Food-Pricing Policy in Developing Countries: Further Evidence on Cereal Producer Prices

Daphne S. Taylor and Truman P. Phillips

Recently, two independent studies have produced contradicting evidence regarding the extent of price discrimination in developing countries. The objective of this study is to reexamine the evidence of direct and indirect distortion in cereal producer prices. Nominal protection coefficients for wheat, maize, and rice are calculated for fifty-one developing countries spanning the period 1980–86. Black market exchange rates are used to adjust the nominal protection coefficients to reflect the indirect effect of price interventions through exchange rate policies. The results confirm the conventional wisdom that, although developing countries tend to protect domestic cereal producers, taxation caused by overvaluation of official exchange rates exceeds any direct price protection offered domestic producers.

Key words: exchange rate bias, price distortion, producer prices.

Numerous studies have shown that price discrimination against agricultural producers is common in many developing countries (Bale and Lutz, FAO 1987, Mergos, Peterson, Schultz, World Bank).[1] It is contended that this discrimination has led to agricultural stagnation. Hence, recent policy reform recommendations suggest the removal or at least reduction of price discrimination through exchange rate adjustments, reduction of food subsidies, and increase in agricultural output prices. Such policy reform recommendations are currently being implemented through the World Bank and International Monetary Fund's structural adjustment lending programs (International Monetary Fund 1986).

More recently, two independent studies (Byerlee and Sain; Krueger, Schiff, and Valdes) have produced contradicting evidence regarding the extent of price discrimination against agricultural producers in developing countries. Specifically, the Byerlee and Sain study, which examines the evidence of discrimination in wheat prices for thirty-one developing countries for the period 1980–82, questions the universality of producer price distortions and the emphasis on [raising producer prices as a key element of] policy reform.[2] In contrast, the Krueger, Schiff, and Valdes study, which includes an examination of discrimination in wheat, rice, and maize prices for eighteen countries for the period 1980–84, supports the contention that producer price distortions exist and the need for policy reform.

The objective of this study is to reexamine the evidence of direct and indirect distortion in cereal producer prices. Three cereal commodities in fifty-one countries are examined for the period spanning 1980–86. The sample represents 97% of the wheat produced in developing countries, 97% of the maize, and 86% of the rice. Regionally, the sample includes twenty-one African countries, fourteen Asian countries, and sixteen Latin American countries which were grouped by commodity into four trading categories: net importers, aid recipients, net exporters, and self-sufficient producing countries.

Daphne Taylor is an associate of the Centre for Food Security, University of Guelph; Truman Phillips is a professor in the Department of Agricultural Economics and Business and director of the Centre for Food Security, University of Guelph.

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[1] The time period of analysis in these studies range from the late 1960s to the late 1970s.

[2] Alternatively, they suggest that, for countries experiencing low agricultural productivity, a better policy would be the development of technologies appropriate to farmers in support of input delivery and extension systems.

Methodology

By far the simplest measure of price distortion is the nominal protection coefficient (NPC). Although nominal protection coefficients measure only the deviation of domestic prices relative to world prices, the conclusions drawn regarding the policy environment facing agricultural production activities are essentially the same as those drawn from more robust calculations (Scandizzo and Bruce, Gotsch and Brown).[3] For the purposes of this study, nominal protection coefficients were considered sufficient to examine the evidence of price discrimination in producer prices across developing countries.

NPCs were calculated in this study as follows:

$$NPC = \frac{P_i^d + t^d}{P_i^w + t^w},$$

where P_i^d is the domestic farm gate producer price of output i, P_i^w is the border price of output i in local currency at official exchange rates, and t^d and t^w are the transport costs associated with moving output i from the farmgate and border to a common consumption location, respectively. The resulting NPC represents the magnitude of direct intervention in domestic price determination by measuring the extent to which the domestic prices deviate from the border prices facing the country. Indirect interventions brought about by exchange rates policies were measured by an adjusted NPC which took into account biased official exchange rates.

Data for Calculating NPCs

Because NPC estimates are sensitive to underlying data choices, the following discussion briefly describes the data and procedures used in the calculation of producer prices, border prices, and transportation costs.

