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In this paper, the authors examined the direct and indirect effects of the Honduran price control system on agricultural goods and other basic goods. The authors describe a situation where the price controls have reduced fluctuations in prices, protecting consumers and producers from international shocks. However, this smoothing of price paths also prevented the domestic market from allocating the costs induced by weather shocks between consumers and producers. Instead, producers had to bear the costs of these fluctuations. This means thatthere was a shift in gains from producers to consumers, which means that urban consumers benefitted from rural worker losses. Also the controls have resulted in a long-term decline in the price of wheat flour, which has in turn driven down the prices of corn, rice, and beans. The declining prices have reduced production of both corn and rice, substantially reducing implicit wages in both industries. The authors conclude that while the controlled prices could be raised, with the increases passed along to consumers, this method causes urban residents to blame the government. They feel that price controls on goods whose domestic prices are near international prices should be released to help the rural populations

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HONDURAS:

AGRICULTURAL PRICE CONTROLS

January, 1991

APAP II Technical Report No. 114

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Prepared For:
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AGRICULTURAL PRICE CONTROLS IN HONDURAS

George T. McCandless Jr.
Evan Tanner

ABSTRACT

As of September, 1990, there were nine agricultural goods whose prices were directly controlled by the government of Honduras. The system of import restrictions then in effect implicitly controlled the prices of many other basic goods. In particular, the prices of basic grains are controlled indirectly by intervention in the market by the Honduran Agricultrual Marketing Institute (IHMA).

We get several strong results from our analysis. The price control mechanisms in Honduras, both direct and indirect, have resulted in much smoother price paths than the prices for the same goods in the international markets. While this smoothing "protected" the consumers and producers from international shocks, it also prevented the domestic market from allocating the costs generated by weather shocks between the consumers and the producers. The price controls forced the producers to bear the costs of these weather shocks.

There exists a strong relationship between the (controlled) price of wheat flour and the prices of the other three basic grains. The long term decline in the price of wheat flour (effected, in part, by a fixed nominal price in the face of slow but continuing inflation) has driven down the prices of corn, rice, and beans. The GOH has been aided in maintaining the price controls on wheat flour by the concessionary rates it gets from the seller countries, and, particularly, the United States Public Law 480 program.

From analysis of production functions, it appears that the price controls has shifted the gains from technological progress from the producers to the consumers, or at least, from the rural workers to the urban consumers. The declining prices has reduced production of both corn and rice and has substantially reduced the implicit wages in both of these industries.

If international prices had been in effect in Honduras, the price of the consumed basket of goods would have been higher. While the cost of the sample basket of goods would have risen for the poorer members of the economy, it would have risen considerably more for the richer sectors. It might be claimed that the price controls have aided the rich relatively more than they have helped the urban poor. Measuring the prices using export prices rather than import prices results in smaller increases for consumers of all income brackets and regions, and the very poorest face virtually no increase in costs.

The very poorest of the Honduran population live in rural areas. It is clear that the price controls have not substantially reduced the cost of the agricultural goods they consume and that they have had a very negative effect on the wages that they could have earned.

Analysis of the monthly data, supports the above conclusions. In addition, it points out the difficulties that the GOH has in attempting to maintain nominal price controls in the face of higher domestic inflation and increasing international prices for agricultural goods. The increases in the exchange rate that took place in early 1990 further add to the

difficulty in maintaining these controls. Unrealistically set domestic prices result in the rational response of producers to shift, as much as possible, production from goods with controlled prices to goods whose prices are not controlled and in which they can earn normal returns. This is illustrated by our discussion of milk and cheese.

Increases in the prices of agricultural goods are required to improve the economic situation of the rural population. While it is possible to increase the controlled prices and pass these increases through to the producers, this method causes the urban consumers to place the blame for the price increases directly on the government in power and especially on the government's price control office. For those goods whose domestic prices are currently near international prices, simply releasing the controls and allowing imports would prevent rapid rises but should eventually result in higher prices for the producers.

It seems unlikely that releasing controls will cause a decline in the domestic price of any of the goods. Even in the case of african palm oil, which is experiencing an unusally low international price, a tariff rate of twenty percent should be able to keep the price at its current level. Since there has been considerable (GOH encouraged) investment in african palm, for reputational reasons, it is reasonable that the GOH continue to protect these producers, at least for some additional years.

The price of wheat flour should be increased and the imports be reduced. While there appears to be considerable demand for wheat flour and its products, much of this is price driven and results from the relatively low price of these goods relative to traditional grains. Reducing wheat imports and raising the price of wheat should result in increased production of the traditional grains and increased income for the Hondurean farmer.

List of Acronyms

BACH - Banco Central de Honduras

EEC - European Economic Community

GOH - Government of Honduras

IHMA - Instituto Hondureno de Mercadeo Agricola --the Honduran Agricultural Marketing Institute

IMF - International Monetary Fund

P.L. 480 - United States Public Law 480

USAID - United States Agency for International Development

U.S.D.A. - United States Department of Agriculture

AGRICULTURAL PRICE CONTROLS IN HONDURAS

1. Introduction and history

1.1 Introduction

As of September, 1990, there were nine agricultural goods whose prices were directly controled by the government of Honduras (GOH). The system of import restrictions then in effect implicitly controlled the prices of many other basic goods. In particular, the prices of the basic grains (white corn, rice, and red beans) are controlled indirectly by intervention in the market by the government marketing board, Instituto Hondureno de Mercadeo Agricola (IHMA). These price controls have subsidized the consumption of the urban sectors at the expense of the rural sector. While consumers have been paying less than world prices for many of these goods during much of the last sixteen years, the producers have been receiving less than world price (and correspondingly lower wages) for their goods. In this paper we study the effects of these price controls.

Chapters 2 through 5 use annual data to demonstrate how the price controls, both direct and indirect, have reduced the cost of a basic basket of goods for the consumer and how they have reduced production and rural wages. In chapter 2, we show that the price controls have reduced the amount of variance that prices have had in Honduras when compared to the international prices for the same (or equivalent) goods. On the positive side, this price smoothing has made it easier for Honduran farmers to predict what price they will be getting for their output (an ex ante benefit). On the negative side, the price controls have prevented the market mechanism from spreading the crop (weather) risk among the consumers and the producers. Under normal conditions, a bad harvest causes the prices of agricultural goods to rise

and softens the shock to the producers by paying them a higher per unit price for their harvest. With prices controlled, the full weight of the climatic risk falls on the producers.

Chapter 3 shows that the long term downward trend in the real price of basic grains can be attributed (at least in part) to the program of importation of concessionary wheat. Granger causality tests show that the price of wheat has a direct (and, generally, strong) effect on the prices of the other three basic grains. Declines in wheat prices generate declines in the prices of white corn, rice, and red beans. The direct price controls on wheat (the only one of the basic grains with direct price controls) resulted in a secular decline in the real price of wheat since 1974. The declining real price of wheat has been made possible by the import of concessionary wheat purchases from Europe and especially from the United States through P.L. 480.

Production functions and equations for determining land use for basic grains are estimated in Chapter 4. For white corn and rice, increases in the price results in an increase in land use in the next year. Increased land use results in increased production (especially in rice, where the labor input is fairly small). Using the economically active rural population as a proxy for labor in each of the goods, we calculate marginal products of labor (a kind of shadow wage). This calculation indicates that technical advances in corn production have not raised the real wage in that industry and have probably gone to the urban consumer through the long run decline in the real price of corn.

Chapter 5 examines the welfare effects of the price controls (both direct and indirect) by computing the cost of a small basket of goods under alternative import and export arrangements. Given that the existing

exchange rate of 2 Lempiras per U.S. dollar was maintained by a wide range of restrictions on imports and exports (beyond the normal tariff rates), we first estimate demand and supply functions for foreign exchange and use the trade deficit to estimate equilibrium exchange rates. Using these estimated exchange rates, we then estimate the cost of the basket of goods under the hypothesis that the goods were a) imported under the regime in effect, b) exported under the regime in effect, c) imported under a regime of a 20% tariff rate, and d) exported under a regime of a 1% export tax. The actual average cost of the basket was less than under any of these regimes and in the cases of the regimes with the import prices, was considerably less. The alternative regimes would have imposed high costs on the urban consumers. The rural consumers did not see increases in the cost of the basket as large as those of the urban consumers. Furthermore, the rural consumers are not as tied to the market economy as the urban consumers and with subsistance production of much of their diet, may not face any real increases in their costs while receiving higher prices (and imputed wages) for their output.

Chapters 6 and 7 analyse the monthly data of prices. Chapter 6 showst that, from 1980 to 1990, changes in controlled prices were the GOH's response to changes in the domestic inflation rate, the international price of the controlled goods, or both. Supporting the results from the annual data, we show that the variation calculated using monthly data shows that Honduras had smoother price paths than did the international market. The recent rapid increase in price levels in Honduras, the changing exchange rate, and increasing international prices suggests that it will be much harder to sustain controls in the coming year than it has been in the past.

Chapter 7 shows how the dairy sector responded to the price controls. During periods when the controlled price of fluid milk was unusually low,

the producers shifted to cheese production and, possibly, to the adulteration of mantequilla crema. Since the price of cheese was not controlled, and cheese is a relatively storable commodity, this was a way of storing production until a period of more favorable prices.

1.2 History

The current system of price controls began in 1973 when the GOH issued Decreto 91. This decree set forth the main program for controlling prices on a wide range of goods of general consumption (bienes de consumo basico). The decree designated the basic types of goods to be covered, the main form of control, and the punishments for infractions of this decree. This law was followed by Acuerdo 297 (issued in September 1974) which designated the particular goods whose prices were to be controlled. The Ministry of Economy (Comercio Interior) was given the responsibility for determining the maximum prices that could be charged at each level (producer, wholesale, and retail) for each type of good (and in many cases for each brand and each package size).

While the basket of goods with controlled prices included a basic group of agricultural goods, it also included many other basic goods. School materials, cloth and thread, hides and other materials for making shoes, petroleum distillates, fertilizers, animal foods, building materials, and pharmaceuticals were all included in the list. Recently, the GOH has reduced the number of items on the list and discussions with the Ministry of Economy indicate that more goods should be removed shortly. Exhibit A1.1 of Appendix 1 is a copy of the GOH publication, La Gaceta, for March 5, 1990 which lists the goods whose prices are currently controlled.

The number of agricultural goods with controlled prices has changed

substantially over the years. For each change, an Acuerdo would give the new list of items on the list and then the Ministry of Economy would publish a separate list of the approved prices for each good designated in the most recent Acuerdo. Table 1.1 shows the goods included in each of the Acuerdos since 1973. Each row is dedicated to one good, so it is easy to follow when goods were put on the list and when they were taken off. In particular, notice that the list has been steadily shrinking since 1984 (it was at its longest with Acuerdo 563-84). There are currently only nine agricultural consumer products included in the list of controlled prices.

Price control decrees

Decree:	297	502-81	563-84	1017-84	344-86	463-88	472-89
Date:	sept/9/74	dec/28/81	jul/6/84	dec/28/84	apr/29/86	dec/28/88	dec/26/89
	lard	lard	lard	lard	lard	vegetabl lard	vegetabl lard
	sugar+panela	sugar	sugar	sugar	sugar	sugar	sugar
	eggs	eggs	eggs	eggs	eggs		
		powdered milk	powdered milk	powdered milk	powdered milk		
	pasta	pasta	pasta	pasta	pasta		
	salt	salt	salt	salt	salt		
	margarine	margarine	margarine	margarine	margarine	margarine	
	beef	beef	beef	beef	beef		
	pork meat	pork meat	pork meat	pork meat	pork meat		
	chicken meat	chicken meat	chicken meat	chicken meat	chicken meat	chicken	chicken
	milk+derivatives	fluid milk	fluid milk	fluid milk	fluid milk		
	bread	bread	bread	bread	bread		
	tomato paste	tomato paste	tomato paste	tomato paste	tomato paste	tomato paste	
	semolina	semolina	semolina	semolina	semolina		
	wheat flour	wheat flour	wheat flour	wheat flour	wheat flour	wheat flour	wheat flour
	animal feeds	animal feeds	animal feeds	animal feeds	animal feeds	animal feeds	animal feeds
	oils		vegetable oil	vegetable oil	vegetable oil	vegetable oil	vegetable oil
	infant food		infant food	infant food	infant food		
	coffee		coffee	coffee	coffee	coffee	coffee
			yeast	yeast	yeast		
			canned juice	canned juice			
	soups dehy.		soups dehy.	soups dehy.	soups dehy.		
			meat flour	meat flour	meat flour		
			oat meal	oat meal	oat meal		
			raw sugar				
			fish				
			corn flour				
			butter				
			cheese				
			honey				
				past. milk		past. milk	past. milk
	polvo de hornear					corn starch	corn starch

Table 1.1: Price control decrees

LA GACETA

Diario Oficial de la República de Honduras

DECANO DE LA PRENSA HONDUREÑA

Nº 001320

Director: Periodista LISANDRO QUESADA

AÑO CXIV TEGUCIGALPA, D. C. HONDURAS. LUNES 5 DE MARZO DE 1990 NUM. 26.0

PRESIDENCIA DE LA REPUBLICA

ECONOMIA

ACUERDO NUMERO 472-89

Tegucigalpa, M.D.C., 26 de diciembre de 1989

El Presidente Constitucional de la República:

CONSIDERANDO: Que de conformidad a la Ley de Protección al Consumidor, del 19 de mayo de 1989, el Poder Ejecutivo, a través de la Secretaría de Economía y Comercio, está facultado para elaborar la lista de productos sujetos a las medidas establecidas en dicha Ley.

CONSIDERANDO: Que el Acuerdo Nº 463-88, del 28 de diciembre de 1988, contempla la lista de productos y materias primas que están sujetos en forma permanente a control de precios.

CONSIDERANDO: Que se hace necesario revisar la lista contemplada en el Acuerdo antes mencionado, a fin de mantener bajo regulación de precios aquellos productos que así lo ameritan dadas las actuales circunstancias.

POR TANTO: En uso de la atribución conferida por el inciso II del Artículo 245, de la Constitución de la República, y en aplicación de los Artículos 9, 29, inciso a) de la Ley de Protección al Consumidor y Artículos 15, 36 y 41 de su Reglamento.

A C U E R D A :

PRIMERO: Sujetar a regulación de precios y demás condiciones de abastecimiento los siguientes productos:

I. PRODUCTOS ALIMENTICIOS:

- Aceites vegetales para cocinar, excepto aceite de maíz
- Azúcar
- Café tostado y molido, excepto café envasado al vacío
- Carne de pollo, incluyendo vísceras
- Fécula de maíz, exceptuando las de sabores
- Mantecas vegetales
- Leche fluida procesada.

II. ARTICULOS DE ASEO EN EL HOGAR:

- Detergentes en polvo
- Jabones para lavar ropa.

III. DERIVADOS DEL PETROLEO:

- Bunker C
- Gasolina Superior
- Gasolina Regular
- Diesel
- Kerosene
- Av-Jet
- Av-Gas
- Gas Butano o L.P.G.
- Aceites y grasas lubricantes
- Asfalto.

IV. OTROS PRODUCTOS:

- Alimentos concentrados para ganado y aves y las materias primas para su elaboración
- Cemento
- Fertilizantes
- Fósforos y cerillos
- Harinas de trigo
- Pegamento para zapatería
- Pieles y suelas
- Tacones y láminas sintéticas (Compolites) para zapatería
- Varilla de hierro.

SEGUNDO: Los precios máximos de venta para los productos anteriores serán los que se encuentren en vigor a la fecha del presente Acuerdo, según las listas que publicará la Dirección General de Comercio Interior.

TERCERO: Las personas naturales o jurídicas que intervengan en la producción o comercialización de los productos enunciados en el numeral primero de este Acuerdo, no podrán aumentar los precios fijados ni variar las demás condiciones de su abastecimiento sin autorización previa de la Secretaría de Economía y Comercio.

CUARTO: Queda derogado el Acuerdo 463-88, del 28 de diciembre de 1988, y demás disposiciones de igual jerarquía legal que se opongan a este Acuerdo.

El presente Acuerdo entrará en vigencia el día de su publicación en el Diario Oficial "La Gaceta".—Comuníquese.

JOSE SIMON AZCONA HOYO

El Secretario de Estado en los Despachos de Economía y Comercio.

REGINALDO PANTING P.

CONTENIDO

ECONOMIA

Acuerdo Número 472-89 — Diciembre de 1989

AVISOS

Appendix A1.1: Offical list of goods with prices under control

2. Price stabilization effects of direct and indirect price controls

2.1 Summary

The GOH has followed policies that have made the prices (both to the consumer and the producer) of the agricultural goods smoother than the international prices of the same goods. This was done for some goods by directly controlling their prices. For other goods, and specifically for basic grains, this smoothing of prices was achieved by allowing a monopoly on imports to a government marketing agency (IHMA) and having that agency import when the domestic prices were high and export when low. This method of smoothing by using indirect controls seems to have been as effective over the long term (in terms of smoothing prices) as the direct controls have been.

Price smoothing shifts some of the risk of bad weather from consumers to producers. During years of a bad weather and a reduced harvest, the price of the crop would normally rise and this higher per unit return helps reduce the variation in the income of the producer. By reducing the price response to the harvest, the GOH has imposed greater risks on the producer at the benefit of the consumers. During years of very poor harvests or very high international prices, even the consumers may bear some risk; not of price changes, but of domestic shortages.

2.2 Direct price controls

The agricultural price controls have had two effects on the real prices of these goods. (We use as the real prices of the goods, their nominal price in each year divided by the consumer price index. This gives us the price of each good in terms of a basket of generic consumer goods. Note that many

of the controlled goods appear in the basket that is used to calculate the consumer price index. Since the prices for these goods did not change often, the changes in the consumer price index are understated.) They have been successful in making the prices of the controlled goods less volatile than the international price of these same goods. The consumer prices of the controlled goods have changed relatively infrequently, less than once a year, on average, over the last twenty years. They have not been very responsive to the changes in the world prices of these goods, especially the extreme peaks and troughs of the world prices.

In addition, these changes have generally been less than the rate of inflation, so that the real price of wheat flour, milk, african oil palm, chicken, and beef (for example) has declined steadily over the period. Figures 2.1 to 2.5 show graphs of the time path of the real prices for these goods. A number of these declines in the real prices have been substantial. The 1989 average real price to the consumer of wheat flour is about half of what it was in 1970.

