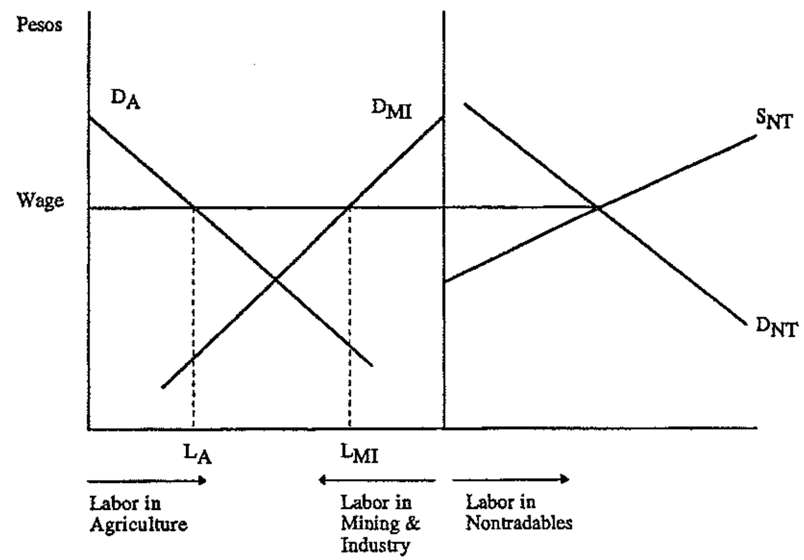
Our model pictures a small economy trading with the Rest of the World. Let the domestic currency be pesos and the foreign currency be dollars. The agricultural price level (*APL*) is defined as the ratio of the agricultural purchasing-power parity (*PPP*) to the exchange rate, where both of these are expressed as pesos per dollar. Thus

$$APL = PPP/ER = (\Sigma p_i X_i / \Sigma p_i^* X_i)(1/ER)$$
$$= (\Sigma p_i X_i)/(\Sigma ER p_i^* X_i)$$

where p_i and p_i^* are the domestic and rest-of-world prices of agricultural commodity i, ER is the exchange rate, and the X_i are the domestic production levels of agricultural commodities.

The model is an adaptation of one that has been used in the explanation of national price levels [Clague 1985]. The economy contains three tradable sectors: agriculture, mining, and industry, and nontradable services. Labor is mobile across all the sectors and is the only factor in services. There are specific factors in mining (mineral resources) and industry (physical and human capital),[1] and in agriculture each agricultural product has its own specific factor (these may be thought of as distinct land-water-climate conditions).

FIGURE 1
Labor Market



To illustrate the operation of the model, let us consider a graphical depiction of the labor market in the particular country. The length of the box on the left in Figure 1 represents the entire labor force in the economy. The vertical axis is scaled in units of domestic currency and is used to measure the wage rate. The curve D_A is the demand curve for labor in agriculture, while the curve D_{MI} is the combined labor demand curve in mining and industry. These demand curves for labor in tradable goods depend on the endowments of the relevant specific factors and on the world prices of the various goods and the transport costs of the goods.

In the right-hand quadrant of Figure 1 the curve S_{NT} represents the supply of labor to the nontradable sector; it is derived simply as the horizontal distance at each wage rate between the D_{MI} and the D_A curves. The downward-sloping D_{NT} curve in Figure 1 is the demand for nontradables labor; the curve slopes downward because consumers buy more nontradables as their price (the wage rate) falls.

Let the exchange rate be the numeraire and the wage rate be the variable that equilibrates the balance of payments. Taking the prices in the Rest of the World as given (the country in question is assumed to be "small"), let us show that the wage rate in the particular country will be higher, the greater the country's endowments of specific factors. The greater these endowments, the higher will be the demand curves for labor in the tradables sectors and hence the lower will be the supply of labor to the nontradables sector. The richer endowment of specific factors implies a higher level of real income, which also shifts up the demand curve for nontradables, and consequently the wage rate (which is the price of nontradables) unambiguously rises. This conclusion is familiar from the standard national price level model [Clague, 1988]: Resource-abundant countries will tend to have high national price levels. The present paper will focus on countries' relative endowments of land, mineral deposits, and physical and human capital.