Producer Prices

Farmgate prices for NPCs are usually taken from the Food and Agriculture Organization (FAO) Producer Price Series (Peterson, FAO 1987). Unfortunately, the FAO Producer Price Series are available for only a limited number of countries, often are not up to date, and on occasion represent official prices as reported by the government as opposed to actual farmgate prices received by farmers. An alternative to this series is farmgate producer survey prices collected by international agricultural research institutions (Byerlee and Sain). The International Maize and Wheat Improvement Centre (CIMMYT) collects data on farmgate prices which represent actual market prices at a low point in the seasonal cycle in major producing regions and are usually the most up-to-date series available.[4] This series, however, is available only in alternative years for wheat and maize. For example, CIMMYT collected farmgate prices for maize for the years 1980/81, 1983/84 and 1985/86. They collected farmgate prices for wheat for the years 1980/81, 1981/82 and 1984/85. The International Rice Research Institute (IRRI) also compiles data on farmgate harvest prices for rice but only for a very limited number of Asian countries (Bangladesh, India, Indonesia, Korea, Philippines, and Thailand).[5] To construct as broad a sample as possible for this study, the FAO series was used to supplement CIMMYT and IRRI data for those years and countries for which data were not available.[6]

Border Prices

Border prices may be calculated using an "undistorted" international price adjusted for a premium reflecting differential freight rates as in Byerlee and Sain or by using actual CIF and FOB border prices (i.e., trade unit values) reported for individual countries. In this study trade unit values were used to reflect the border prices facing each country for each commodity and year.[7]

[3] Alternative methods, such as the effective protection coefficient, effective subsidy coefficient, producer subsidy equivalent, resource cost ratio, and domestic resource cost, provide more detail on the effects of price distortion on agricultural production.

[4] CIMMYT collects wheat and maize producer prices through questionnaires which are sent to agricultural researchers and extension workers working in the country and who have frequent farmer contact in major cereal-producing regions. The questionnaire requests information on the post-harvest price, the price of nitrogenous fertilizer, and the daily wage rate for unskilled labor for the most recent production season (CIMMYT).

[5] Unlike CIMMYT, IRRI does not collect primary data on producer farmgate prices but compiles and publishes data from government and other sources in their publication *World Rice Statistics*.

[6] FAO data was the principle source for maize prices in 1981/82 and 1982/83, wheat prices in 1982/83, and rice prices in 1980/81, 1981/82, 1982/83.

[7] Yearly trade unit values were calculated by dividing the total value of imports and exports by their total quantities as reported in FAO statistics.

It is argued that trade unit values more accurately reflect the opportunity costs facing domestic producers because they are the prices with which domestic producers must complete (Scandizzo and Bruce).[8]

Internal Transportation Costs

Internal transportation costs were used to adjust both border and farmgate prices to each country's major consumption or market center, as done by Byerlee and Sain. This center was assumed to be the largest, most populated city in each country. For importing countries, the cost of transporting produce from the production region to the consumption point was added to the farmgate price, and the cost of transporting produce from the port to the consumption point was added to the border price. For exporting countries, the cost of transporting produce from the production region to the port was added to the farmgate price. Internal transportation distances and road conditions were determined individually for each country and commodity in this study using Bartholomew maps and transportation costs by truck or wagon estimated at US $.07 to US $.10 per tonne per kilometer for paved roads, $.15 for gravel roads, and $.20 to $.25 for dirt tracks. For mountainous regions these estimates were adjusted upward by 20%.[9]

Together, these data were used to calculate NPCs. The resulting values are discussed in the following sections.

Results on Direct Price Intervention

A total of 310 NPCs were calculated; 152 for maize, 85 for wheat, and 73 for rice for fifty-one countries spanning the period 1980–86. For presentation and analytical purposes, NPCs were averaged by country and commodity for the period 1980–86 (see appendix). The sample includes twenty-one African countries, fourteen Asian countries, and sixteen Latin American countries.

Because the study by Krueger, Schiff, and Valdes noted that, on average, food imports are subsidized while exports are generally taxed, each country by commodity in this study was classified as a net importer, a net exporter, a food-aid-recipient importer, or a self-sufficient producer over the period 1980–86. Self-sufficient countries were those countries which shifted between net exporting and net importing positions within the time period under examination. Aid recipient countries were identified as net importing countries where food aid receipts made up more than 50% on average of the total imports of the commodity.