We use here two methods for expressing, statistically, the amount of variation that has occurred in the real prices of these goods. The first method is simply the coefficient of variation of the price (the standard deviation of the real price of each good divided by the average real price of that good). While this is a standard statistic for expressing the relative amount of variation in a variable, it is not necessarily the most useful for a variable that has a general downward trend (as do the prices we are considering). Since the standard deviation is measured around the average, for a good with a downward trend in price, the prices at the beginning of the sample period are all well above the average and those at the end of the sample period are well below the average. If what we are

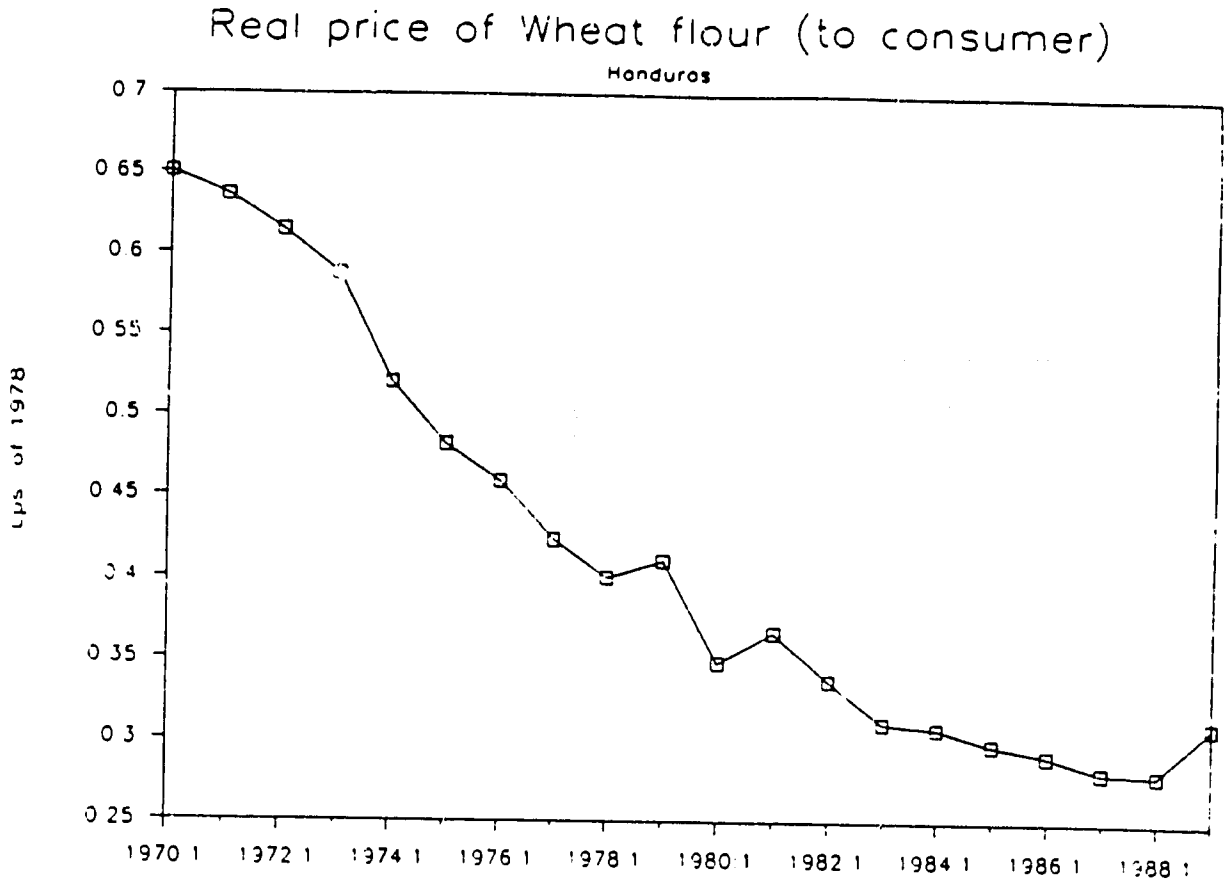

Figure 2.1: Real price of wheat flour in Honduras

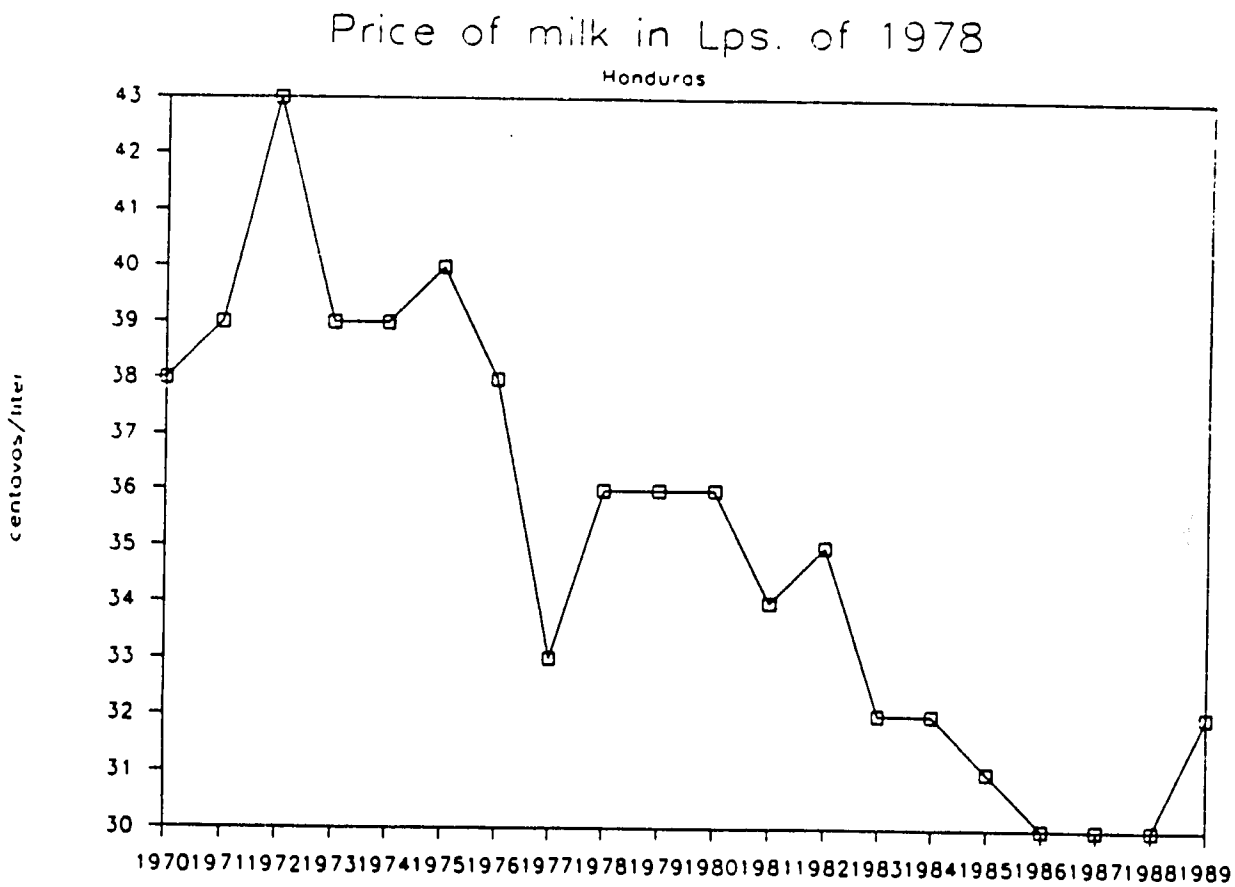

Figure 2.2: Real price of milk in Honduras

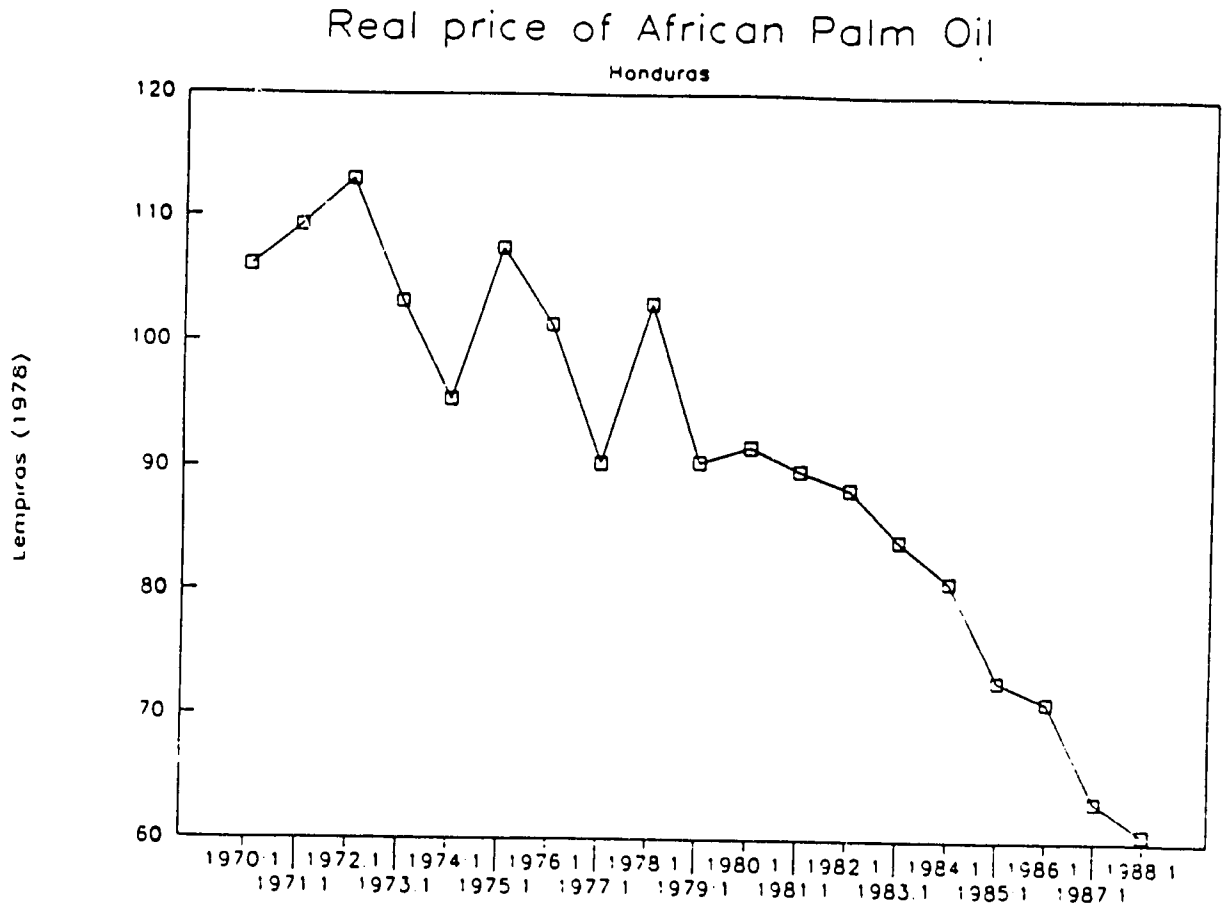

Figure 2.3: Real price of african palm oil in Honduras

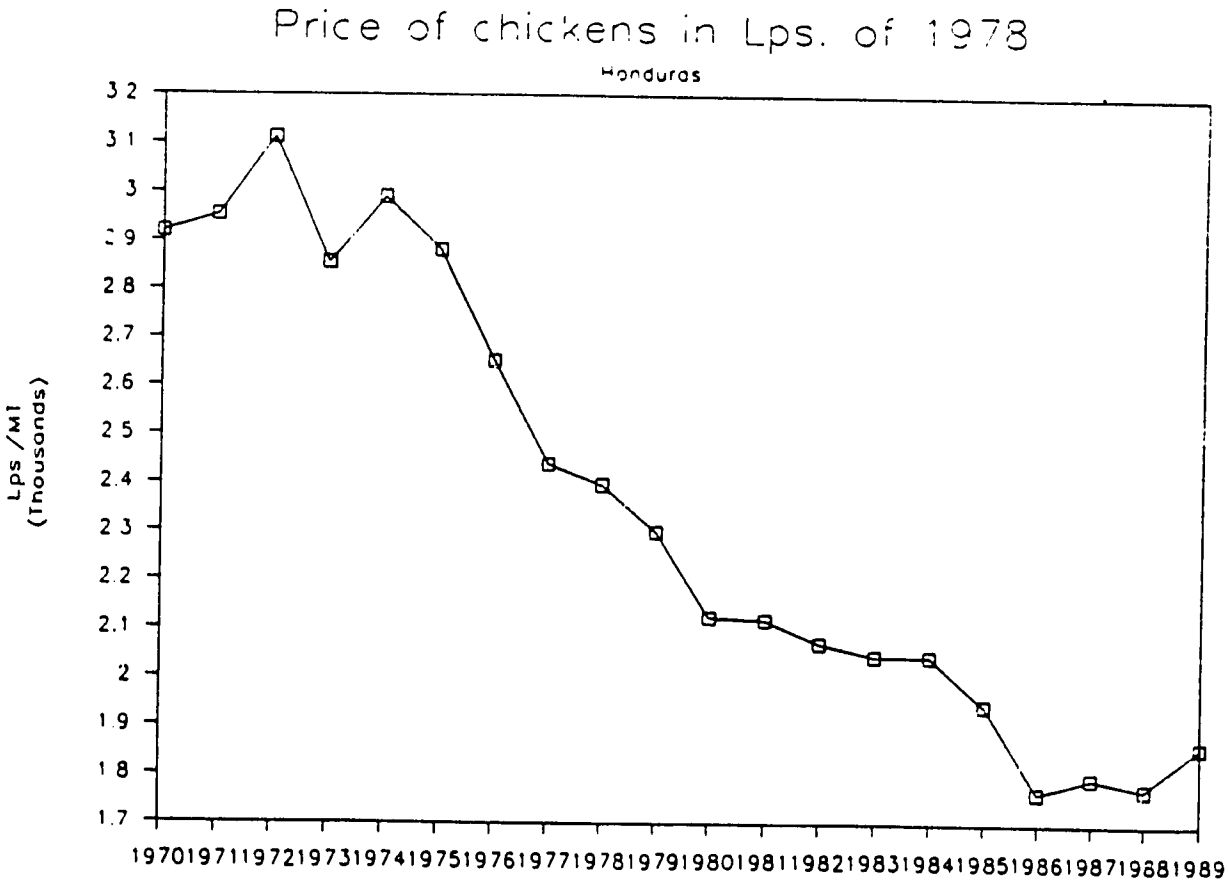

Figure 2.4: Real price of chicken in Honduras

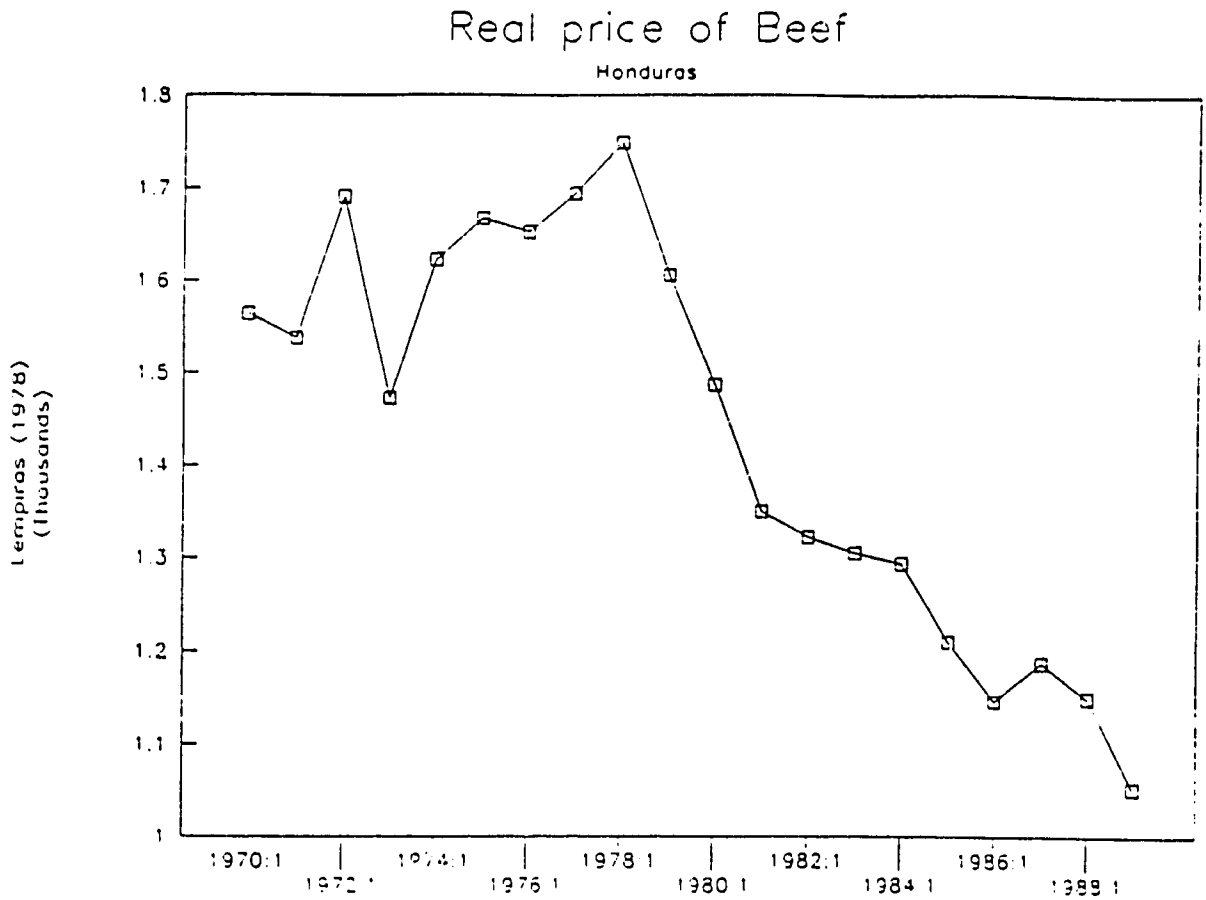

Figure 2.5: Real price of beef in Honduras

interested in (and what might be important to the producers and consumers in a country) is the year to year variation in the price of the variable, then the coefficient of variation may seriously overstate the amount of relevant variation.

We use a second statistic to capture the year to year variation. This we call a modified Z statistic. We define this statistic as

$$Z = \{[\sum(p(t)-p(t-1))^2]/(n-1)\}/(\text{mean}(p)),$$

where, in our case, the summation goes from 1971 to 1989 and n = 20. In the coefficient of variation, we summed the square of the difference between the time t price and the average price. Here we sum the square of the difference between the time t price and the time t-1 price. This modified Z statistic gives a better notion of the year to year movements in the price than does the coefficient of variation.

Table 2.1 presents the coefficient of variation and the modified Z statistic for the domestic and international real prices of a number of major agricultural goods. Of the goods on the list, coffee, palm oil, beef, sugar, chicken, wheat, and milk had their price controlled for all or most of the relevant period. Notice that for all of these goods both the coefficient of variation and the modified Z statistic are smaller for the domestic price than for the international price. Notice that both of these statistics are larger for the domestic prices of those goods which are exported than they are for purely domestic goods. While sugar, beef, and palm oil are exported, the amount exported is small relative to domestic consumption.

Notice that, for domestic prices, the modified Z statistic is generally much smaller than the coefficient of variation (coffee and sugar are the only

Variation in Domestic and International Prices

	Domestic prices		International prices	
PRODUCT	Coeff. of Variation	Modified Z	Coeff. of Variation	Modified Z
Rice	0.142	0.076	0.459	0.391
Sorgum	0.148	0.078	0.367	0.297
Coffee	0.352	0.344	0.374	0.365
Corn	0.108	0.072	0.294	0.191
Palm Oil	0.166	0.079	0.352	0.344
Beef	0.136	0.067	0.236	0.191
Sugar	0.110	0.108	0.780	0.763
Cotton	0.251	0.174	0.257	0.221
Wheat	na	na	0.323	0.237
Chicken	0.188	0.055	0.183	0.181
Milk	0.105	0.059		

Table 2.1: Coefficients of variation and modified Z statistics

exceptions to the word much). This is because these commodities have experienced strong long term downward trends in their prices. Notice that these domestic prices have also had much smaller year to year variations than the international prices.