To bring out the implications of differences in relative resource endowments, assume for the moment that all goods have the same transport costs between the particular country and the Rest of the World. A country that is well endowed with physical and human capital and mineral deposits and poorly endowed with land will for obvious reasons import most of its agricultural consumption. Because imported goods will be more expensive and exported goods will be less expensive in the particular country than in the Rest of the World, this country will have a high agricultural price level. Conversely, a country well endowed with land and poorly endowed with mineral deposits and physical and human capital will export most agricultural products and have a low agricultural price level.

To avoid confusion it is useful to describe the relationship between the *APL* and the pre-trade relative prices. It is perfectly consistent with our theoretical framework to say that the production quantities of agricultural exports and import-competing products are a function of the pre-trade price ratios (p_i/p_i*) (domestic relative to the rest of the world) of agricultural tradable commodities compared to nonagricultural tradables. A country whose pre-trade price ratios (p_i/p_i*) are higher for agricultural commodities than for nonagricultural tradables, when trade is opened, is likely become a net importer of agricultural products. The opening of trade would tend to reduce the price ratios for agricultural products and increase them for nonagricultural products, but because of transport costs, the price ratios would tend to remain higher for agricultural than for nonagricultural commodities. In the post-trade equilibrium the relationship between domestic and foreign prices is

$$p_i = p_i^*ER(1 + t_i) \text{ for imports and}$$
$$p_i = p_i^*ER(1 - t_i) \text{ for exports,}$$

where t_i represents *ad valorem* transportation costs. The agricultural price level *APL* is a weighted average of (p_i/ERp_i*) for agricultural products. Thus a country with a negative (positive) agricultural trade balance will tend to have *APL* greater (less) than unity. One could say, therefore, that the pre-trade price ratios determine the *APL* via the net exports of agricultural products and transport costs. Because we do not observe the pre-trade prices, we formulate our model in terms of the factor endowments, which are observable.

We next develop a more detailed expression for the agricultural price level. The many agricultural products are indexed by i = 1,...I. The units of quantity are defined such that the rest-of-world price p_i* of each agricultural good is equal to unity. The exchange rate is also set equal to unity for convenience.

Let us divide the country's agricultural products into three categories: export goods, goods not actually traded internationally, and imported goods. Define the transport cost between the particular country and the Rest of the World on good i as t_i. Clearly the domestic prices of export goods in the particular country will be below unity, and those of imported goods will be above unity. The prices of goods not actually traded will lie within the bounds given by transport costs in either direction (which are assumed to be equal). More precisely, the price of an export good will be $1 - t_i$, that for an imported good will be $1 + t_i$, and that for a good not actually traded must lie between $1 - t_i$ and $1 + t_i$. Since the world prices are all unity, the agricultural price level in the country is

$$APL = \Sigma p_i X_i / \Sigma X_i.$$

Let us denote the export goods by i = 1,...I_1, the goods not actually traded by $i = I_1 +$ 1,...I_2, and the imported goods by $i = I_2 +$ 1,...I. Thus we have

$$APL = \left\{ \sum_{i=1}^{I_1} (1-t_i)X_i + \sum_{i=I_1+1}^{I_2} p_i X_i + \sum_{i=I_2+1}^{I} (1+t_i)X_i \right\} / \sum X_i . \quad (1)$$

Equation (1) gives a precise expression for the agricultural price level in terms of the domestic production shares and the international transport costs of the various commodities. Before commenting on the role of these variables, let us show how the conclusion established above, that an increase in a country's endowment of mineral resources and physical and human capital will raise its *APL*, can be seen to hold in equation (1). The conclusion follows from the fact that an increased endowment of these resources raises the wage rate. A higher wage rate pulls goods into the import category from the not-traded category and pushes goods out of the export category into the not-traded category. In other words, it reduces the value of I_1 and I_2. Equation (1) shows that these changes in I_1 and I_2 raise *APL*. The higher wage also raises the cost of production and the price of not-traded goods (those indexed from I_1 + 1 to I_2), reinforcing the changes in I_1 and I_2.