To reduce the possibility that countries are classified as having an environment of protection or discrimination when in fact they do not, NPCs within the range of .85 to 1.15 are considered to be free of price intervention. NPCs less than .85 represent an environment of taxation while NPCs greater than 1.15 represent an environment of protection. This approach was also taken by Byerlee and Sain.

Table 1 summarizes the results in terms of average NPC and standard deviation for each commodity and trade grouping.[10] Of the seven groups, only two appear to have direct taxation: rice producers (.83) and net exporting countries (.84). Although a relationship between net exporters and rice producing countries is apparent, in fact less than half the NPCs calculated for rice were identified as net exporters. At the other extreme, direct protection is indicated for three groups: maize (1.30), wheat (1.19), and net importers (1.42). The average NPCs for the remaining two groups indicate neutral policy environments: aid recipients (.99) and self-sufficient producers (1.07). These results suggest that, on average, direct producer price discrimination is evident in only rice and net exported commodities. Within trading categories, maize is protected at a higher rate than wheat, while rice generally receives the least price protection. These results are consistent with the results found by both Byerlee and Sain and Krueger, Schiff, and Valdes.

While, all three studies conclude that direct domestic cereal price discrimination is not widespread, it is widely acknowledged that exchange rate policies significantly affect trading patterns and opportunities. Exchange rate policies can act either as an indirect tax or as a subsidy on agricultural prices in developing countries (World

[8] Years when countries were net importers, CIF values were used. Years when countries were net exporter, FOB values were used. For those countries and years where neither imports nor exports were reported in the FAO statistics, a border price was taken from a neighboring country that best reflected the border price facing that country if it had imported.

[9] These estimates were provided by Charles Van Dervoort, Department of Transportation, Washington, D.C., 8 November 1988. Van Dervoort is a member of the Interagency Task Force on the African Emergency Transportation Team.

[10] Regional NPC averages were not found to be statistically different and therefore are not discussed here. They may be found however in the appendix.

Table 1 Summary of Unadjusted NPC Results by Commodity and Trade Groupings

Groupings	Maize	Wheat	Rice	Average NPC	Standard Deviation	Number of Observations
Net importer	1.64	1.43	1.14	1.42	.57	110
Aid recipient	1.14	.97	.66	.99	.46	95
Net exporter	1.13	.67	.62	.84	.40	35
Self-sufficient	1.21	.97	.59	1.07	.49	64
Average NPC	1.30	1.19	.83	1.15		
Standard deviation	.62	.46	.37		.55	
Number of observations	147	85	72			304

Note: This summary excludes Ghana's NPC for maize and Venezuela's NPC for rice.

Bank, FAO 1987, Peterson, Schultz). To determine if exchange rate policies provide indirect price distortions, NPCs were adjusted for biases in official exchange rates.

Exchange Rate Bias

Two methods are commonly used to account for exchange rate bias. The most common method is to adjust official exchange rates to reflect the differential inflation rate between domestic and import prices (Byerlee and Sain, FAO 1987). However, this type of correction ignores factors other than inflation differentials that lead to exchange rate distortions. For example, Byerlee and Sain note that in a country such as India, the inflation method indicates an undervalued exchange rate, but high tariff protection and import controls relative to export subsidies would suggest significant overvaluation.

The second method is to calculate shadow or equilibrium exchange rates. Krueger, Schiff, and Valdes define equilibrium exchange rates as the real exchange rate necessary to keep current accounts sustainable within a country if all quantitative and tariff protection against imports and intervention affecting exports were removed. This involves the estimation of the equivalent tariff on import protection, foreign exchange demand, and supply elasticities and comparison with the actual real exchange rate to estimate the amount of change in the real exchange rate needed to yield a sustainable current account level. Such procedures require substantial research resources and in-depth study within each country, which limits the timeliness of the estimates.

This study introduces a simpler approach. This approach is to measure exchange rate bias as the ratio of black market exchange rates (Cowitt) to official exchange rates (IMF). Although black market rates may reflect a risk premium on the exchange owing to the illegal nature of the transaction, they produced results similar to those found by Krueger, Schiff, and Valdes but were easier and less costly to calculate than shadow exchange rates.[11] The use of black market adjustments, however, did lead to some important differences from the Byerlee and Sain study (Taylor).