2.3 Indirect price controls

While the GOH has not imposed direct price controls on such basic grains as corn, red beans, and rice, it has used the import monopoly of IHMA to smooth out the prices for these goods. One evidence of this smoothing on the part of IHMA is the relative price variation in Honduras compared to the variation of the same goods in the international market. In Table 2.1, both the coefficient of variation and the modified Z statistic show that the domestic prices for corn and rice had much less variation than did the world prices of the same goods (not exactly the same, the world price is for yellow corn while the domestic is for white corn). The difference between these statistics for the international prices and the domestic prices are much greater than for the goods that are directly controlled. Figures 2.6 and 2.7 show the time paths for the domestic and international real prices of rice and white corn. (We use 1.26 times the international price of yellow corn as a proxy for the international price for white corn. In the Kansas City market, for the years for which we have prices of both, the price of white corn averaged 1.26 times the price of yellow corn.)

Whether government policy or not, the amount of variation in the real prices of goods destined primarily for domestic markets were, generally, considerably smaller than the amount of variation in the goods that were traded internationally. Table A2.1 in the appendix for this chapter gives the coefficient of variation and the modified Z statistic for a wide range

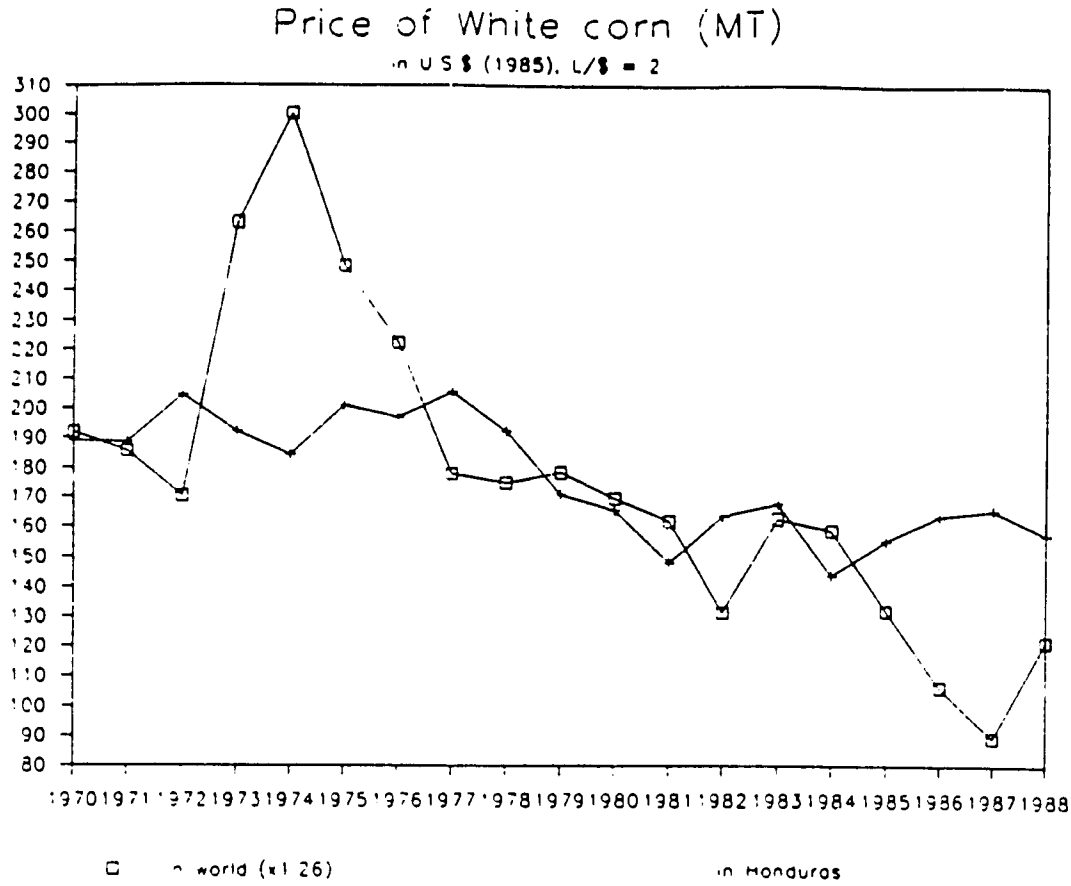

Figure 2.6: Real domestic and international prices for white corn

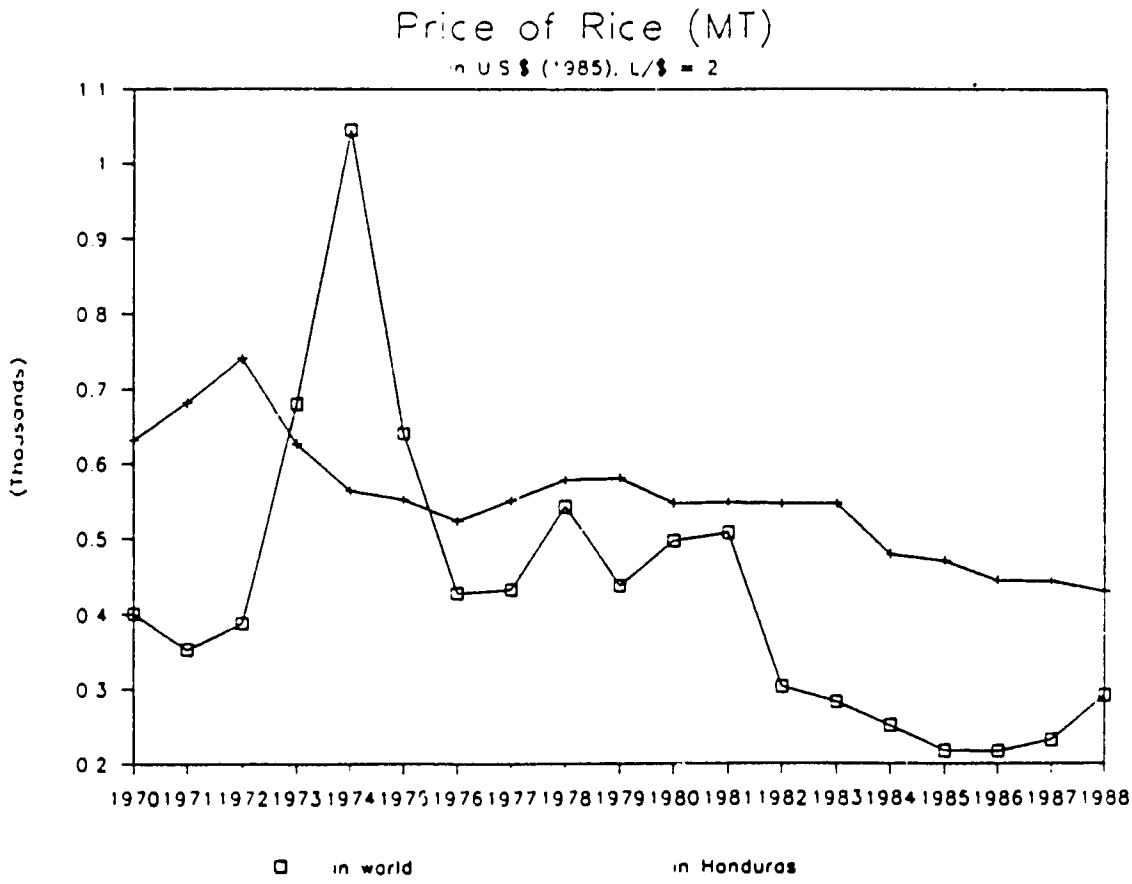

Figure 2.7: Real domestic and international prices for rice

of goods produced in Honduras. From the table one can see that the amount of variation in pinapple, coco, cotton, coffee, and tobacco (as measured by either the coefficient of variation or the modified Z statistic) is greater than for the rest of the goods. Among the non-traded goods, tomatoes, cabbage (repollo), watermelon, melon, and chicken have the largest amounts of variation. In watermelon, melon, and chicken much of this variation seems to come from a long term trend, since the modified Z statistic is much smaller for each of these than is the coefficient of variation.

2.4 Welfare effects of price smoothing

There is neither the data nor time to do an empirical analysis of the welfare effects of the reduced variation in the Honduran domestic agricultural prices. It is possible to suggest the results of this smoothing on the consumers and the producers.

For a country as small as and with as homogeneous a climate as Honduras, variations in the annual weather patterns for the whole country probably dominate local variations. Therefore, each year either all the producers of one type of crop have a good harvest or they all have a bad harvest. For a crop that is not traded internationally, the normal functioning of a domestic market changes the price of the good in response to the size of the harvest and shifts some of the weather risk (the results of the good or bad weather) from the producer to the consumer. This occurs since in years with a generally bad harvest for some crop, the price of that good is higher and farmers get more (per ton) than they would get during a year of a good harvest. This price variation means that the real income of the farmer does not vary as much as it would if the price did not change. It also means that the real income of the consumer varies more than it otherwise would.

(Note, if the demand for the good is inelastic, then farmers, in aggregate, actually get more for the crop during a bad harvest than they get during a good harvest. If the demand for the crop is elastic, then the farmers get less during a bad harvest, but not as little as they would get if the price were kept constant.)

Therefore, both the direct price controls and IHMA's pattern of imports of basic grains have forced the farmers to bear greater weather risk which has resulted in higher incomes during years of good harvests and lower incomes during years of bad harvests. There can be little doubt that the price controls (both direct and indirect) have improved the farmers ability to predict the price that he will receive for his crop, but it can be argued that the welfare gains from this improved predictability are smaller than the losses from increased fluctuations in income.

The GOH's smoothing of the within year movements in prices have worked to prevent private individuals from investing in storage facilities (both on farm and off farm silos). It is the within year variations in price that generate the profits to the owners of stored grains (for example). They purchase the grains right after the harvest, store it in their facilities, and then sell it when the price rises. The net effect of individuals entering this industry is to reduce the amount of annual variation in the prices. The fact that the majority of the silos are owned by IHMA is strong evidence that the price controls have kept private investors out of the storage industry.

For the consumer, the price controls have shifted the weather risk from the consumer to the producer, although not completely. Since the import and export facilities work with a delay, a bad harvest can result in shortages of goods because prices are not allowed to adjust to equalize supply and

demand. The consumers do not face price risk (and do not gain from price declines during good harvests) but do face the risk of shortages during poor harvests.

For internationally traded goods (coffee is the best example), the domestic retail price controls become important constraints to consumption when the world price of the good is very high. In 1986, when the world price of coffee was at a peak, almost all of the coffee crop was exported and very little coffee was available for domestic consumption. This is not surprising since the price of the domestically sold toasted and ground coffee was only 93.8% of the price that the domestic producer received for (green) coffee beans.

Real Prices of Domestic agricultural goods

limperas of 1978

year	Corn	Beans	Sorgum	Rice	Potato	Yuca	Onion	Tomato	Cabbage	Pinapple	Melon	atermelon	Banana	Banana Export.
1970	233	647	290	780	414	191	497	196	321	324	268	268	89	293
1971	233	629	285	842	468	188	593	210	319	378	282	282	92	254
1972	253	691	311	915	438	204	652	293	357	475	285	285	102	335
1973	237	619	264	774	471	174	521	206	301	514	244	242	89	293
1974	228	554	255	696	474	166	413	175	264	451	214	213	81	266
1975	248	582	276	682	439	171	476	179	249	381	200	200	121	396
1976	244	537	252	648	433	172	505	189	229	284	210	187	117	397
1977	254	530	248	681	402	168	546	206	208	406	196	169	108	355
1978	238	547	252	715	350	160	515	191	273	378	196	154	110	365
1979	211	502	236	718	418	160	542	211	264	323	198	161	114	374
1980	204	540	227	676	432	152	497	209	301	273	186	145	120	391
1981	183	454	233	677	423	145	498	217	323	250	191	149	117	383
1982	202	476	233	675	371	135	555	173	222	281	159	144	107	349
1983	207	481	237	675	375	117	495	165	271	301	167	146	108	394
1984	178	469	199	593	348	109	616	156	247	293	174	144	104	368
1985	192	484	192	582	319	101	540	137	215	303	170	142	101	367
1986	202	412	199	550	322	93	544	123	166	310	170	141	98	357
1987	205	406	196	549	317	92	536	121	164	299	202	139	98	378
1988	195	665	178	532	304	88	514	116	157	0	194	133	94	405
std div	23.4889831	81.09287	35.45137	96.68886	54.54371	35.52590	51.09097	41.01007	56.10686	73.30146	36.87088	50.48907	11.26543	44.18731
mean	218.195839	538.0949	240.1950	682.0659	395.5980	146.6348	529.1945	182.8887	255.3400	345.7785	205.5712	181.2121	103.8119	353.5811
coed var	0.10765092	0.150703	0.147594	0.141758	0.137876	0.242274	0.096544	0.224235	0.219733	0.211989	0.179358	0.278618	0.108517	0.124970
div2	15.7314108	74.82207	18.78335	52.05302	32.74811	10.75706	66.40110	32.93550	40.55987	57.12997	17.88079	15.23794	11.25453	43.98640
indx2	0.07209766	0.139049	0.078200	0.076316	0.082781	0.073359	0.125475	0.180084	0.158846	0.165221	0.086980	0.084088	0.108412	0.124402

Appendix A2.1: Coefficients of variation and modified Z statistics for a variety of domestic goods

Platano	Coco	Sugar Cane	Cotton	Coffee	Oil palm	Tabaco	Eggs (L/Caja)	Chicken	Milk Liters	Beef	Pork	Wheat flour
136	210	20	650	2897	106	3061	47	2920	0.38	1564	432	0.65
141	225	22	648	2737	109	4470	45	2955	0.39	1535	470	0.64
163	234	25	846	2839	112	5054	51	3114	0.43	1691	510	0.61
139	196	23	958	2839	103	4058	43	2857	0.39	1474	465	0.59
127	172	20	990	2999	96	3324	41	2992	0.39	1624	479	0.52
124	169	23	1182	2293	108	3264	41	2882	0.40	1667	460	0.48
124	159	22	1308	3073	101	2850	40	2653	0.38	1651	450	0.46
118	143	19	987	5772	91	2817	37	2440	0.33	1692	449	0.42
122	138	20	1056	4070	103	2530	37	2398	0.36	1749	445	0.40
116	126	20	984	3196	90	2590	34	2301	0.36	1608	448	0.41
119	112	23	987	2740	92	2740	37	2125	0.36	1487	454	0.35
117	104	26	691	2139	90	2546	31	2120	0.34	1351	508	0.37
117	99	21	703	2089	88	2566	32	2071	0.35	1322	534	0.34
116	96	22	844	1712	84	2657	32	2072	0.32	1306	521	0.31
111	97	21	685	1806	80	2560	27	2045	0.32	1296	513	0.31
107	92	19	543	1757	73	2553	30	1945	0.31	1211	492	0.30
102	87	18	642	2874	71	2353	28	1766	0.30	1150	466	0.29
101	85	18	633	1663	63	2271	0	1797	0.30	1192	0	0.28
98	82	17	607	1843	61	2178	0	1774	0.30	1148	0	0.28
15.32791	49.11485	2.314351	211.0173	952.250390	15.01485	750.636253	6.617492	447.7460	0.036971	198.0250	29.96832	0.12072787
120.9653	138.2184	20.98346	839.2067	2702.11412	90.53474	2970.49518	37.20442	2380.427	0.353348	1458.813	476.1597	0.43743324
0.126713	0.355342	0.110294	0.251448	0.35240939	0.165846	0.25269734	0.177868	0.188094	0.104631	0.135743	0.062937	0.27599153
8.880205	13.41224	2.268794	145.6998	930.552231	7.160495	486.021579	3.671886	130.9894	0.020873	97.46779	25.99209	0.03149145
0.073411	0.097036	0.108123	0.173616	0.34437932	0.079091	0.16361634	0.098694	0.055027	0.059072	0.066813	0.054586	0.07199144

3. Long term trends in basic grain prices

3.1 Summary

Over the last twenty years in Honduras, there has been a general downward trend in the real prices of wheat, white corn, rice, and red beans. The movements of these prices are interconnected (as we show using Granger causality tests). Since the price of wheat flour is directly determined by the price control mechanism, it can be viewed as exogenous to domestic production behavior (it would not be exogenous if the GOH systematically chose the price of wheat in response to the size of each year's harvest of rice and white corn). The statistical tests show that the price of wheat influences the prices of white corn and rice, with positive coefficients, so that the long-term decline in the price of wheat can be viewed as contributing to the long term declines in the price of the other crops. Since much of the wheat has entered Honduras under concessionary rates (for example, the U.S. P.L. 480 program) that encourage the GOH to import wheat, we conclude that these programs have reduced the prices of the other crops as well.

3.2 The relationship among prices of basic grains

Among the four basic grains (wheat, white corn, rice, and red beans), a change in the real price of one can result in a change in the price of the others. Since three of these four goods are, to some degree, substitutes (rice and red beans are complements), we should expect that a decline in the real price of rice, for example, will cause an increase in rice consumption and a decline in the demand for each of the substitutes (corn and wheat) and an increase in the demand for the complement (red beans). Without changes in the supplies, the decline in the demand for the substitutes will result in a

decline in their equilibrium prices.

However, there are dynamic, intertemporal aspects of the relationship between these goods. The decline in the price of one of these goods today (especially if this decline is expected to continue) should result in changes in production decisions for at least some of the other goods. Of course, there is no production of wheat in Honduras, so only the demand side is relevant for wheat. Expected declines in the relative price of any one of the domestically produced basic grains will reduce the amount that farmers choose to produce. However, if farmers have a reasonable understanding of how their markets work, desired production should not decline so much that the new equilibrium price is above the original price.

To discover what the intertemporal relationships between the basic grains are, we use Granger causality tests. These are simply regressions where the dependent variable in each equation is the time t price of one of the basic grains and the independent variables are lagged (time t-1) prices of all four of the basic grains. We then run a series of regressions leaving out, for each test, the lagged price of one of the basic grains and use an F test to see how much leaving out this price reduced the prediction of the dependent variable. Notice that we are testing how much predictive power is in the lagged price of each of the basic grains when the other three are included in the regression. This tells us how much is added by including the price of each of the grains.

Table 3.1 shows the results of the one lag Granger causality test for the price of each of the four basic grains. The number in the first column of the first row is the F statistic on the restriction that the coefficient of lagged price of wheat is equal to zero in an equation estimating the current price of wheat and using the lagged price of corn, rice, and red beans. The

F-TESTS

One Lag With Constant

	Wheat	Corn	Rice	Beans
Wheat	69.04	0.00	0.04	6.29
	(.00)	(.95)	(.85)	(.03)
Corn	13.22	10.95	8.28	1.13
	(.00)	(.00)	(.01)	(.31)
Rice	4.48	0.95	14.45	37.07
	(.05)	(.35)	(.00)	(.00)
Beans	2.74	0.00	1.02	0.31
	(.12)	(.95)	(.33)	(.58)

Table 3.1: F statistics for Granger causality tests

significance level is given in parenthesis. In the first row of the table, we see that the past price of wheat is very important in predicting the current price of wheat, that the past prices of corn and rice do not help much in predicting the current price of wheat, and that the past price of red beans help, but not as much as wheat, in predicting the current price of wheat. In the second row, we see that the past price of wheat, corn and rice help in predicting the current price of corn, but that the past price of red beans does not help much. In the third row, we see that the past price of wheat, rice and, most strongly, red beans help in predicting the current price of rice. The past price of corn does not help much. In the fourth line, we see that the past price of wheat helps, a little, in predicting the current price of red beans, but not much else helps.