However, the *APL* does not depend only on resource endowments, nor on the trade patterns determined by resource endowments. It is possible for a country to have a low *APL* despite having a large import surplus of agricultural goods. Recall that in equation (1) the prices are weighted by the *domestic production* quantities. Suppose a land-poor country with an agricultural import surplus did not produce any of the agricultural goods that it imported. Suppose further that domestic agricultural production was concentrated in some goods that were exported subject to heavy transport costs. For such a country the *APL* would be low, despite its poor land endowment and its agricultural import surplus. This curious result shows that even at the theoretical level, there is not a perfect negative matching across countries or over time of the agricultural price level and the agricultural trade balance. However, in the empirical analysis it seems reasonable to assume that the peculiar conditions required for this curious result are not commonly present and that, data problems aside, the agricultural price level and the agricultural trade balance are expected to be strongly (but not perfectly) negatively correlated in a sample of countries.

The agricultural price level will also be affected by government policies that protect or discriminate against agriculture. The theory of national price levels suggests that import protection (via tariffs and other barriers to imports) and export subsidies raise the national price level, while export tariffs reduce it [Clague, 1986]. The same logic applies to the agricultural price level. The role of government protection of or discrimination against agriculture can be illustrated in equation (1). Suppose that transport costs are zero. On the export products the t_i refer to export taxes (export subsidies are interpreted as negative export taxes). On the imported products the t_i refer to import tariffs and the tariff equivalent of quantitative import restrictions. Let us note first that import tariffs (or equivalent import quotas) and export subsidies raise the equilibrium wage rate. This conclusion follows because these measures shift up the D_A curve in Figure 1, while they do not alter the D_{MI} and D_{NT} curves. The rise in the wage rate shifts up the costs and hence the prices of agricultural goods in the not-traded category. At the same time, the imposition of import barriers and export subsidies raises the prices of the affected goods in the exported and import-competing categories. In the final equilibrium, it is clear that the *APL* will be higher, the greater the positive t_i on the imported goods and the greater in absolute value the negative t_i on the exported goods. Conversely, the *APL* will be lower, the greater the positive t_i on the exported goods. Because positive export taxes constitute negative protection, we can summarize by saying that the *APL* is positively related to the level of protection of agriculture.

The model shows that *APL* is a function of the domestic production quantities of agricultural exports and import-competing products, and the levels of protection and transport costs. The production quantities in turn are a function of factor endowments and the levels of protection. The level of agricultural protection depends on the political strength of farmers versus that of consumers and taxpayers. The political economy literature on this topic [Olson, 1985; Anderson and Hayami, 1986] suggests that farmers in poor countries are difficult to organize, partly because they are spread out over space in an environment where transportation and communication are difficult, partly because they are less well educated in general than urban dwellers (and this limits their political influence), and partly because they are located far from the seats of political power (and thus have less ability to influence political decisions either by lobbying or by threatening disruption). In addition, consumers in poor countries are more sensitive to the price of food than consumers in rich countries because of Engel's Law. For all these reasons, agricultural protection tends to be higher in rich countries than in poor ones. Drawing on the literature on collective action, van Bastalaer [1998] has used the share of farmers in the labor force as a measure of their political strength. Finally, as mentioned above, collective action theory suggests that countries with negative agricultural trade balances should have higher levels of agricultural protection than countries with strong agricultural export surpluses, because it is less transparent and hence politically easier to transfer resources from consumers to farmers through protection against imports than to do so through the budget (for evidence of this effect in the United States, see Gardner [1987]).

EMPIRICAL TESTS

We define the following variables.