Results on Indirect Price Intervention

Adjustments for exchange rate bias were made to the 310 original NPCs by multiplying each NPC by the ratio of the black market exchange rate to the official exchange rate for that year. The results are summarized in table 2.

In sharp contrast to table 1, table 2 shows that the average adjusted NPC is less than .85 in five of the seven groups and is less than 1.15 for the remaining two groups. Those groups that have an environment of taxation are wheat (.76), rice (.62), aid recipients (.68), net exporters (.58), and self-sufficient producers (.82). Maize (.93) and net importers (1.01) have neutral policy environments.

By trading group, producers in self-sufficient countries and aid recipient countries face taxation because of exchange rate distortions, whereas indirect taxation merely offsets the advantages of direct subsidies in net importing countries and increases the taxation within net exporting countries.

These results suggest that the classification of countries by their trading posture is important. For example, when the indirect effects of exchange rate bias are not considered, countries

[11] Cowitt black market rates were also used in a recent World Bank study examining global trends in real exchange rates (Wood).

Table 2. Summary of NPC Results Adjusted for Exchange Rate Bias by Commodity and Trade Groupings

Groupings	Maize	Wheat	Rice	Average NPC	Standard Deviation	Number of Observations
Net importer	1.23	.95	.82	1.01	.54	110
Aid recipient	.80	.65	.44	.68	.41	100
Net exporter	.72	.40	.49	.58	.29	35
Self-sufficient	.90	.76	.54	.82	.38	64
Average NPC	.93	.79	.62	.81		
Standard deviation	.54	.39	.32		.47	
Number of observations	152	85	72			309

Note: This summary excludes Venezuela's Adjusted NPC for rice.

which receive substantial volumes of food aid illustrate neutral policy environments, whereas net importing countries illustrate protective policy environments (table 1). When the indirect effects of exchange rate bias are considered (table 2) aid recipient countries illustrate significant taxation toward domestic producers (the average NPC is only slightly higher than that observed in net exporting countries), whereas exchange rate policies merely neutralize the direct protection observed in net importing countries.

A comparison of the results contained in table 2 with those contained in table 1 provides strong evidence that indirect price discrimination owing to distorted exchange rate policies is widespread in developing countries. In most cases, taxation from indirect intervention though exchange rate distortion exacerbates taxation caused by direct pricing policies and negates any protection offered producers though favorable direct pricing policies. This result is consistent with the results of the Krueger, Schiff, and Valdes study which found that imported commodities (mostly cereals) were taxed at a rate of approximately 7% when direct and indirect effects were considered. This is contrary to the results of the Byerlee and Sain study, which did not find strong evidence of exchange rate distortion.[12]

Concluding Comments

The results of this study confirm many of the basic premises regarding trading patterns and pricing policies. Exporting countries use agricultural taxation to generate needed revenue, and importing countries, in general, offer production incentives to domestic agricultural producers in the hope of reducing import dependency (Krueger, Schiff, and Valdes). The extent of direct and indirect price discrimination in developing countries suggests that, although developing countries tend to protect domestic cereal producers, taxation caused by overvaluation of official exchange rates exceeds any direct price protection offered domestic producers. The tendency to provide direct price protection to cereal producers was strongest for maize producers and weakest for rice producers. However, all cereal producers were found to compete against cheaper cereal imports owing to overvalued official exchange rates. This result is consistent with individual country studies reported by Krueger, Schiff, and Valdes but contradicts the conclusions for wheat drawn by Byerlee and Sain.

The results of this study go beyond those of previous studies by examining a broader and larger sample of countries and by examining the impacts of pricing policies by commodity, trading, and regional groupings. In particular, this study has revealed that divergent price policy environments exist between net importing and food aid recipient countries. A strong negative pricing bias against domestic producers was observed in aid receiving countries, whereas a strong protective bias was revealed in net importing countries. This result has previously been overlooked because most studies assume a homogenous group of net importing countries.