Table 3.2 gives the coefficients from the above test. While one must be careful in interpreting the coefficients of vector autoregressions, mainly because of correlation among the independent variables, in the Granger causality test that we run, the coefficient on the lagged real wheat price is positive in each of the four equations for basic grains. This is the sign one would expect for the prices of goods that are substitutes. A decline in the price of wheat generates a decline, in the next period, in the price of each of the four basic grains (but the test results are not significant for red beans). Note that the sign for lagged beans in the equation for rice is negative, the sign one would expect for complements.

Table 3.3 shows the result of contemporaneous causality tests. To perform these tests, we estimate an equation for the current price of each of the four basic grains as a function of the one period lagged price of all four basic grains and the current price of the other three. For example, we estimate the current price of wheat as a function of the previous period's

Coefficients on Granger causality test

	Lagged variable				
	Wheat	Corn	Rice	Beans	Constant
Wheat	0.8142	0.0158	-0.0215	0.2061	-39.556
Corn	0.2017	0.5154	-0.1817	-0.0493	167.45
Rice	0.7117	0.9202	1.4542	-1.7158	76.849
Beans	0.5538	-0.0572	-0.3837	0.1572	488.59

Table 3.2: Coefficients from vector autoregression for Granger causality tests

	Current Value With Constant			
	Wheat	Corn	Rice	Beans
Wheat		4.03	6.59	1.07
		(.07)	(.03)	(.32)
Corn	4.03		1.30	0.08
	(.07)		(.28)	(.78)
Rice	6.59	1.30		2.86
	(.03)	(.28)		(.12)
Beans	1.07	0.08	2.86	
	(.32)	(.79)	(.12)	

Table 3.3: F statistics for contemporaneous Granger causality tests

price of wheat, corn, rice, and red beans, and of the current price of corn, rice, and red beans. We then test the restriction that the current price of corn does not help predict the current price of wheat, given the rest of the equation. The values given in the table are the F statistic on the restriction and the value in parenthesis is the significance level of that statistic.

Table 3.3 shows that the current price of corn and rice help predict the current price of wheat (note that the relationships are symmetric, so that the current price of wheat helps predict the current prices of corn and rice). In the last column of the third row, we can see that the current price of beans is weakly helpful in predicting the current price of rice.

The main point of interest is the relationship between the price of wheat (really the price of wheat flour), which is a controlled price, and the prices of the other three basic grains, which have not been directly controlled. The real price of wheat flour (both lagged and current) helps to predict the (current) price of corn and rice (and much more weakly, beans). However, the past prices of corn and rice do not help very much in predicting the current price of wheat. This statistical evidence allows us to suggest (but not prove) that there is a causal relationship from past and current prices of wheat (which appear to be somewhat exogenous) and current prices of corn and rice. In other words, the GOH's pricing policy on wheat flour has had direct impacts on the price of corn and rice.

3.3 More on the effects of wheat imports

Almost all of the wheat that enters Honduras does so at concessionary prices: subsidized by the EEC or from the United States under P.L. 480. Figure 3.1 shows the amounts of wheat and wheat flour that have been

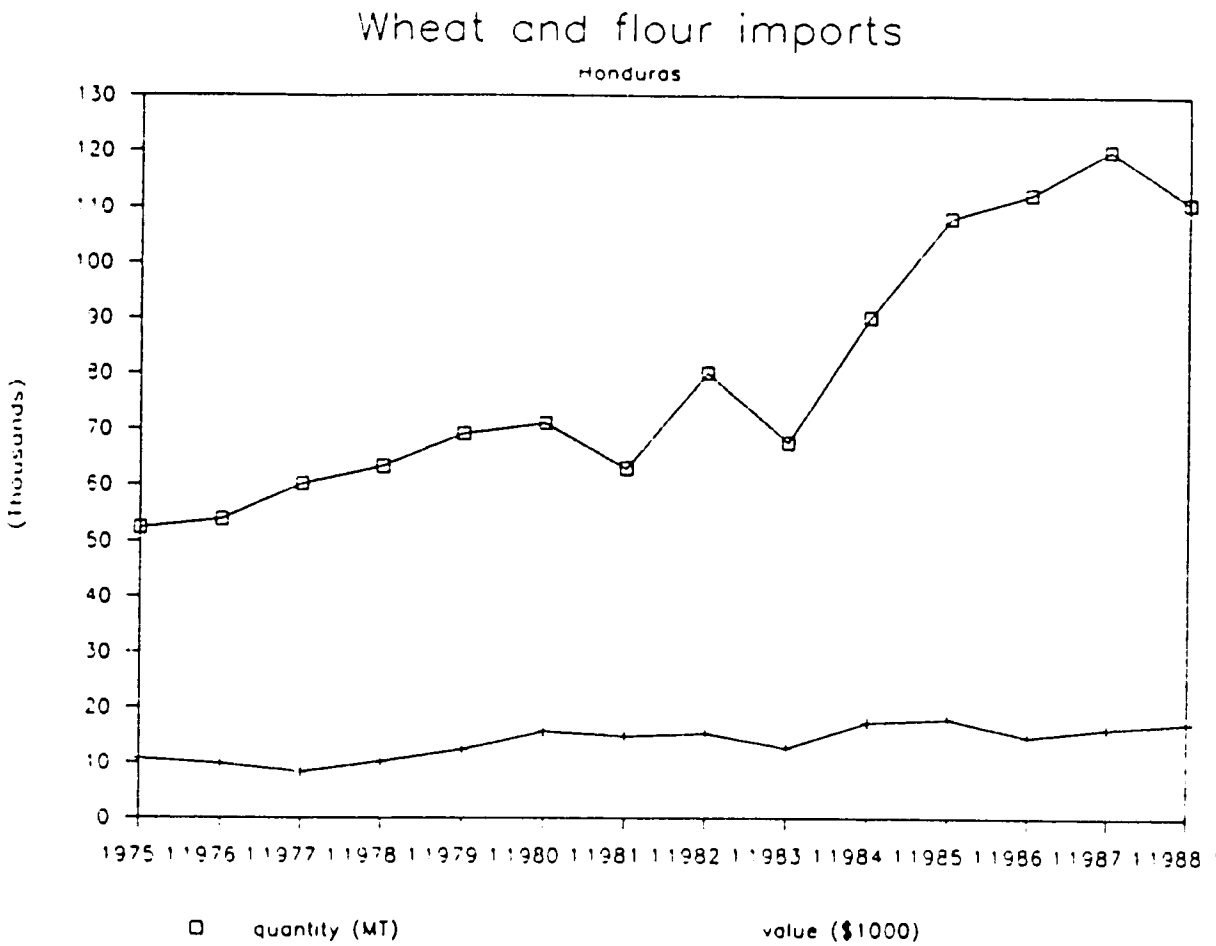

Figure 3.1: Wheat and flour imports

imported by Honduras since 1970 (although the imports for 1971 through 1974 are missing). There has been a steady increase in the imports of wheat, with the real volume more than doubling since 1975. At the same time, the real domestic price of wheat flour to the consumer has dropped. Figure 2.1 (in the previous chapter) showed the path of the real (in Lempiras of 1978) price of wheat flour to the consumer since 1970. There has been a steady decline in the real price of wheat flour in Honduras so that the price in 1989 is less than half that of 1970.

The increasing imports of wheat can be attributed to the incentive structure that P.L. 480 provides for the GOH. Since P.L. 480 wheat is sold to the GOH with financing at well below market interest rates, a 30 to 40 year payoff period, and a ten year grace period, the incentives for each government (which will not be in power when the payoff date arrives) is to import as much as possible. The GOH sells the imported wheat to millers and uses the revenues for current government expenditures. Since government revenues are always in short supply, a myopic government or one that faces severe revenue difficulties may view concessionary wheat imports as a method for increasing revenues and let a future administration worry about payment.

The evidence from the Granger causality tests (the positive signs on wheat in each of the vector autoregressions) suggests that the increased imports of wheat and the declining price of wheat flour have been a principal factor in generating the declining real prices for rice and white corn. While there has been a long run international trend of declining real prices for basic grains, there seems to be less a connection between the international and domestic prices for rice and white corn than between the domestic price of wheat flour and the domestic prices for these two grains. Figures 2.6 and 2.7 in the previous chapter show times series graphs of the real

domestic and international prices for rice and corn, respectively. We will examine this lack of connection more carefully later using the monthly data.

As mentioned above, the domestic markets for corn and rice are essentially closed markets. White corn does not have a very large international market (although it has been traded between the Central American countries and in some years South Africa has had substantial international exports) and while yellow corn serves as a substitute for some of the Honduran uses of corn, it is not a perfect substitute. There have been technological improvements in the production of white corn and rice over the last twenty years and these technological improvements have been incorporated into the production technology in Honduras (we will see this below), there has also been a very large increase in the Honduran population (from 2.6 million in 1970 to 4.8 million in 1988). That the prices of rice and white corn have declined over this period of increasing demand and moderate technological improvements must be attributed to the competition from the imported wheat.

4. Estimates of production responses to price changes

4.1 Summary

Generally, for the three basic grains, white corn, rice, and red beans, prices affect output through their effects on plantings. Past prices of a good and of complementary goods are important predictors of the amount of land that are planted in each of these three crops. Not surprisingly, in each case the amount of land planted in the crop is an important determinant of the amount of output. The importance of the available rural labor force in determining output is greatest in white corn and least in red beans.

The general result is that a decline in the real price of a good reduces, at the margin, production of that good. A decline in the price of a complementary good (the complements are rice and beans) increases, at the margin, production. For white corn and rice, we observe that increases in the economically active rural population and technological improvements have offset the marginal effects of declining prices.

A crude estimate of the marginal product of labor in white corn shows that the indirect price controls shifted most of the gains from labor augmenting technological improvements to the consumers and not to the workers. In the case of rice, it seems that some of the gains from labor augmenting technological improvements went to the workers and some to the consumers. The estimation technique is too crude to determine the amounts that went to each group.

4.2 Production functions for basic grains

In this section, we present estimated production functions for white corn,

rice, and red beans, the three most important elements in the Honduran diet. The production functions for white corn and rice are very standard, Cobb-Douglas functional forms. We assume that production is a function of a technology factor which is a function of time, of the amount of land planted in the crop, and the economically active rural population. It would be much preferable to use a more direct variable for labor input, such as actual person-years of labor in each industry, but this kind of data simply does not exist. In using the economically active rural population as a proxy for the actual labor input, we are assuming that, over the years, approximately the same portion of the rural population is working in corn and in rice. There are good reasons to believe that the proportion of the rural labor force in each industry changes in response to changes in the price of the good and, therefore, in its expected marginal product of labor. By using the economically active rural population in our estimation of the production function instead of the actual labor input in each industry, we ignore these changes.

The production function for corn was estimated as a linear model using the natural logs of the output of corn, $\ln(Q_{corn})$, the land planted in corn, $\ln(L_{corn})$, and the economically active rural population, ln(POPR). It also included a technology coefficient that is a function of time, t. In terms of levels, the estimated Cobb-Douglas (almost Cobb-Douglas, since it is not restricted to constant returns to scale) production function is

$$Q_{corn}(t) = \underset{(3.195)}{(1.0149)^{t}}\underset{(3.497)}{(L_{corn}(t))^{.624}}\underset{(2.082)}{(POPR(t))^{.355}}(e(t)),$$

$$R^2 = .7432 \qquad DW = 2.3776.$$

where the log of the error term is assumed to be normally distributed about zero. The terms in parenthesis are the t statistics. Note that there is

probably multicolinearity between the trend term and the economically active rural population, POP_R, since the annual estimates of the rural population are found by exponentially smoothing between the census years. In fact, a regression of constant and trend on the log of the economically active rural population gives

$$\log(POPR(t)) = 6.092 + .0179474\ t$$
$$(684.19) \qquad (24.10)$$
$$R^2 = .9699 \qquad DW = .1474.$$

The multicolinearity between the trend and POPR means that the t statistics presented in the production function regression are incorrect. While it is possible to remove the trend from POPR and use the residual from the above equation in the production function estimation, we lose the ability to separate the growth of population and the growth of technology. Logically, the growth in the rural population should have a direct effect on the available output. (There is large body of modern literature that defends the proposition that the marginal product of labor in the rural sector in less developed countries is not zero.) Logically, there has also been an improvement in the level of technology. Both of these may have grown at an exponential rate. This multicolinearity means that simple OLS tools do not allow us to separate these and get reliable statistics on the regressions. In spite of these problems, the estimates for the production function given above seem reasonable and will be used.

The above production function does not relate the decision on how much corn to produce to the price of corn. What is related is the amount of land that individuals choose to plant. The best function for relating plantings to the past real price of corn (in other equations we included the current price of corn, but that proved not to be significant) is

$$L_{corn}(t) = \underset{(-2.347)}{-208.29} + \underset{(4.388)}{6.2189}\, t + \underset{(6.27)}{2.2146}\, P_{corn}(t-1) + error(t)$$

$$R^2 = .711 \qquad DW = 2.125.$$

The real price of corn at date t-1 is the nominal price of corn produced divided by the Honduran consumer price index. Changes in the lagged real price of corn change the production of corn by changing the amount of land planted. One can then use the above production function to find the amount of corn produced (adjusted for rural population and technology growth). Notice that the sign on the real price of corn is positive. Therefore, decreases in the real price of corn, reduce the amount of land devoted to corn production and therefore the relative amount of corn produced.

We get similar results for a production function for rice. The estimated production function for rice is

$$Q_{rice}(t) = \underset{(5.855)}{(1.0377)^t}(L_{rice}(t))^{\underset{(4.557)}{.875}}(POPR(t))^{\underset{(1.108)}{.095}}(e(t)).$$

$$R^2 = .8321 \qquad DW = 1.4428$$

This function is very similar to the one for corn. When we attempt to get a good representation between plantings (the amount of land used in rice production) and the real price of rice, we are much less successful than we were with corn. We could find no significant relationship between land in rice and the lagged real price of rice. What slight relationship we get between the price of rice and the quantity of rice produced (when we estimate rice production as a function of land use and price) disappears when a trend term is added to the the regression. The price sequence adds no information in addition to that included in a trend (possibly interpreted as improvements in technology).

Figure 4.1 shows the time paths of both the land used in rice production and the real price of rice to the producer. Notice that the price series is much smoother than the land series. Casual observation of this pair of series confirms the regression analysis and leaves open the question of what is driving the choice of the use of land for growing rice. From additional analysis, neither rice imports and exports, nor the world price of rice help in explaining the large variation in the use of land in rice production.

Interestingly enough, a regression for the land used in rice as a function of the real price of red beans gives significant results. First, we remove the constant and trend term from the real price of red beans. Calling the residual from that regression $ResPR_{beans}$, we get the equation

$$\log(L_{rice}(t)) = \underset{(76.59)}{2.7945} - \underset{(-2.502)}{.001387}\, ResPR_{beans}(t) - \underset{(-2.026)}{.001998}\, ResPR_{beans}(t-1).$$

$$R^2 = .386 \qquad DW = 2.159.$$

The sign on the detrended real price of red beans is negative, indicating that in the planting of rice, red beans serve as a complement. Higher red bean prices (both lagged and current) reduce the amount of land that gets planted in rice. The fairly low R^2 indicates that we are not explaining very much of the variation in the plantings in rice, yet it is still surprising that the price of red beans have this large an effect. This result is consistent with the results from the causality tests given above. We found that lagged prices of beans helped predict the current price of rice. The above equation suggests that this occurs because the past price of beans is used by farmers in determining their current plantings of rice.

The estimated production function for red beans is considerably more complicated than for the other two basic grains. When we estimate an

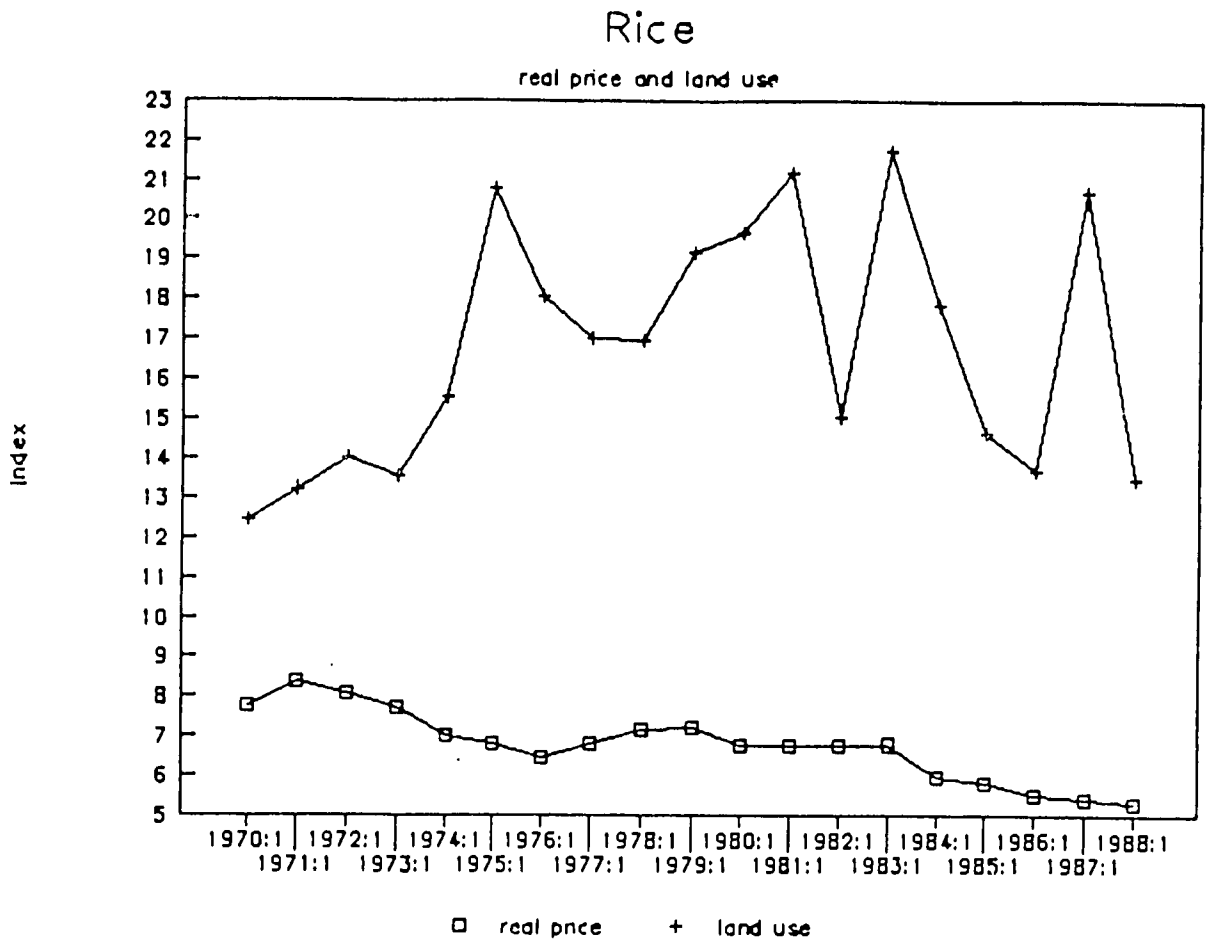

Figure 4.1: Index of land used in rice production and the real price of rice

equation of the same form as the ones above, one with log output as a function of a constant, a trend, the log of the land used in bean production, and the log of the economically active rural population, we get an R^2 of only .15. The best equation that we could find for bean production (with all real variables current and in logs) is

$$Q_{beans} = \underset{(216.8)}{.837\ L_{beans}} + \underset{(4.587)}{.843\ ResYld_{corn}}$$
$$+ \underset{(2.553)}{.00121\ ResPR_{rice}} - \underset{(-4.65)}{.00126\ ResPR_{beans}},$$
$$R^2 = .7638 \qquad DW = 2.096,$$

where the residuals of the real price of rice and corn have had a constant and trend removed. The first term is the land used in growing beans. Including this variable in the production function is compatible with earlier versions of our production function.