BAL	=	agricultural trade balance, or net normalized exports of agricultural products. This is $(X - M)/(X + M)$, where X and M refer to exports and imports of agricultural products.
PROTECT	=	level of agricultural protection.
DENS	=	density, or population per unit of agricultural land.
MINS	=	share of mineral products in GDP.
KAP	=	physical capital per capita.
HUMCAP	=	human capital per capita.
AGRLF	=	share of labor force in agriculture.
RELY	=	real income per capita (measured at *PPP*).
APL	=	agricultural producer price level.

We estimate the following three regressions. The expected signs of the coefficients are given in parentheses.

(2) *PROTECT* on *RELY* (+), *AGRLF* (−), *BAL* (−)

(3) *BAL* on *DENS* (−), *MINS* (−), *KAP* (−), *HUMCAP* (−), *PROTECT* (+)

(4) *APL* on *BAL* (−), *PROTECT* (+)

The signs of the coefficients have been explained above. To recapitulate, the level of agricultural protection (*PROTECT*) in equation (2) is positively related to per capita income for a variety of political economy arguments, negatively related to the share of agriculture in the labor force because a smaller size of the interest group facilitates its organization (which was the predominant influence in van Bastalaer's [1998] study), and negatively related to the agricultural trade balance (*BAL*) on the argument that it is politically easier to protect farmers through restrictions on imports than via budgetary subsidies.

The agricultural trade balance (*BAL*) in equation (3) is negatively affected by population density and by per capita endowments of human and physical capital and of mineral resources. The positive sign on *PROTECT* reflects the inhibitory influence of import restrictions on imports of agricultural products and the positive effect of export subsidies on exports.

The agricultural price level (*APL*) is negatively related to the trade balance because of the influence of transport costs — prices of a product are lower in an exporting country than in a country where domestic producers compete against imports — and positively related to import restrictions, which of course raise the prices of agricultural products.

Equations (2) and (3) form a simultaneous equation system, since *PROTECT* and *BAL* are both endogenous variables. We estimate them by two-stage least squares (2SLS), and we show the estimation by OLS for comparison. To allow for the possibility of correlation in the error terms across equations, we also present estimates by three-stage least squares (3SLS). Equation (4) is not subject to simultaneity bias and we estimate it by ordinary least squares (OLS).

THE DATA

The agricultural price level is the ratio of an agricultural purchasing-power parity to an exchange rate. The results below are for the official exchange rate, but the results were similar for the black market exchange rate[2]. The agricultural Puchasing Power Parities (PPP's), taken from Food and Agriculture Organization (FAO) [1986], are Geary-Khamis indexes. The Geary-Khamis system starts from the category-level prices (e.g., pesos per ton) of each country and calculates simultaneously the world category prices and each country's overall agricultural PPP (relative to the numeraire currency, the U.S. dollar). This PPP may be interpreted as the cost in domestic currency of a bundle of goods that cost one dollar at international prices. The weights in this bundle are the quantities of domestic production of the various goods in the particular country [FAO, 1986, 21]. All the data are for 1980.

Real income per capita relative to the United States (*RELY*), converted to dollars using GDP-level *PPP*, is from Summers and Heston [1988]. The agricultural trade balance (*BAL*) is from the FAO *Trade Yearbook*. The mineral share in GDP (*MINS*) is from the World Bank's *World Tables*, and refers to the years 1970-81. Four countries (Mali, Senegal, Costa Rica, and Israel) do not separate mining from the rest of industry; in these cases the mineral share was set equal to 0.5 percent. Population density is total population divided by the sum of arable land plus permanent crop land and one-half of pasture land.[3] The data are from the FAO *Production Yearbook* [1983].