The implication for policy reform is that the common dual recommendations of realigning exchange rates and increasing agricultural producer prices may be inappropriate. If exchange

[12] The average adjusted NPC for wheat-producing countries in the Byerlee and Sain study was 1.02. For those same countries and years, the adjusted NPC in this study was .83.

rate reforms are achieved, most of the countries covered in this study will appear to have direct price protection policies prevail, particularly for maize producers. Thus, recommendations for increased agricultural prices may not be necessary if exchange rate reforms are successful. In fact, if the objective is to achieve efficiencies in resource allocation, policy makers may wish to lessen direct support programs, once exchange rates have been devalued.

Finally, the use of published black market exchange rates could make tracking price distortions a much more routine and less demanding undertaking than is suggested by Krueger, Schiff, and Valdes.

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Appendix

Average NPCs Country and Commodity Spanning 1980–86

West Asia and North Africa

	Unadjusted NPC			NPC Adjusted for Exchange Rate Bias		
Country	Maize	Wheat	Rice	Maize	Wheat	Rice
Algeria		1.57			.36	
Egypt	.82	.44	.40	.49	.33	.30
Morocco	2.25	1.23		2.04	1.07	
Tunisia		.91			.76	
Iran		2.55			.38	
Iraq		1.14			.28	
Jordan		1.03			.96	
Syria	2.29	1.49		1.47	.87	
Turkey	1.14	.92	1.13	.85	.69	.82
Average	1.63	1.25	.76	1.21	.63	.56

Sub-Saharan Africa

	Unadjusted NPC			NPC Adjusted for Exchange Rate Bias		
Country	Maize	Wheat	Rice	Maize	Wheat	Rice
Benin	1.08			.91		
Burkina Faso	.98			.83		
Cameroon	.72	.91	1.13	.72	.86	1.06
Ethiopia	.65	.88		.41	.56	
Ghana	24.34			1.02		
Ivory Coast	1.19		.75	1.14		.71
Kenya	1.28	.96	.44	1.08	.73	.34
Madagascar	1.36			1.06		
Malawi	.78		.30	.47		.16
Mozambique	1.01			.25		
Niger	2.81		.51	2.37		.48
Senegal	1.47		.77	1.35		.71
Sudan	.72	1.59		.38	.85	
Tanzania	1.60	1.03	.59	.47	.30	.19
Zaire	1.49			.52		
Zambia	.67	1.08	.76	.45	.72	.50
Zimbabwe	.83	.65		.41	.30	
Average	2.53	1.02	.66	.81	.62	.52
(ex. Ghana)	1.17					

Far East Asia

	Unadjusted NPC			NPC Adjusted for Exchange Rate Bias		
Country	Maize	Wheat	Rice	Maize	Wheat	Rice
Bangladesh	.65	1.31	.86	.35	.74	.47
China	2.36	1.36	1.17	1.91	1.10	.91
India	1.24	1.00	.45	1.07	.87	.41
Indonesia	1.23		.60	1.14		.57
Korea	2.65	2.30	1.93	2.43	2.19	1.77
Nepal	.76	.82		.63	.70	
Pakistan	1.13	.77	.57	.91	.56	.41
Philippines	1.56		.71	1.37		.64
Thailand	1.08		.50	1.11		.49
Average	1.41	1.26	.85	1.21	1.03	.71

Latin America

Country	Unadjusted NPC			NPC Adjusted for Exchange Rate Bias		
	Maize	Wheat	Rice	Maize	Wheat	Rice
Argentina	.66	.67		.41	.40	
Bolivia	.65			.33		
Brazil	1.46	1.43	1.06	1.10	1.19	.61
Chile	.90	1.16		.66	.94	
Colombia	1.45	.95	.78	1.23	.87	.67
Dominican Rep.	1.19		.82	.79		.39
Ecuador	2.19	1.33	.99	1.26	.89	.68
El Salvador	.99			.40		
Guatemala	.72			.34		
Haiti	1.11			1.11		
Honduras	.53			.53		
Mexico	2.03	1.52	1.28	1.23	1.15	.81
Paraguay	1.73		1.51	.62		.65
Peru	2.96	1.85	.84	2.09	1.46	.67
Uruguay	1.03	.77		.82	.56	
Venezuela	1.26		3.88	.47		3.58
Average	1.30	1.21	1.39	.84	.93	1.01
(ex. Venezuela)			1.04			.64