The second term in the production function is the detrended yield on corn and can be thought of as a representation of the state of the world in a stochastic production function. If a year of good weather for corn is also a year of good weather for beans, then the yield on corn tells us something about what the yield on beans should be. This variable adjusts the amount of land used in beans for each year's weather.

The last two variables do not rightly belong in a production function, yet it should not be surprising that they help to predict bean output. They are the current real prices (detrended) of rice and beans. Their presence in an equation for estimating the production of beans is more indicative of their theoretical presence in demand and supply functions for beans. Changes in the output of beans will change the price of beans by shifting the supply curve along the demand curve. The presence of the price of rice, a

complement of beans, indicates how the demand curve for beans is shifting as the price of rice changes.

Lastly, we have a function for the land used in the production of red beans. The best equation we found gives land as a function of the previous year's price of beans and the previous two years' prices for rice. This equation is

$$\log(L_{beans}(t)) = \underset{(151.8)}{4.2537} + \underset{(1.781)}{.00135}\ ResPR_{beans}(t-1) - \underset{(-2.25)}{.00184}\ ResPR_{rice}(t-1) - \underset{(-1.54)}{.00126}\ ResPR_{rice}(t-2).$$

$$R^2 = .5392 \qquad DW = 1.6388.$$

Approximately one half of the variance among each years plantings in beans is explained by the past price of beans and by the past prices of rice. Note that the land use in beans has a very high *t* statistic in the equation for the output of beans. Past prices in beans and rice affect the current output of beans by their effects on the amount of land planted in beans.

4.3 An estimate of rural wages

In a competitive economy, the marginal product of labor is equal to the real wage paid to labor. A Honduran farmer can choose to allocate his labor between the different goods that he can produce so as to equalize, ex ante, the expected marginal product from labor in each crop. If the farmer has the option of off farm labor, the same equalization of expected marginal product from labor takes place, but the set of choices now includes the off farm work. One would not expect the ex post marginal product of labor to be equal for each crop in each year, but, with rational expectations, the average ex post marginal products of labor should be equal for each crop.

If we had estimated our production functions using the actual amount of labor that was used in the corn and the rice industries, then taking the first derivative of each of the production function with respect to labor would give the marginal product of labor and the real wage. Unfortunately, we do not have the actual amount of labor used in the industry, instead we have the economically active rural population. Only a small portion of the Honduran land is appropriate for the production of rice and only that portion of the rural population that lives on or near this land could be rightly considered even as potential workers in the rice industry. A much larger portion of the economically active rural population can be considered potential producers of corn.

Even for corn, our use of the economically active rural population in the place of actual labor employed in corn production invalidates any interpretation of the first derivative as representing an accurate marginal product of labor. Yet if the *proportion* of the economically active rural population that is working in corn and the *proportion* that is working in rice stay constant through the years, then a calculation of the marginal product of the economically active rural population in these industries indicates the trend in real rural wages. Note that since a smaller portion of the population is likely to be working in rice, the "real wage" in rice calculated from the first derivative of the production function for rice will be smaller than that calculated for corn. In fact, the real wage in each industry, given that the proportion of workers is constant, could be found by adjusting the calculated real wage by the proportion of the economically active rural labor force that is in that industry.

Figure 4.2 shows the time paths for the first derivatives of the output of corn and rice with respect to the economically active rural population. For

Figure 4.2: Real wages in white corn and rice production calculated from marginal product of labor from production functions

rice, there has been a gradual upward trend in this variable. For corn, it is difficult to attribute any trend to the data. One interpretation of this result is that the real wages in the corn sector did not change systematically (did not exhibit a general trend) over this entire period. Since there were improvements in the technology for producing corn over this twenty year period, the gains from these improvements either went to land rents (implicit land rents, since renting land is not allowed), to capital, or to consumers, through reduced prices. The set of GOH's policies that resulted in a long term trend of a declining price of corn caused the bulk of the labor augmenting technological improvements in corn to be shifted to consumers.

The logical chain of the above argument is fairly long and has several weak links. However, the basic result is that in the white corn industry, the downward trend in the real price of corn transfered most (and possibly all) of the technological gains that might have gone to the rural workers to the consumers, mainly in urban areas. For rice, it seems that some of the labor augmenting technological gains were captured by the workers, although it is not possible to determine how much of it went to the consumer and how much to the workers.

5. Estimates of the alternative prices of food when trade is unrestricted

5.1 Summary

The controls (both direct and indirect) on the prices of agricultural goods have resulted in reduced expenditure for the consumers when compared to the international prices for these same goods evaluated at estimated equilibrium exchange rates. When measured against the cost of importing these goods (either under the trade regime that actually was in effect or under a regime with a 20% import duty) the cost of the basket of five goods was at least double that with the prices that actually existed. When the domestic prices that would have existed if the goods were exported is used, the cost is much less: about the same as the actual prices for the poorest sectors and up to twice as much for some of the richest sectors. The export price of beef and the increasing consumption of beef with income is what causes the richer sectors of the economy to have higher expenditures. From a consumption point of view, the price controls have substantially lowered the costs of this basket of goods when compared to the same basket evaluated at international prices. Interestingly, the gains may have been relatively greater for the richer consumers and definitely have been greater for the urban consumers. The costs of the basket are probably overstated for those in the rural sector because they produce much of what they consume. For someone who is consuming entirely subsistence production, the relative prices do not matter and real (labor) costs of the consumption basket is independent of market prices.

The lower actual domestic prices have served to reduce the real wages for the rural sector when compared to what they would have been at international prices. This substantial loss in wages (estimated to be at least a 50%

reduction in real wages in the corn sector) has reduced general food consumption in the rural sector and encouraged migration to the urban areas. It seems clear that urban consumption has been subsidized at the cost of rural consumption.

5.2 Introduction

In this section, we consider a counterfactual alternative. How would the welfare of various sectors of the economy have changed if the prices for the basic grains and other agricultural goods have been at international levels rather than at the controlled prices that actually occurred?

To do this requires several steps. First, the offical exchange rate that prevailed in Honduras during most of the period from 1970 to 1989 was not an equilibrium exchange rate. For much of the period, it was only by restricting the quantity of imports of goods at the official rate that the GOH was able to maintain that rate. There existed a black market exchange rate for the Lempira that was often very different from the official rate. Since black market rates are usually not the same as the rate that would have applied without restrictions, we need to make estimates of the equilibrium exchange rate. This we do in part 3 of this section.

We then calculate the counterfactual import or export price by taking the international price at the estimated equilibrium exchange rate and adjusting it for taxes and transportation. For imports, we add the transportation to Honduras and the import tariffs under the official regime (even though agricultural goods imported by IHMA did not pay import duties) to get the domestic price at the port. For exports, we subtract transportation and taxes from the international price to get the domestic price at the port. We ignore transportation costs in Honduras.

Assuming that each income group consumes the same quantities of food as it reported to the 1979 survey on consumption behavior, we calculate the compensating differential that one would need to make to each group in each year to maintain that consumption under the new prices. This serves as our indicator of the welfare effects of a movement to international prices. In the final part of this section, we use the production function for corn and the land use equation for corn that we estimated earlier to calculate a hypothetical wage rate under international prices for the corn sector.

5.3 Equilibrium exchange rates

Following the technique used in Schiff and Valdes (1990), we find an equilibrium exchange rate from a demand function for imports and a supply function of exports. The demand function for imports uses the log of the real value of imports (measured in constant, 1985, dollars) as the endogenous variable and a price index for imports and the log of real Honduran GDP as exogenous variables. The supply function for exports uses the log of the real value of exports (measured in constant, 1985, dollars) as the endogenous variable and a price index for exports as the exogneous variable. The resulting equations are

$$\underset{}{\mathrm{Log}(IMP(t))} = \underset{(-1.578)}{-2.6157} - \underset{(-3.295)}{.5184}\, P_{IM}(t) + \underset{(5.424)}{1.439}\, \log(GDP_H(t))$$

and

$$\mathrm{Log}(EXP(t)) = \underset{(12.08)}{4.5932} + \underset{(5.304)}{.4467}\, P_{EX}(t).$$

We take the trade deficit for each year and calculate the increase in the exchange rate that would close that trade deficit given the elasticities of exports and imports with respect to their prices. This increase in the

exchange rate is added to the official exchange rate of 2 Lps./$U.S. to get the equilibrium exchange rate. A second calculation was done assuming that a country such as Honduras could expect an inflow of capital of $100 million (U.S.) each year. The time paths for these estimates of the equilibrium exchange rate are given in Figure 5.1.

Table 5.1 gives the published (and collected by USAID Honduras) parallel market exchange rates. It should not be surprising that, for many years, the estimated equilibrium exchange rate is less than the parallel market rate. First, actual foreign exchange purchases were divided between those who had access to the offical rate and those who did not and purchased at the parallel market rate. Second, the trade deficit we use is from offical sources and does not contain goods that might have been imported illegally. For some years, the GOH had import restrictions, either direct or indirect, and some of the purchases of parallel market dollars must have gone to imports that did not get reported. Since we have no way of estimating the amount of illegal imports, we use the official trade deficit to calculate our equilibrium exchange rate.

5.4 Counterfactual equilibrium prices

Using world prices and adjusting them for international transportation and the Honduran tariff regime that was actually in effect from 1975 to 1988, we can construct a series of frontier prices for a number of important commodities. We calculate the prices as imports (by adding the transportation costs and taxes to the international price) for corn, rice, and African palm oil. There have been three different import tariff regimes in Honduras since 1974. The tariff history for the goods we are interested in are given in Table 5.2. We calculate the prices as exports (by

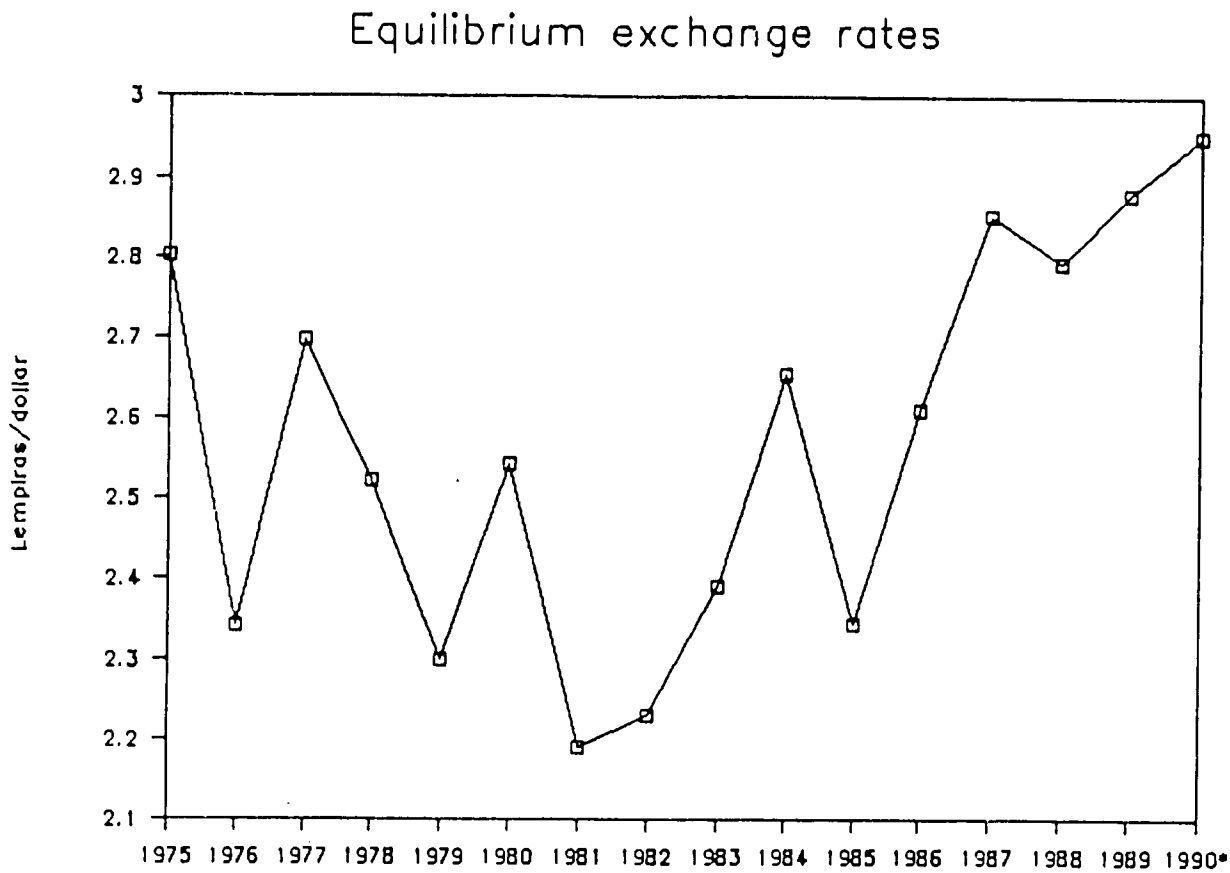

Figure 5.1: Equilibrium exchange rate from calculations

Nominal Exchange rate in Honduras

from Sabastian Edwards table 4 (Sept 1989 on from AID honduras)

	month	offical rate	CETRA	Interbank	Parallel rates IICA	AID	El Tiempo	combined iica and aid	
1985	jan	2.00			2.30			2.30	
1985	feb	2.00			2.32			2.32	
1985	mar	2.00			2.35			2.35	
1985	apr	2.00			2.40			2.40	
1985	may	2.00			2.45			2.45	1
1985	jun	2.00			2.45			2.45	9
1985	jul	2.00			2.50			2.50	8
1985	aug	2.00			2.50			2.50	5
1985	sep	2.00			2.60			2.60	
1985	oct	2.00			2.70			2.70	
1985	nov	2.00			2.80			2.80	
1985	dec	2.00			2.90			2.90	
1986	jan	2.00			2.20			2.20	
1986	feb	2.00			2.22			2.22	
1986	mar	2.00			2.23		2.80	2.23	
1986	apr	2.00			2.25			2.25	
1986	may	2.00			2.30			2.30	1
1986	jun	2.00			2.35		2.20	2.35	9
1986	jul	2.00			2.35			2.35	8
1986	aug	2.00			2.40			2.40	6
1986	sep	2.00			2.50		2.40	2.50	
1986	oct	2.00			2.65			2.65	
1986	nov	2.00			2.70			2.70	
1986	dec	2.00			2.80		2.35	2.80	

Table 5.1: Exchange rates in Honduras: reported from several sources

Nominal Exchange rate in Honduras
continued from previous page

	month	offical rate	CETRA	Interbank	Parallel rates IICA	AID	El Tiempo	combined iica and aid	
1987	jan	2.00			2.20			2.20	
1987	feb	2.00			2.30			2.30	
1987	mar	2.00			2.32		2.30	2.32	
1987	apr	2.00			2.35		2.30	2.35	
1987	may	2.00			2.35		2.30	2.35	1
1987	jun	2.00			2.35	2.35	2.30	2.35	9
1987	jul	2.00			2.35	2.36	2.40	2.36	8
1987	aug	2.00			2.50	2.36		2.36	7
1987	sep	2.00			2.55	2.38	2.40	2.38	
1987	oct	2.00			2.60	2.45		2.45	
1987	nov	2.00			2.68	2.60		2.60	
1987	dec	2.00			2.75	2.65	2.60	2.65	
1988	jan	2.00			4.40	2.50	2.60	2.50	
1988	feb	2.00			3.50	2.58	2.60	2.58	
1988	mar	2.00			3.50	2.66	2.67	2.66	
1988	apr	2.00			3.50	2.72	2.60	2.72	
1988	may	2.00			3.35	2.75	3.00	2.75	1
1988	jun	2.00			3.35	2.85	2.80	2.85	9
1988	jul	2.00			3.35	3.00	3.25	3.00	8
1988	aug	2.00			3.30	3.10	3.25	3.10	8
1988	sep	2.00			3.20	3.05	3.25	3.05	
1988	oct	2.00			3.20	3.22	3.25	3.22	
1988	nov	2.00	3.15		3.50	3.45	3.70	3.45	
1988	dec	2.00	3.00		4.00	3.02	3.00	3.02	

Nominal Exchange rate in Honduras
continued from previous page

	month	offical rate	CETRA	Interbank	Parallel rates IICA	AID	El Tiempo	combined iica and aid	
1989	jan	2.00	3.07		3.50	3.10	2.78	3.10 j	
1989	feb	2.00	3.08		3.50	3.36	3.35	3.36	
1989	mar	2.00	3.09		3.50	3.39	3.43	3.39	
1989	apr	2.00	3.16		3.50	3.40	3.41	3.40	
1989	may	2.00	3.17		3.50	3.38	3.41	3.38	1
1989	jun	2.00	3.17		3.40	3.46	3.41	3.46	9
1989	jul	2.00	3.11		3.50	3.50	3.50	3.50	8
1989	aug	2.00	3.13		3.70	3.60	3.62	3.60	9
1989	sep	2.00	3.19			3.65		3.65	
1989	oct	2.00	3.30			3.80		3.80	
1989	nov	2.00	3.38			3.95		3.95	
1989	dec	2.00	3.40			4.00		4.00	
1990	jan	2.00	3.40			4.35		4.35	
1990	feb	2.00	3.45			4.55		4.55	
1990	mar			4.10		4.35		4.35	
1990	apr			4.10		4.35		4.35	
1990	may			4.10		4.30		4.30	1
1990	jun			4.30		4.57		4.57	9
1990	jul			4.30		4.70		4.70	9
									0

History of tariff rates for specific goods

good		1990 tariff	1990 surcharge percent	1988 tariff	1988 surcharge percent	1974 tariff	surcharges (percent) 1981-88	1982-88	1984-88
wheat		2%	+5	1%	+5	$.015K	0	0	5
wheat flour		15%	+10 +5	20%	+10 +5 +20	$.10K	10	20	5
powdered milk		2%	+5	5%		$.15K + 10%	0	0	0
liquid milk		15%	+10 +5	30%	+10 +5 +20	$.20K + 10%	10	20	5
corn		30%	+10 +5	30%	+5	$.08K + 10%	0	0	5
rice		30%	+5	30%	+5	$.10K + 10%	0	0	5
chicken		30%	+10 +5	30%	+10 +5 +20	$.80K + 15%	10	20	5
red beans		30%	+5	30%	+5	$.10K + 8%	0	0	5
lard (veg)		10%	+5	10%	+10 +5 +20	$.50K + 10%	10	20	5
beef		30%	+10 +5	30%	+10 +5 +20	$.60K + 10%	10	20	5
coffee	green	10%	+10 +5	10%	+10 +5 +20	$.40K + 20%	10	20	5
	toasted	30		30%	+10 +5 +20	$1.20K + 20%			
sugar		30%	+10 +5	30%	+10 +5 +20	$.15K + 10%	10	20	5
palm oil		30%	+10 +5	40%	+10 +5 +2	$.20 + 10%	10	20	5

Table 5.2: Import tariffs in Honduras

subtracting the transportation costs and taxes from the international price) for corn, african palm oil, beef, and sugar. For beef and sugar, the export taxes are paid in lempiras and depend on the domestic lempira of the good. The export tax rules are given in Table 5.3. These taxes were subtracted from the international price after it was converted into lempiras at the equilibrium exchange rate we calculated in the previous section. The frontier dollar price of each of the goods was converted to a lempira price by multiplying by the equilibrium exchange rate. Table A5.1 in the appendix of this chapter presents the data used for calculating the frontier prices.