The physical capital stock per capita (*KAP*) is from Benhabib and Spiegel [1991], who construct series of capital stock data for a large number of countries using two alternative methodologies for estimating the initial capital stock. We use the data based on the iterative methodology and a 7 percent depreciation rate. The human capital stock (*HUMCAP*) measures total mean years of education and is from Nehru and Dhareshwar [1993]. Our use of stock variables constitutes an improvement over the standard practice in the national price level literature of including flow variables (for example, the investment-to-GDP ratio and educational enrollment rates) in regressions. Stock variables are theoretically appropriate to the model.

Nominal tariff protection was taken from several different sources. Schiff and Valdes [1992] provide nominal protection rates for eighteen lesser developed countries. Anderson and Hayami [1986] provide rates of nominal protection for fifteen industrial countries. Data for many of the same industrial countries and some additional ones are in *National Prices and Agricultural Trade* [OECD, 1986].[4] The two sources were merged by taking the average of the two figures, or where only one source provided a figure, taking that figure. Finally, Webb et al. [1990] provide figures for many countries, starting in 1982. These figures are not ideal, since all the other data are for 1980. However, data could be added from this source for eight countries that were not available elsewhere.

In all we have complete data for 39 countries.

RESULTS

The regressions are displayed in Tables 1-3. The *PROTECT* regressions (Table 1) have the expected signs on the coefficients, and real income (*RELY*) and the trade balance (*BAL*) are significant. The share of the labor force in agriculture (*AGRLF*) is insignificant. Although this result seems to draw into question the strength of van Bastalaer's [1998] conclusions about the smaller size of an interest group facilitating its organization and political influence, this regression does not provide a good test of van Bastalaer's hypothesis. There is a strong negative correlation, −0.905, between the share of agriculture in the labor force (*AGRLF*) and real income, which can be expected to reduce the t-values of the coefficients. In regressions in which real income is omitted, the agricultural labor force share is negative and significant.[5] Shifting from OLS to 2SLS increases the absolute value of the trade balance coefficient, while it remains highly significant. Shifting from 2SLS to 3SLS makes very little difference.

The trade balance regressions (Table 2) are less satisfactory. In the 2SLS regression only population density (*DENS*) is significant. The mineral share (*MINS*) and physical capital (*KAP*) have the expected signs, but are not significant. Human capital (*HUMCAP*) has the wrong sign, but is also insignificant. *PROTECT* has the wrong sign in the OLS regression (not surprisingly, given the strong negative effect of *BAL* on *PROTECT* in equation (1)), and the sign changes to the expected positive sign in 2SLS, but it remains quite insignificant. Again, shifting from 2SLS to 3SLS makes very little difference.

The agricultural price level (Table 3) is quite well explained by the two theoretically indicated variables. The trade balance comes in negative, reflecting in part the influence of resource endowments and transportation costs, and *PROTECT* comes in positive, reflecting the influence of trade restrictions on agricultural prices. Both coefficients are highly significant. Simultaneity bias is not an issue in this regression.

It is not fully correct, however, to identify the trade balance coefficient in equation (3) with the effect of resource endowments (via transport costs on trade) and the *PROTECT* coefficient with the effect of trade restrictions on the agricultural price level. In the first place, the *PROTECT* coefficient in equation (3) includes only the direct effect of trade restrictions on agricultural prices and does not include the indirect effect that arises through the influence of *PROTECT* on the trade balance (see equation (2)). Secondly, the degree to which a change in the trade balance (due to, say, a change in resource endowments) affects agricultural prices depends on the gap between world and domestic prices, and this gap is affected by trade restrictions as well as by transport costs. Thus the separation of the two sets of influences is not complete. Still, it is probably correct to think of the trade balance coefficient as *primarily* reflecting the influence of resource endowments and transport costs and the *PROTECT* coefficient as reflecting the *major* effect of trade restrictions on agricultural prices.