Figures 5.2 to 5.6 show the domestic price (in current lempiras, the next section explains how these prices were determined) and the estimated counterfactual import and export price (whichever exists) for the five goods mentioned above. For both white corn and African palm oil, the domestic price stays between the calculated export and import prices for most of the years in our sample. For rice, the domestic price was almost always below the import price, when calculated with the tariff regime actually in place, but often above the frontier price when it is with a tariff rate of zero. The domestic price of beef for most of the sample period was well below the frontier price. The producer price for sugar was below the frontier price for the first half of the period and above it for the second half of the period.

5.5 Domestic prices

For all but two of the commodities we are using for comparison, the domestic producer prices can be easily converted into current Lempiras per metric ton. The two for which we have some difficulty are palm oil and sugar. For palm oil, we have data on the producer prices of the palm fruit

EXPORT TAXES

PRODUCT	UNITS	PRICE	TAX ON INCREMENT
Coffee	Lmps. per 60kg Bag	0 - 200	0%
		200-240	30%
		>240	60%
Sugar	Lmps. per 100lb.	0 - 30	0%
		30 -31.5	5%
		31.5-33	10%
		33 - 36	15%
		36 - 40	20%
		40 - 45	30%
		45 -52.5	40%
		>52.5	50%
Beef	.035 Lmps. per lb.		

Table 5.3: Export taxes in Honduras

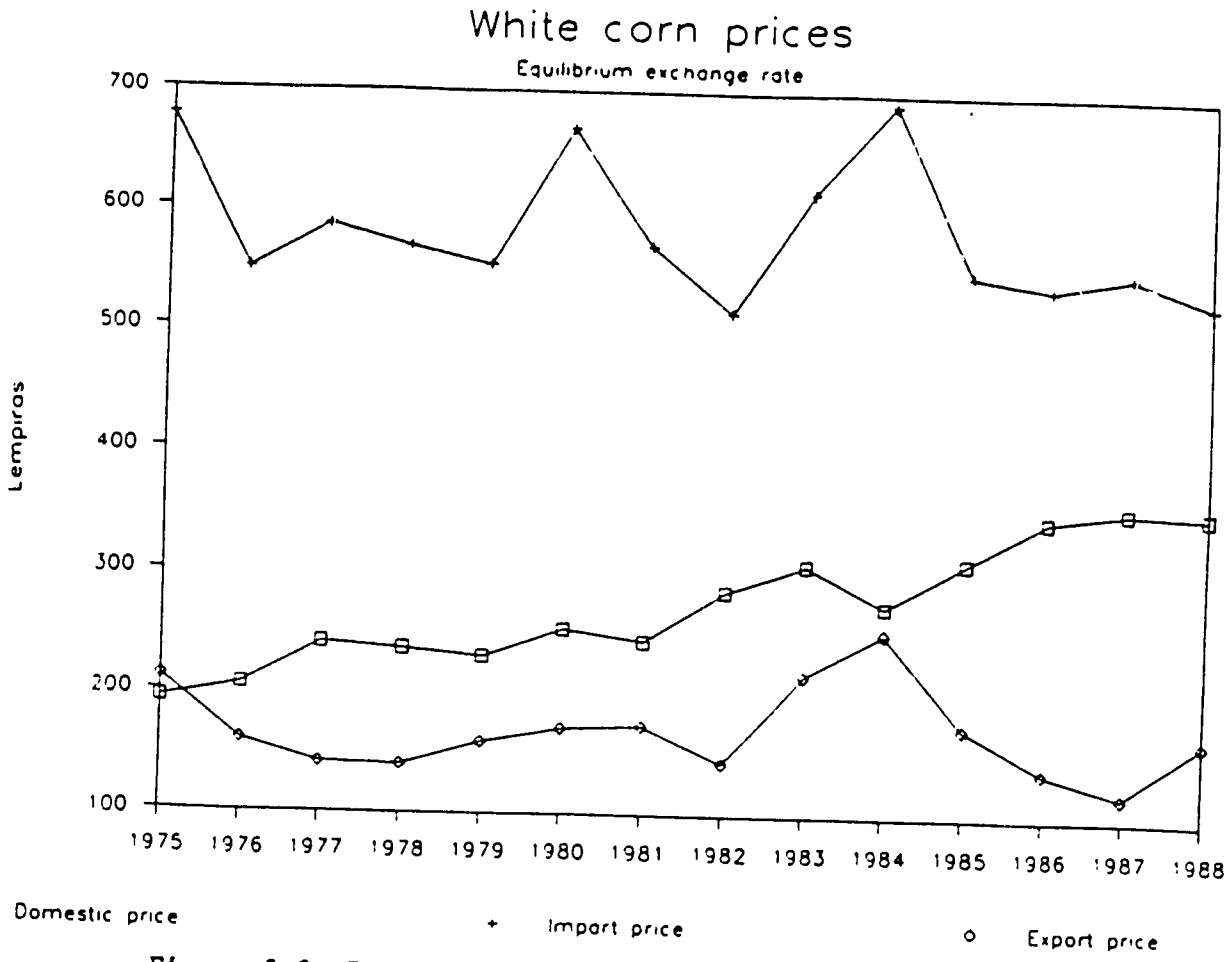

Figure 5.2: Price of corn under actual and alternative regimes

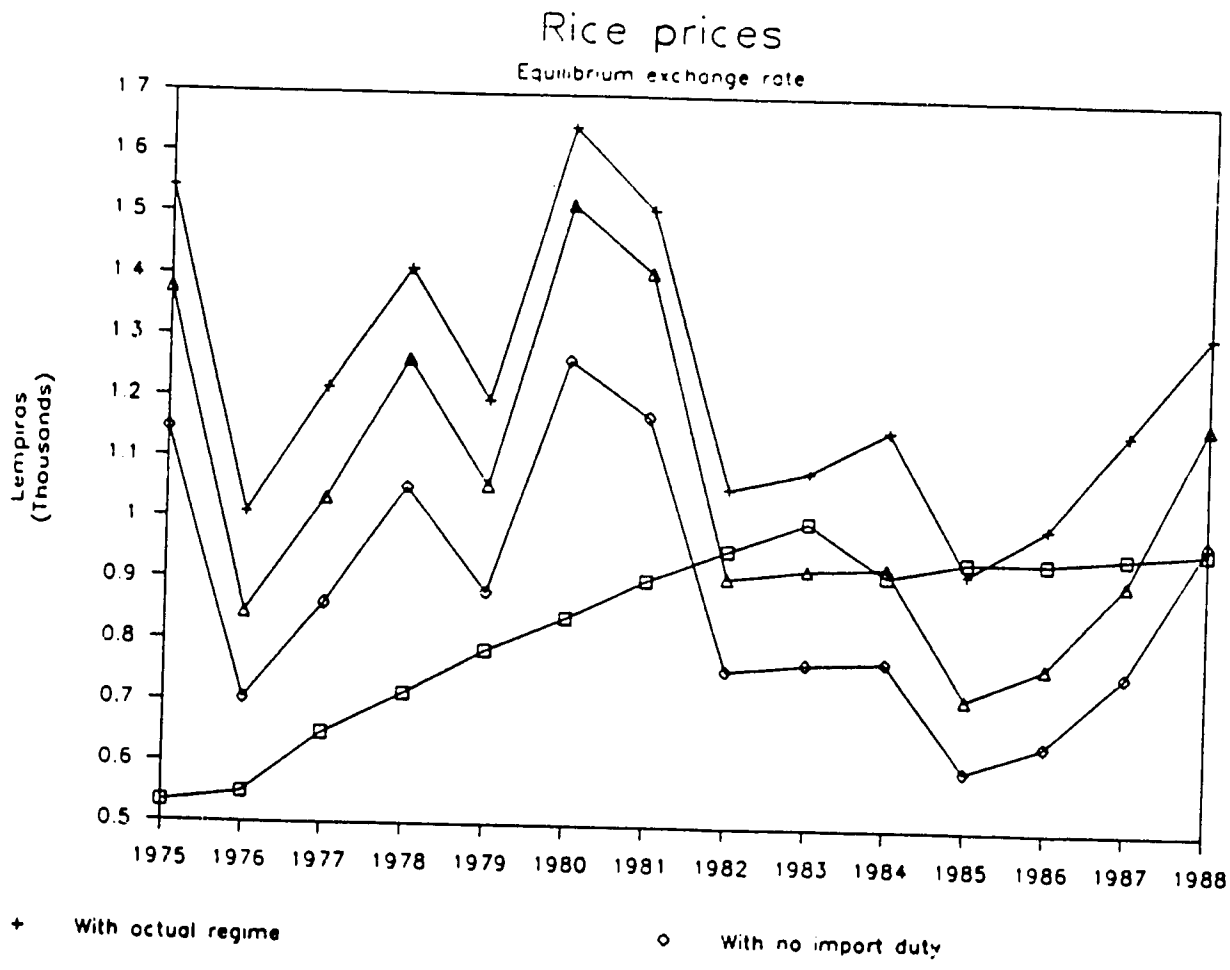

Figure 5.3: Price of rice under actual and alternative regimes

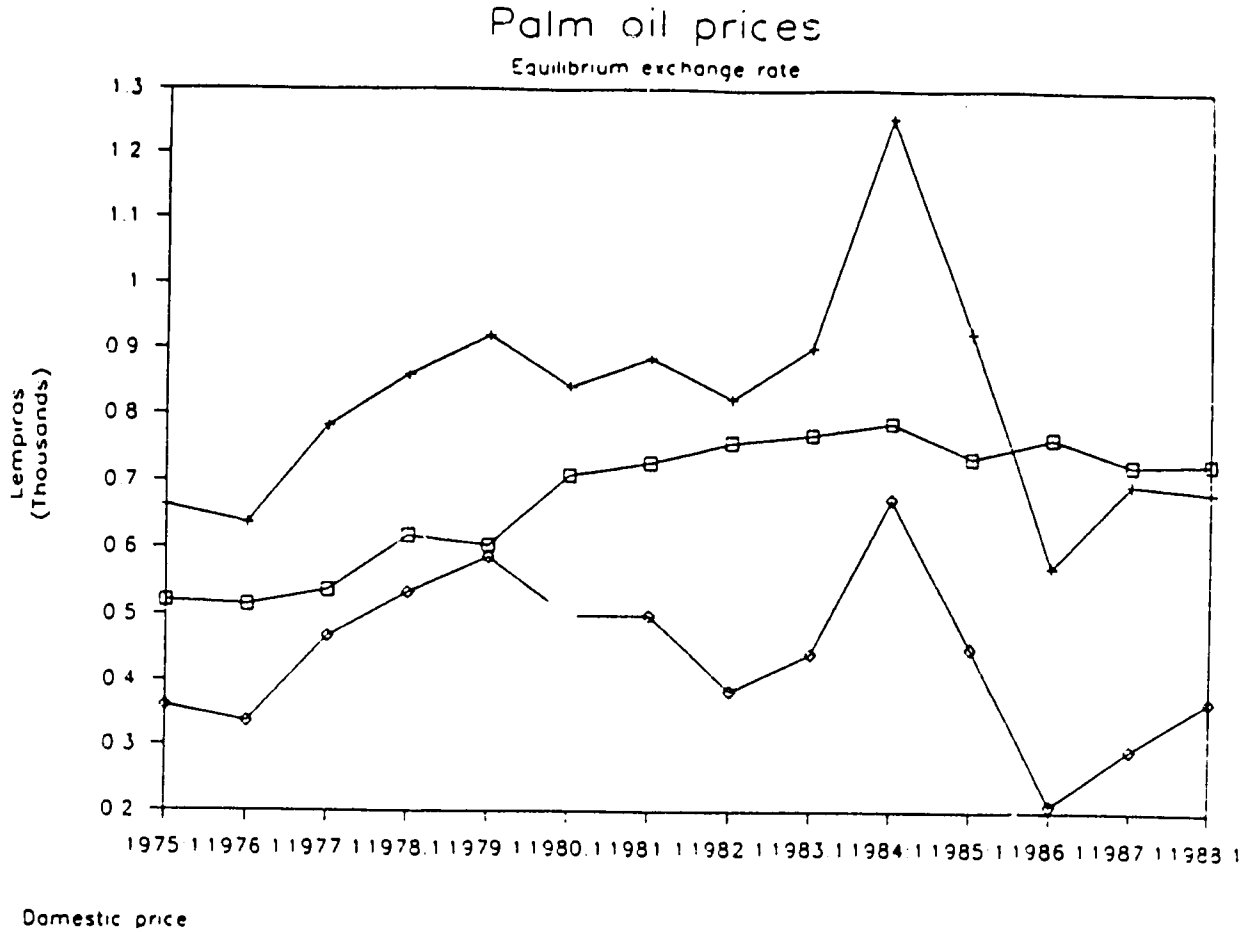

Figure 5.4: Price of African palm oil under actual and alternative regin

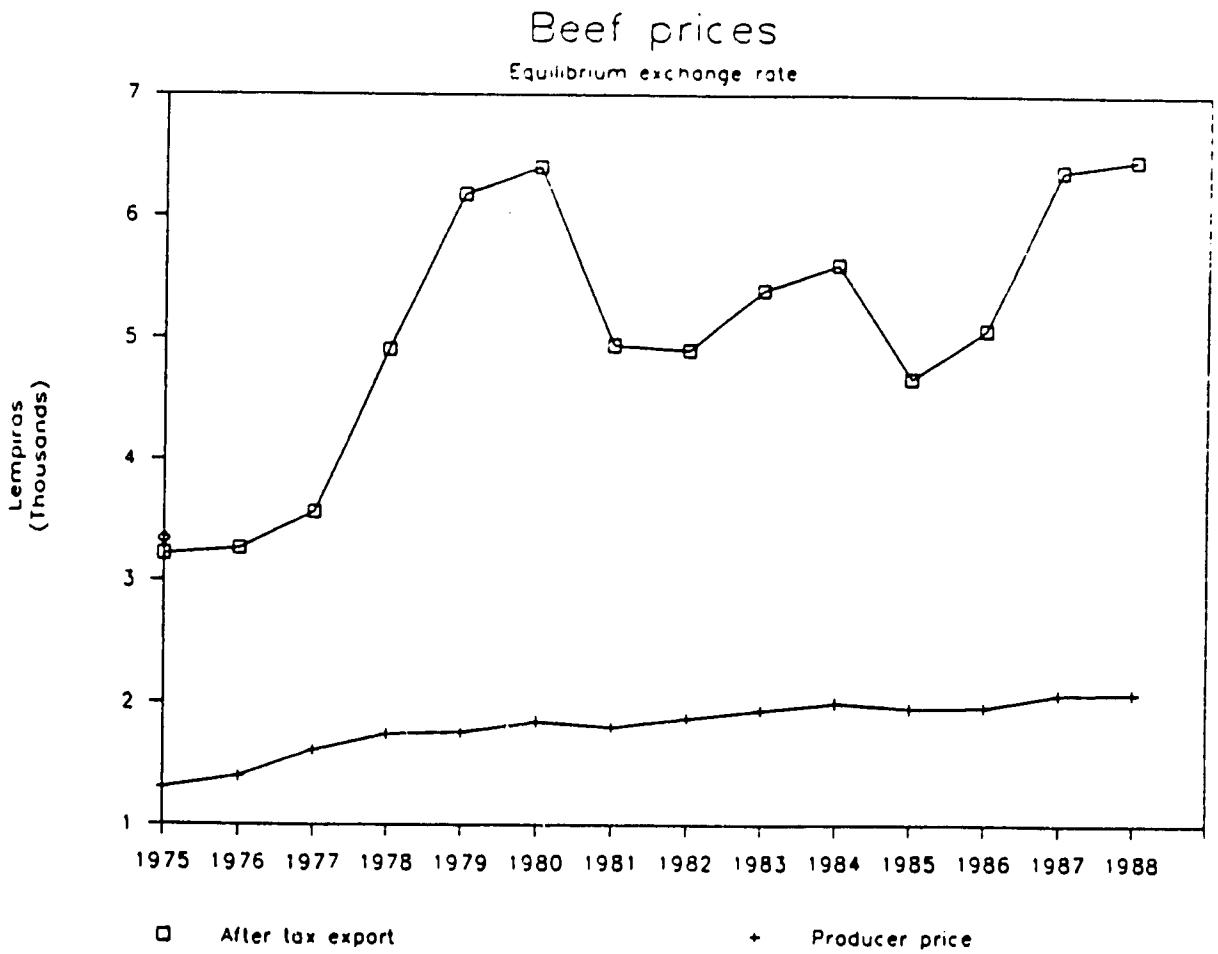

Figure 5.5: Price of beef under actual and alternative regimes

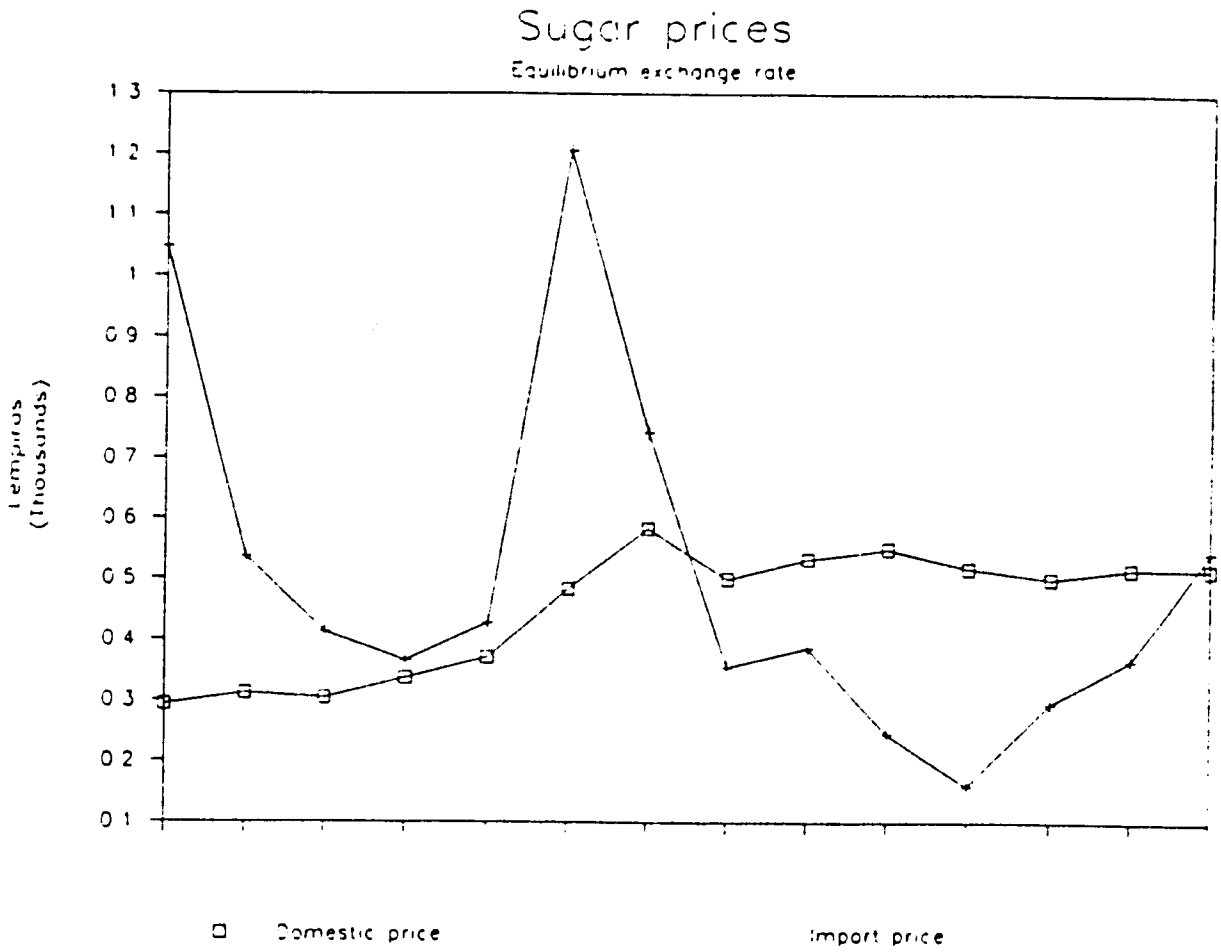

Figure 5.6: Price of sugar under actual and alternative regimes

per metric ton. For sugar, we have the producer price of sugar cane per metric ton. We need to estimate the Honduran producer price of palm oil and sugar.