TABLE 1
Dependent Variable: *PROTECT*

Estimation Method	Intcpt	RELY	AGRLF	BAL	RBARSQ S.E.E.
OLS	-0.076	0.619	-0.001	-0.296	0.5366
	(0.32)	(2.09)	(-0.20)	(-3.67)	(0.249)
2SLS	-0.071	0.610	-0.001	-0.368	0.4942
	(-0.29)	(2.04)	(-0.18)	(-2.71)	(0.25)
3SLS	-0.076	0.617	-0.001	-0.368	System:
	(-0.32)	(2.06)	(-0.16)	(-2.70)	(0.46)

PROTECT= level of agricultural protection; *RELY*= real income; *AGRLF*= share of labor force in agriculture; *BAL*= agricultural trade balance. *t*-statistics appear below coefficients in parentheses.

TABLE 2
Dependent Variable: *BAL*

Intcpt	DENS	MINS	KAP	HUMCAP	PROTECT
Estimation Method: OLS					
-0.040	-0.160	-0.741	3.970	0.038	-0.765
(-0.23)	(-2.85)	(-0.55)	(0.30)	(1.19)	(-2.67)
RBARSQ=0.3833 S.E.E.=0.3959					
Estimation Method: 2SLS					
0.313	-0.295	-2.612	-32.38	0.040	0.829
(0.75)	(-1.94)	(-1.00)	(-0.85)	(0.90)	(0.52)
RBARSQ=0.1438 S.E.E.=0.5507					
Estimation Method: 3SLS					
0.356	-0.313	-2.808	-37.08	0.040	1.052
(0.85)	(-2.05)	(-1.08)	(-0.98)	(0.90)	(0.66)
System RBARSQ=0.4581					

DENS= population density; *MINS*= share of mineral products in GDP; *KAP*= physical capital per capita; *HUMCAP*= human capital per capita. t-statistics appear below coefficients in parentheses.

TABLE 3
Dependent Variable: Agricultural Price Level (*APL*)

Estimation Method	Intcpt	BAL	PROTECT	RBARSQ S.E.E.
OLS	0.905	-0.254	0.540	0.5513
	(19.9)	(-2.78)	(4.29)	(0.249)

t-statistics appear below coefficients in parentheses.

CONCLUDING OBSERVATIONS

This paper has presented a theoretical model of the agricultural price level, determined by both the structure of the country's economy and by governmental interventions in agricultural trade. A country with a resource endowment that gives it a comparative advantage in agriculture will tend to export agricultural products, and given significant transportation costs, will tend to have lower producer prices for agricultural products than will countries whose resource endowments lead them to import agricultural products. On the other hand, given its resource endowment, a country that protects its farmers through import restrictions will tend to have higher producer prices for its farmers than one that does not. Our empirical test (Table 3) has provided strong support for this model, as described in the previous section.

We have also tested the standard factor endowments model of the agricultural trade balance. Somewhat surprisingly it did a rather poor job. Among the resource variables only population density was significant. The physical and human capital variables are perhaps theoretically ambiguous determinants of the agricultural trade balance, because it is not clear that agriculture is always less intensive in these factors than nonagricultural products. It does seem to us very plausible that an abundant endowment of mineral resources (which is plausibly measured by the share of minerals in GDP) would tend to make a country have a comparative disadvantage in agriculture, but there are only a few countries in our sample with a large mineral share and hence this coefficient is quite imprecisely measured.

In addition we tested some ideas from the political economy literature on the determinants of agricultural protection. We confirmed the conventional wisdom that richer countries tend to provide greater protection for their farmers than poorer ones.[6] We also found support for the proposition that it is politically easier to protect farmers through import restrictions than through budgetary outlays.