The fruit of the African palm is crushed and washed to produce palm oil. The standard return is 21% by weight of palm oil from the fruit. So the conversion of the basic material from fruit to oil is fairly simple; the cost of the fruit to produce a metric ton of oil is the cost of 4.76 metric tons of fruit. However, there are additional costs to the processing. The oil must be washed and purified. The cost of this process in Malaysia was estimated at $39 a ton in 1977 (from United Nations, 1977, p. 112). We use that figure as representing an appropriate processing cost for Honduras and adjust the $39 for dollar inflation and the equilibrium exchange rate to add to the cost of the raw material.

The sugar content of a metric ton of sugar cane varies from 14 to 7.64 per cent, worldwide. The international average is 10.24 and the average for Latin American countries (excluding Argentina) is 9.65 per cent (from Blume, 1985). The base data for this is given in Table A5.2 in the appendix to this chapter. Unfortunately, Blume does not include Honduras, nor any other Central American country, in his sample. The Foreign Agricultural Service of the United States Department of Agriculture reports (Report, 1977, p. 84) that Honduras has overall lower cost sugar production than the rest of Central America (8.8 cents per pound compared to a Central American average of 11.0 cents per pound), but does not break the cost between production of cane and the processing of cane into sugar.

By default, we use the Latin American average of 9.65 per cent for the percentage of sugar in Honduran cane. To find the other processing costs, we use a report on the Bangladesh sugar industry (Motiur Rahman, 1977). He

found that the raw material made up 51.56 per cent of the cost of production for sugar that yield 7.56 per cent sugar. Using this ratio of raw material costs to other production costs and adjusting for the higher sugar content of Honduran cane, we get that 37.94 per cent of the total cost of sugar goes to processing. It takes 10.36 tons of cane to get a ton of sugar. The price of a metric ton of sugar is 10.36 times the price of a metric ton of cane times 1.61 to incorporate the processing costs or 16.70 times the price of a metric ton of cane.

5.6 Food consumption by income class

Table 5.4 shows the proportion of food expenditure spent on a variety of foods for a range of income groups in major cities, other cities, and rural areas of Honduras. This is the result of a survey conducted in 1978 and 1979. Notice that the list also includes the average expenditure on food for each income group. Using this average expenditure on food and the proportion of food expenditure spent on each type, we calculate the average expenditure on each type of food for each income group and region. We divide the expenditure on each good by the 1979 producer price of that good to get an approximation of the average consumption (in metric tons) of each good for each income group and region. These consumptions are shown in Table 5.5.

The most noteworthy aspects of Table 5.5 are: 1) the decline in food expenditure in each income group as one compares the major city to the other urban to the rural groups; and 2) the relatively small increase in beef consumption and the continued high consumption of corn and rice in the rural population. Why the rural groups choose to spend so much less on food, in general, is difficult to explain, unless a large portion of the subsistence

Portion of the Diet from Major Agricultural Goods (1979)

Monthly Income	Food Expenditure	Corn	Rice	Vegetable Lard	Milk	Beans	Beef	Sugar	Total
Cities									
<100	44.50	0.24	0.05	0.06	0.02	0.12	0.04	0.05	0.58
100-300	121.50	0.13	0.06	0.06	0.02	0.07	0.07	0.04	0.46
300-500	188.00	0.10	0.05	0.05	0.02	0.05	0.10	0.03	0.41
500-1000	256.30	0.08	0.04	0.05	0.02	0.04	0.11	0.02	0.36
1000<	375.80	0.04	0.03	0.03	0.02	0.03	0.11	0.02	0.27
Other Urban									
<100	41.70	0.33	0.04	0.05	0.04	0.13	0.02	0.05	0.66
100-300	106.70	0.18	0.06	0.06	0.03	0.09	0.07	0.05	0.54
300-500	185.30	0.12	0.05	0.05	0.03	0.06	0.09	0.04	0.45
500-1000	249.10	0.09	0.04	0.05	0.03	0.04	0.11	0.03	0.40
1000<	350.80	0.06	0.04	0.05	0.03	0.03	0.11	0.03	0.35
Rural									
<100	45.40	0.38	0.08	0.08	0.01	0.19	0.02	0.05	0.78
100-300	94.10	0.24	0.09	0.09	0.02	0.13	0.05	0.05	0.66
300-500	169.70	0.15	0.08	0.08	0.02	0.08	0.08	0.04	0.54
500-1000	185.30	0.13	0.07	0.08	0.06	0.07	0.08	0.06	0.55
1000<	161.70	0.13	0.05	0.10	0.03	0.07	0.10	0.05	0.53

Table 5.4: Proporcion of expenditure on food groups

Quantities of Major Agricultural Goods (1979)

Monthly Income	Food Expenditure	Corn	Rice	Vegetable Lard	Beef	Sugar
Cities						
<100	44.50	0.046	0.003	0.004	0.001	0.006
100-300	121.50	0.070	0.009	0.012	0.005	0.013
300-500	188.00	0.084	0.013	0.017	0.010	0.016
500-1000	256.30	0.089	0.014	0.019	0.015	0.017
1000<	375.80	0.072	0.014	0.017	0.023	0.019
Other Urban						
<100	41.70	0.059	0.002	0.004	0.001	0.005
100-300	106.70	0.081	0.008	0.011	0.004	0.014
300-500	185.30	0.098	0.012	0.016	0.009	0.020
500-1000	249.10	0.094	0.014	0.019	0.015	0.022
1000<	350.80	0.088	0.019	0.027	0.022	0.026
Rural						
<100	45.40	0.074	0.004	0.006	0.000	0.006
100-300	94.10	0.099	0.011	0.014	0.003	0.012
300-500	169.70	0.111	0.017	0.023	0.008	0.020
500-1000	185.30	0.102	0.016	0.025	0.008	0.030
1000<	161.70	0.093	0.011	0.026	0.009	0.022

Table 5.5: Quantity of consumption of food groups

food production is unreported. If the value of the subsistence food production is left out of these tables (and it is unclear exactly how subsistence food was treated), then the data for the rural population must be held suspect.

5.7 Actual and counterfactual expenditures on five foods

We can calculate the expenditures that would have been required to achieve the same level of consumption under each of the counterfactual price sequences based on international prices. There are two sets of counterfactual prices, one based on the assumption that import prices prevailed domestically and the other on the assumption that exports prices prevailed. For each year from 1975 to 1988, we calculate the total expenditures on the five goods under the new prices. These expenditures for each income group and region are given in Tables 5.6, 5.7, and 5.8.

Since Honduras has exhibited a slow but continuous inflation during this period, we deflate the series by the consumer price index and then take averages for each income group. These averages are shown in Table 5.9. The deflated expenditures are expressed in terms of 1978 lempiras. These averages allow us to make some general statements about the welfare effects of the pricing regime that has been followed by the GOH.

For individuals in all income groups living in the major cities, the actual cost of the basket of five goods was approximately half of what it would have been if the legal import regime had determined domestic prices. The cost of the basket if the legal export regime had determined the domestic prices would have been about the same (almost exactly the same for the very poorest group) for the lower income groups and increasing to almost double

Expenditures on Five Major Agricultural Goods, Cities

	Actual Prices					With Counterfactual Import Prices					With Counterfactual Export Prices				
	≤100	100-300	300-500	500-1000	1000≤	≤100	100-300	300-500	500-1000	1000≤	≤100	100-300	300-500	500-1000	1000≤
1975	15.79	35.33	50.13	59.78	66.84	48.07	99.72	138.23	161.86	177.80	25.24	63.25	94.28	114.83	139.27
1976	16.62	37.04	52.66	62.87	70.56	37.62	79.16	112.42	134.64	151.86	18.34	48.09	74.89	94.4[illegible]	118.81
1977	18.83	41.68	59.33	70.96	79.68	40.23	85.45	121.80	146.34	164.78	18.29	50.25	79.33	100.86	127.46
1978	19.49	44.09	63.12	75.73	85.57	41.46	93.06	137.30	168.86	198.13	20.27	58.94	96.10	124.70	161.85
1979	19.54	44.59	63.92	76.63	86.81	42.05	97.98	148.62	186.30	226.14	22.43	66.19	110.19	145.07	192.21
1980	21.93	49.90	71.06	84.72	95.34	53.03	120.42	177.81	217.90	259.74	28.50	81.13	130.42	167.16	218.13
1981	22.26	51.10	72.54	86.11	96.77	44.05	99.39	145.61	177.71	208.20	24.12	66.81	106.13	135.27	173.19
1982	24.07	54.14	76.51	90.73	100.94	37.67	85.40	127.43	158.11	188.31	18.66	53.90	89.12	116.83	154.13
1983	25.55	57.05	80.42	95.21	105.66	43.53	96.72	143.33	177.20	209.53	23.08	62.91	102.23	132.93	172.89
1984	23.99	54.69	77.81	92.68	104.23	48.17	106.33	156.36	192.63	224.39	25.37	68.20	109.89	142.47	182.77
1985	25.30	56.18	79.29	94.01	104.58	37.96	84.17	124.66	154.35	181.38	18.62	51.95	85.43	112.02	146.28
1986	26.99	58.88	82.58	97.58	107.52	37.46	83.63	125.44	156.32	187.72	17.42	51.01	85.96	113.93	152.80
1987	27.49	59.89	84.21	99.69	110.41	40.80	94.94	145.32	183.31	224.96	19.13	59.63	102.55	137.36	187.09
1988	27.41	59.87	84.24	99.78	110.62	41.23	97.40	149.12	187.71	230.99	23.13	68.01	113.56	149.54	199.57
Average	22.52	50.32	71.27	84.75	94.68	42.38	94.56	139.53	171.66	202.42	21.61	60.73	98.58	127.67	166.18

Table 5.6: Expenditure on food groups--cities

Expenditures on Five Major Agricultural Goods, Other Urban

	Actual Prices					With Counterfactual Import Prices					With Counterfactual Export Prices				
	≤100	100-300	300-500	500-1000	1000≤	≤100	100-300	300-500	500-1000	1000≤	≤100	100-300	300-500	500-1000	1000≤
1975	16.80	35.44	51.92	61.77	77.58	53.11	102.94	146.85	169.30	204.54	24.51	61.79	96.45	119.84	155.35
1976	17.72	37.23	54.56	64.98	81.50	41.63	81.13	117.22	138.77	170.37	17.55	46.20	74.31	96.49	127.94
1977	20.19	41.90	61.35	73.08	91.53	44.38	86.95	126.04	149.80	185.10	16.93	47.30	77.41	101.98	137.33
1978	20.62	44.01	64.98	77.95	98.46	44.53	92.93	139.11	171.33	217.47	18.06	54.56	91.98	124.91	170.92
1979	20.52	44.39	65.78	78.96	99.98	44.37	97.09	148.75	188.59	243.19	19.91	61.43	104.88	145.27	199.50
1980	23.01	49.83	73.55	87.77	110.76	56.08	121.06	182.40	224.81	284.65	25.37	76.77	128.11	171.46	231.44
1981	23.14	50.97	75.36	89.66	113.22	46.86	99.56	148.94	182.23	230.61	22.09	63.15	104.00	137.68	185.27
1982	25.44	54.18	79.44	93.99	118.00	40.34	85.26	128.60	160.38	204.63	16.83	50.26	85.19	117.10	159.99
1983	27.10	57.24	83.68	98.72	123.53	47.18	97.24	145.33	179.95	227.89	21.87	59.63	98.74	133.53	180.10
1984	25.13	54.61	80.61	96.13	121.33	52.50	106.81	158.42	194.97	246.63	24.39	64.59	105.93	142.42	191.99
1985	26.95	56.50	82.52	97.45	121.74	41.33	84.41	125.84	155.89	197.76	17.46	48.68	81.47	111.53	151.78
1986	29.08	59.52	86.22	101.12	125.44	40.57	83.93	126.54	158.26	201.06	15.60	47.41	81.53	113.74	155.95
1987	29.66	60.61	87.91	103.30	128.09	43.17	94.13	144.96	185.11	238.90	16.20	54.61	96.24	136.87	189.95
1988	29.52	60.52	87.89	103.37	128.32	43.06	96.26	149.00	190.29	246.21	20.50	63.32	108.44	150.20	205.69
Average	23.92	50.50	73.98	87.73	109.96	45.65	94.98	142.00	174.98	221.36	19.81	57.12	95.33	128.79	174.51

Table 5.7: Expenditure on food groups--other urban

Expenditures on Five Major Agricultural Goods, Rural

	Actual Prices					With Counterfactual Import Prices					With Counterfactual Export Prices				
	<100	100-300	300-500	500-1000	1000<	≤100	100-300	300-500	500-1000	1000<	≤100	100-300	300-500	500-1000	1000<
1975	21.89	39.12	57.95	60.95	55.79	67.72	114.13	161.06	168.18	149	31.69	64.22	102.62	113.13	98.42
1976	23.01	40.97	60.62	63.72	58.32	53.02	89.07	127.50	130.78	120.36	22.63	46.69	77.56	83.54	76.38
1977	26.22	46.30	68.11	70.91	65.00	56.99	96.27	138.20	140.28	129.87	22.38	48.17	81.71	86.96	80.29
1978	26.91	48.46	72.26	75.69	69.40	57.30	100.59	150.29	152.79	143.52	23.90	54.04	95.46	100.95	95.26
1979	26.83	48.84	73.14	76.90	70.02	56.57	101.69	157.28	161.44	154.46	25.65	58.43	106.11	112.93	109.23
1980	30.05	54.78	81.94	86.95	78.80	71.00	127.27	193.17	203.97	187.39	32.30	73.54	130.14	144.52	132.14
1981	30.26	55.91	84.04	90.17	80.89	60.08	106.94	160.53	166.93	154.06	28.70	62.76	107.92	116.85	107.25
1982	33.29	60.11	89.00	93.97	84.84	51.54	90.76	137.38	140.37	133.52	21.66	48.28	86.28	91.43	87.61
1983	35.40	63.56	93.68	98.84	89.07	60.08	103.92	155.34	158.14	150.60	27.93	58.29	100.53	105.69	101.42
1984	32.83	59.99	89.84	95.60	86.54	67.36	115.77	171.73	173.42	166.43	31.56	64.54	109.70	113.79	110.35
1985	35.09	62.59	92.07	96.97	87.65	52.93	91.04	135.63	136.51	131.47	22.55	47.69	83.26	86.24	84.24
1986	37.79	66.31	96.42	100.92	91.45	51.40	88.88	133.55	135.13	128.93	19.82	44.57	80.96	85.17	82.30
1987	38.44	67.30	97.86	102.38	92.73	54.70	97.79	151.57	154.64	148.52	20.58	49.84	94.59	100.48	97.94
1988	38.29	67.19	97.85	102.41	92.74	54.62	99.57	155.69	160.76	152.59	26.11	59.61	108.34	115.83	110.68
Average	31.16	55.82	82.48	86.89	78.80	58.24	101.69	152.07	155.95	146.52	25.53	55.76	97.51	104.11	98.11

Table 5.8: Expenditure on food groups--rural

Actual and Counterfactual Expenditures on Five Major Foods

Major Cities

Income Range	Actual	Import	Export
<100	17.36	34.42	17.52
100-300	38.86	76.23	48.78
300-500	55.12	111.80	78.58
500-1000	65.61	136.92	101.26
1000<	73.39	160.38	131.02

Other Urban

Income Range	Actual	Import	Export
<100	18.43	37.19	16.13
100-300	38.98	76.76	46.00
300-500	57.16	114.21	76.33
500-1000	67.88	139.85	102.39
1000<	85.16	176.21	138.33

Rural

Income Range	Actual	Import	Export
<100	24.02	47.45	20.83
100-300	43.06	82.54	45.22
300-500	63.71	122.68	78.44
500-1000	67.10	125.96	83.98
1000<	60.93	117.76	78.59

Table 5.9: Average real expenditure on food basket by income group under actual and counterfactual regimes

for the very highest income group. To some extent, the increase in the relative cost of the basket with income group represents the significant increase in the importance of beef in the consumption basket.

For individuals living in the smaller cities, the pattern of costs for the basket is almost identical to that in the large cities. The cost of the basket under the import price assumption is almost double the cost that actually occurred, and, under the export price, the relative costs rise with income level, from less than the actual costs for the very poorest to approximately one and a half times the actual costs for highest income group.

For the rural group, the costs of the basket of goods under import prices relative to the actual prices are the same as for the other two groups. For the costs under export prices, however, the relative cost of the basket is similar to the cost of the actual regime. To a large extent this is due to the relatively small amount of beef that enters the rural diet, even for the higher income groups. The quantities of corn, rice, vegatable fats that enter the diet of the rural population stay relatively high even as income increases.

Table 5.10 shows the cost of the basket of five goods under the assumption that the prices for imports were the international price and transportation with a twenty percent tariff and the prices for exports were the international price minus transportation and a one percent tariff. The table indicates that the costs of these baskets would have risen substantially, between two and three times for the highest income groups (especially in the cities) and considerably less for the lower income groups (between fifty and 100 percent for the low income group). These increases are substantial and, if they were in effect, would have imposed substantial

Average Expenditure on Five Goods

Major Cities

Income Range	Actual	Import	Export
<100	17.36	33.31	25.18
100-300	38.86	83.94	61.61
300-500	55.12	129.26	94.09
500-1000	65.61	163.10	118.31
1000<	73.39	201.53	144.94

Other Urban

Income Range	Actual	Import	Export
<100	18.43	33.22	25.68
100-300	38.98	81.75	60.55
300-500	57.16	128.54	94.04
500-1000	67.88	166.28	120.67
1000<	85.16	219.18	157.75

Rural

Income Range	Actual	Import	Export
<100	24.02	42.57	32.76
100-300	43.06	83.04	61.93
300-500	63.71	135.83	99.50
500-1000	67.10	145.32	105.75
1000<	60.93	139.11	101.70

Note: Assuming an Import Tax = 20% and an Export Tax = 1%.

Table 5.10: Average real expenditure on food basket by income group under actual and import tariffs of 20% and export taxes of 1%

increases in the cost of consumption for all income groups.