NOTES

1. For the purposes of the theoretical model we consider physical and human capital as a single factor, which is specific to the industrial sector. In the empirical work we distinguish physical from human capital. The assumption in the empirical work will be that relatively rich endowments of both types of capital, as well as of mineral resources, will tend to give a country a comparative advantage in nonagricultural tradable commodities.
2. These results are available on request. The black market rates were taken from World Bank [1991]; the original source is the World Currency Yearbook.
3. Three other density measures were examined: (a) population / total land area, (b) population / arable land plus permanent crop land, and (c) population / arable plus permanent crop plus pasture land. Results were quite similar using definitions (b) and (c). Definition (a) yielded poorer results, as might be expected, since it makes no allowance for land quality.
4. The OECD study of government intervention in agriculture provides figures for "price intervention" and for "value of production". The ratio of these is taken as the rate of nominal protection. The figures match up quite well with the nominal protection figures in Anderson and Hayami [1986].
5. Cassing and Hillman [1986] among others suggest that the relationship between protection and the share of the labor force in a sector is likely to be nonlinear, because if the sector is extremely small it may not have much political influence. In our regressions the square of the agricultural labor force share was uniformly insignificant.

6. Rao et al. [1990] dispute this conventional wisdom. However, their claim is based on a comparison of producer agricultural PPP with the overall (GDP-level) PPP. This variable is affected by many other things besides the degree of agricultural protection. In particular, it is affected by the fact that poorer countries tend to have lower prices for nontradables than richer ones, and this phenomenon appears to account for their finding that the agricultural price level, as they measure it, is negatively correlated with per capita income.

REFERENCES

Anderson, K. and Hayami, Y. *The Political Economy of Agricultural Protection: East Asia in International Perspective*. Sydney: Allen and Unwin and Australian National University, 1986.

Benhabib, J. and Spiegel, M. M. Growth Accounting with Physical and Human Capital Accumulation. Economic Research Report 91-66, 1991.

Cassing, J. H., and Hillman, A. L. Shifting Comparative and Senescent Industry Collapse, *American Economic Review*, June 1986, 516-23.

Clague, C. K. A Model of Real National Prices. *Southern Economic Journal*, April 1985, 988-1017.

__________. Tariffs, Transfers, and the Real Exchange Rate. *Southern Economic Journal*, July 1986, 155-69.

__________. Explanations of National Price Levels, in *World Comparison of Incomes, Prices and Product*, edited by J. Salazar-Carrillo and D.S.P. Rao. New York: North-Holland, 1988, 237-62.

Food and Agriculture Organization (FAO). *Production Yearbook*. Rome, 1983.

__________. *Trade Yearbook*, Rome, various years.

__________. *Intercountry Comparisons of Agricultural Production Aggregates*. Economic and Social Development Paper No. 61. Rome, 1986.

Gardner, B.L., Causes of U.S. Farm Commodity Programs. *Journal of Political Economy*, April 1987, 290-309.

Nehru, V. and Dhareshwar, A. A New Database on Physical Capital Stock: Sources, Methodology, and Results. *Revista de Analisis Economico*, 1993, 37-59.

Olson, M. Space, Agriculture, and Organization. *American Journal of Agricultural Economics*, 1985, 928-37.

Organization for Economic Cooperation and Development (OECD). *National Prices and Agricultural Trade*. Paris, 1987.

Rao, D.S.P., Shepherd, W.S., and Sharma, K.C. A Comparative Study of National Price Levels, Agricultural Prices and Exchange Rates. *World Development*, 1990, 215-29.

Schiff, M., and Valdes, A. *The Political Economy of Agricultural Pricing Policy, Vol. 4: A Synthesis of the Economics in Developing Countries*. Baltimore, MD: Johns Hopkins University Press for the World Bank,1992.

Summers, R. and Heston, A. A New Set of International Comparisons of Real Product and Prices: Estimates for 130 Countries, 1950-1985. *Review of Income and Wealth*, March 1988, 1-25.

van Bastalaer, T. The Political Economy of Food Pricing: An Extended Empirical Test of the Interest Group Approach. *Public Choice*, 1998.

Webb, A.J. Lopez, M., and Penn, R. *Estimates of Producer and Consumer Subsidy Equivalents: Government Intervention in Agriculture, 1982-87*, U.S. Department of Agriculture, Economic Research Service, Statistical Bulletin no. 803, 1990.

World Bank. *World Development Report 1991*, Supplementary Data, Xerox and data diskette, 1991.