5.8 Production effects

In the production functions that we estimated for basic grains in the Section 4, an increase in the price of the good resulted in an increase in the production of that good. This effect, although it operated with a lag, was particularly apparent in corn. In addition, in the estimate for rural wages in the same section, we indicated that an increase in the price of a good would have resulted in an immediate increase in the rural wage and, through an increase in the land use, would have raised the marginal product of labor in the next periods.

Using the counterfactual import prices of corn as an example, we can calculate what the change in the land use would have done for the production of corn. Our land use equation states that the one period lagged price of corn is important in determining the amount of land that individuals choose to use in corn. We first calculate the amount of land that this equation predicts would have been used if the counterfactual import prices were in effect and then use that as an input into corn production (leaving the labor input, the economically active rural population, unchanged). Figure 5.7 shows the time path for actual corn production and for corn production if the amount of land determined by the import price had been in effect. Notice that corn production is more than doubled for some years. However, the prices that we are using are higher than are likely to have existed in Honduras (since we have not modeled the demand side) and the simulation does not take into effect the changes in the prices for other agricultural goods which would have competed with corn for available land.

Figure 5.8 shows the estimated wages in the corn industry with the actual

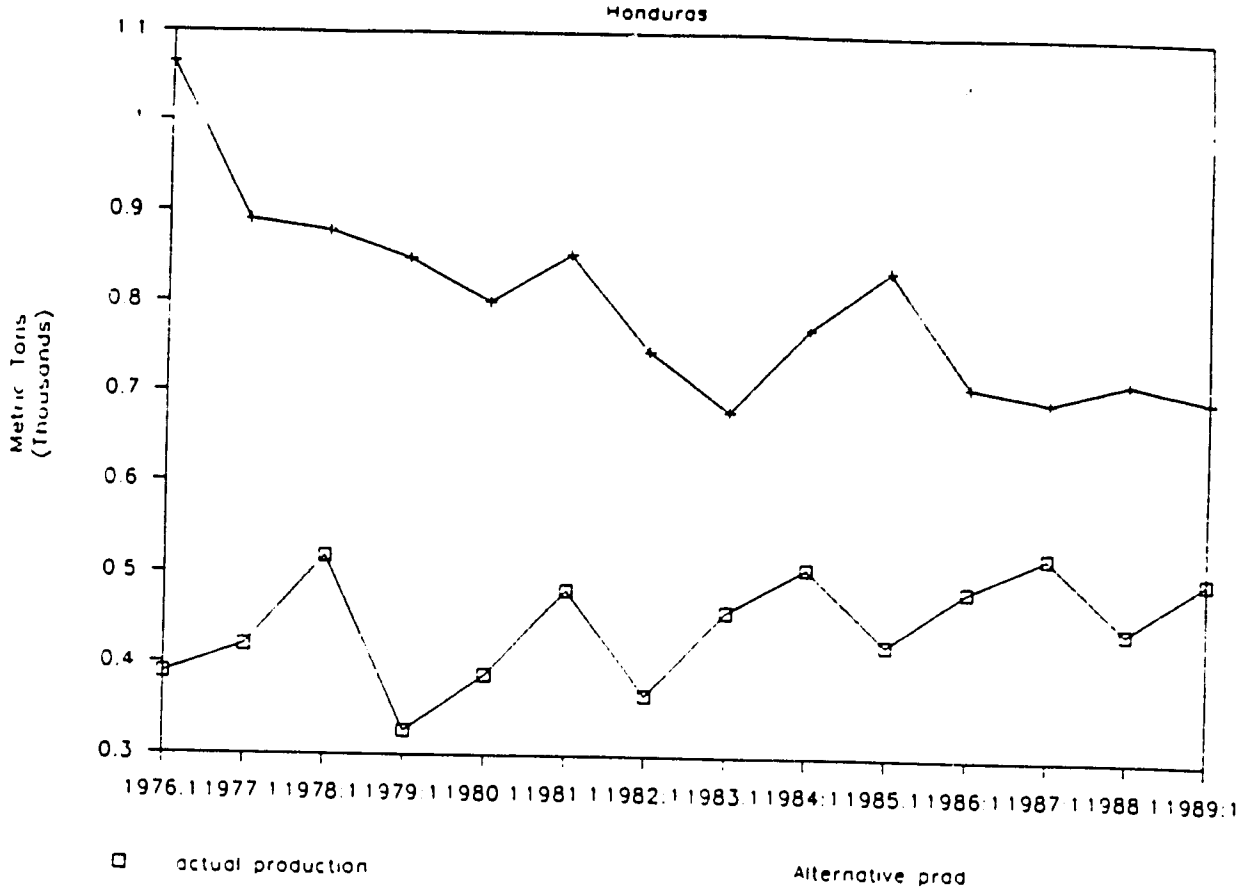

Figure 5.7: Corn production: actual and counterfactual

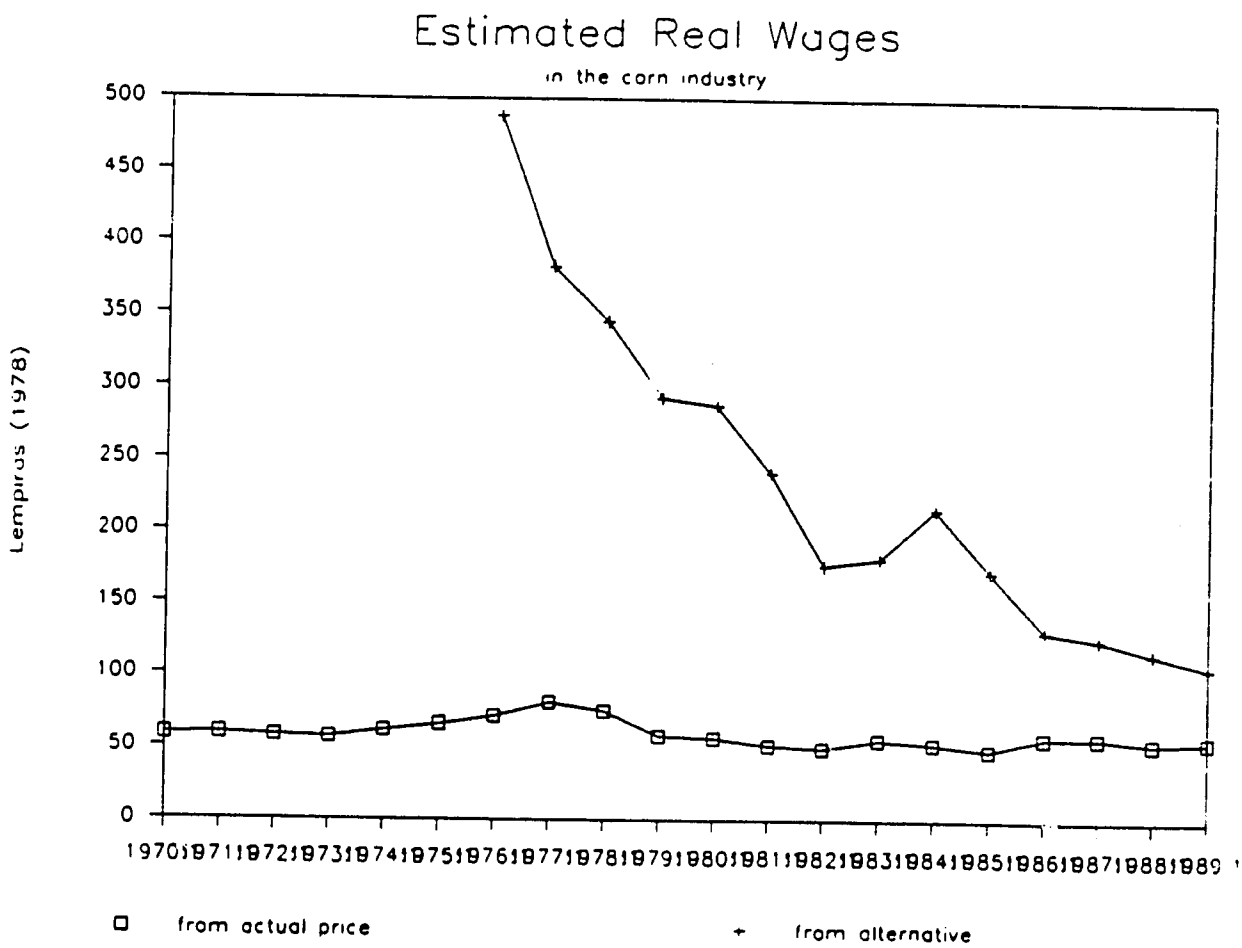

Figure 5.8: Wages in corn production: actual and counterfactual

prices and the counterfactual import prices for corn. From the counterfactual import prices we estimate the land use in corn. Then the marginal product of labor is calculated using the estimated production function, but with the land use we just calculated in place of actual land use. This gives the marginal product of labor in terms of corn, so we multiply each year's marginal product of labor by that year's real price of corn (in Lempiras of 1978) to get the real wage in the corn sector. We include the "actual" wage that we calculated earlier from the marginal product and the domestic prices as a comparison.

INTERNATIONAL PRICES

(US Dollars per Metric Ton)

PRODUCT	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
SUGAR										
world price E	82.89	99.87	164.91	212.08	660.06	453.27	254.85	178.79	172.40	212.97
transport	21.24	21.45	21.74	24.67	24.95	25.17	25.46	25.67	27.03	27.03
taxes										
TOTAL PRICE										
WHEAT										
world price I	54.72	61.73	69.81	139.99	179.67	149.18	133.01	103.25	127.87	160.20
transport	29.70	30.00	30.40	34.50	34.90	35.20	35.60	35.90	37.80	37.80
taxes					15.00	15.00	15.00	15.00	15.00	15.00
TOTAL PRICE					229.57	199.38	183.61	154.15	180.67	213.00
WOOL										
world price	1202.80	1216.99	2084.79	3640.60	2851.30	2343.90	3204.80	3385.70	3473.40	4223.00
transport	34.80	35.15	35.62	40.42	40.89	41.24	41.71	42.06	44.28	44.28
taxes										
TOTAL PRICE										
AFRICAN PALM OIL I										
world price I	259.50	262.08	217.42	375.92	691.33	420.25	397.33	530.08	600.33	653.83
transport										
taxes					269.13	242.03	239.73	253.01	260.03	265.38
TOTAL PRICE					960.46	662.28	637.06	783.09	860.36	919.21
AFRICAN PALM OIL E										
world price E	259.50	262.08	217.42	375.92	691.33	420.25	397.33	530.08	600.33	653.83
transport					55.73	56.21	56.85	57.33	60.36	60.36
taxes					6.91	4.20	3.97	5.30	6.00	6.54
TOTAL PRICE					628.69	359.84	336.51	467.45	533.96	586.93
BEEF										
world price	1304.25	1345.92	1480.18	2010.39	1582.26	1327.18	1580.93	1506.41	2 38.26	2884.08
transport	127.04	128.32	130.03	147.57	149.28	150.57	152.28	153.56	161.69	161.69
taxes									385.00	385.00
TOTAL PRICE									1591.57	2337.39

Notes:

1) (US cents/Lb) to (US $/TM) is 22.0462.

2) (US $/Bushel) to (US $/TM) is 36.7431.

Source: International Financial Statistics, IMF
and author's calculations.

Appendix A5.1: Calculation for frontier prices

INTERNATIONAL PRICES

(US Dollars per Metric Ton)

PRODUCT	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
SUGAR										
world price E	632.06	372.36	185.41	186.73	114.64	89.29	133.38	149.03	224.65	282.41
transport	35.18	29.74	25.67	25.03	21.81	21.02	20.02	20.02	28.60	28.60
taxes										
TOTAL PRICE										
WHEAT										
world price I	172.69	174.90	160.20	157.26	152.48	135.95	115.01	112.80	145.14	169.39
transport	49.20	41.60	35.90	35.00	30.50	29.40	28.00	28.00	40.00	40.00
taxes	15.00	15.00	15.00	15.00	24.15	23.27	22.15	22.04	11.11	12.56
TOTAL PRICE	236.89	231.50	211.10	207.26	207.13	188.62	165.16	162.84	196.25	221.95
WOOL										
world price	4297.80	3914.30	3427.60	3202.40	3155.40	3014.80	3259.90	4078.90	4675.70	
transport	57.64	48.73	42.06	41.00	35.73	34.44	32.80	32.80	46.86	46.86
taxes										
TOTAL PRICE										
AFRICAN PALM OIL I										
world price I	583.08	570.67	445.08	501.42	728.83	500.92	257.00	342.50	437.17	350.42
transport										
taxes	258.31	314.13	378.03	400.57	527.97	425.41	315.65	354.13	249.19	199.74
TOTAL PRICE	841.39	884.80	823.11	901.99	1256.80	926.33	572.65	696.63	686.36	550.16
AFRICAN PALM OIL E										
world price E	583 08	570.67	445.08	501.42	728.83	500.92	257.00	342.50	437.17	350.42
transport	78.57	66.43	57.33	55.89	48.70	46.95	44.71	44.71	63.87	63.87
taxes	5.83	5.71	4.45	5.01	7.29	5.01	2.57	3.43	4.37	3.50
TOTAL PRICE	498.68	498.53	383.30	440.52	672.84	448.96	209.72	294.36	368.92	283.04
BEEF										
world price	2759.96	2471.82	2389.58	2439.85	2273.18	2153.25	2093.95	2384.96	2517.01	2567.50
transport	210.45	177.94	153.56	149.71	130.46	125.76	119.77	119.77	171.10	171.10
taxes	385.00	385.00	385.00	385.00	385.00	385.00	385.00	385.00	385.00	385.00
TOTAL PRICE	2164.51	1908.88	1851.02	1905.14	1757.72	1642.49	1589.18	1880.19	1960.91	2011.40

Notes:

1) (US cents/Lb) to (US $/TM) is 22.0462.

2) (US $/Bushel) to (US $/TM) is 36.7431.

Source: International Financial Statistics, IMF
and author's calculations.

INTERNATIONAL PRICES

(US Dollars per Metric Ton)

PRODUCT	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
RICE										
world price I	143.00	130.33	149.92	296.58	541.50	363.17	254.08	272.42	368.50	334.33
transport	38.88	39.28	39.80	45.17	45.69	46.08	46.61	47.00	49.00	49.00
taxes					158.72	140.93	130.07	131.94	141.75	138.33
TOTAL PRICE					745.91	550.18	430.76	451.36	559.25	521.66
SORGUM										
world price I	55.80	55.70	56.20	93.39	120.95	111.87	105.22	88.52	93.84	108.11
transport	29.70	30.00	30.40	34.50	34.90	35.20	35.60	35.90	37.80	37.80
taxes										
TOTAL PRICE										
COFFEE										
world price E	1143.62	991.86	1109.59	1373.70	1451.52	1442.04	3147.10	5173.58	3589.56	3825.68
transport	148.50	150.00	152.00	172.50	174.50	176.00	178.00	179.50	189.00	189.00
taxes										
TOTAL PRICE										
COTTON										
world price E	637.80	746.93	799.40	1368.85	1435.87	1170.43	1702.85	1572.56	1586.22	1700.64
transport	34.80	35.15	35.62	40.42	40.89	41.24	41.71	42.06	44.28	44.28
taxes	5.97	7.05	7.56	13.15	13.81	11.18	16.45	15.15	15.27	16.40
TOTAL PRICE	597.03	704.74	756.22	1315.28	1381.17	1118.01	1644.70	1515.35	1526.67	1639.96
WHITE CORN I										
world price I	54.38	54.38	52.18	91.12	123.46	111.70	104.72	88.92	94.06	108.02
transport	29.70	30.00	30.40	34.50	34.90	35.20	35.60	35.90	37.80	37.80
taxes					95.84	94.69	94.03	92.48	93.19	94.58
TOTAL PRICE					254.20	241.59	234.35	217.30	225.05	240.40
WHITE CORN E										
world price E	54.38	54.38	52.18	91.12	123.46	111.70	104.72	88.92	94.06	108.02
transport	29.70	30.00	30.40	34.50	34.90	35.20	35.60	35.90	37.80	37.80
taxes					0.88	0.76	0.68	0.52	0.56	0.70
TOTAL PRICE					87.68	75.74	68.44	52.50	55.70	69.52

Notes:

1) (US cents/Lb) to (US $/TM) is 22.0462.

2) (US $/Bushel) to (US $/TM) is 36.7431.

Source: International Financial Statistics, IMF
and author's calculations.

INTERNATIONAL PRICES

(US Dollars per Metric Ton)

PRODUCT	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
RICE										
world price I	433.67	482.83	293.38	276.83	252.25	217.42	210.19	230.26	301.50	320.33
transport	64.00	54.00	47.00	46.00	[illegible]	38.00	36.00	36.00	49.00	49.00
taxes	149.77	153.68	134.04	132.28	143.84	138.31	136.93	139.94	122.68	129.27
TOTAL PRICE	647.44	690.51	474.42	455.11	436.09	393.73	383.12	406.20	473.18	498.60
SORGUM										
world price I	128.86	126.54	108.35	128.42	118.19	102.97	82.41	72.82	98.46	105.94
transport	49.20	41.60	35.90	35.00	30.50	29.40	28.00	28.00	40.00	40.00
taxes										
TOTAL PRICE										
COFFEE										
world price E	3399.52	2823.90	3080.30	2902.16	3178.40	3209.04	4249.18	2475.57	2978.44	2358.06
transport	246.00	208.00	179.50	175.00	152.50	147.00	140.00	140.00	200.00	200.00
taxes										
TOTAL PRICE										
COTTON										
world price E	2066.39	1851.22	1598.57	1854.09	1784.42	1321.01	1056.89	1648.39	1400.37	1674.40
transport	57.64	48.73	42.06	41.00	35.73	34.44	32.80	32.80	46.86	46.86
taxes	19.89	17.84	15.41	17.95	17.31	12.74	10.14	15.99	13.40	16.11
TOTAL PRICE	1988.87	1784.64	1541.10	1795.14	1731.38	1273.83	1013.95	1599.59	1340.11	1611.43
WHITE CORN I										
world price I	117.21	121.99	101.04	126.76	126.76	104.72	81.94	70.55	99.94	103.98
transport	49.20	41.60	35.90	35.00	30.50	29.40	28.00	28.00	40.00	40.00
taxes	96.64	96.36	93.69	96.18	103.59	100.12	96.49	94.78	48.98	50.39
TOTAL PRICE	263.05	259.95	230.63	257.94	260.85	234.24	206.43	193.33	188.92	194.37
WHITE CORN E										
world price E	117.21	121.99	101.04	126.76	126.76	104.72	81.94	70.55	99.94	103.98
transport	49.20	41.60	35.90	35.00	30.50	29.40	28.00	28.00	40.00	40.00
taxes	0.67	0.80	0.64	0.91	0.95	0.75	0.53	0.42	0.59	0.63
TOTAL PRICE	67.34	79.59	64.50	90.85	95.31	74.57	53.41	42.13	59.35	63.35

Notes:

1) (US cents/Lb) to (US $/TM) is 22.0462.

2) (US $/Bushel) to (US $/TM) is 36.7431.

Source: International Financial Statistics, IMF
and author's calculations.

SUGAR RECOVERY RATES

Country	Recovery Rate % of Cane	Latin American ex Argentina
Austrailia	14.00	
Fiji	12.50	
China	11.87	
Japan, 2	11.75	
Malawi	11.64	
Bolivia, 2	11.55	11.55
Ethiopia	11.49	
Swaziland	11.48	
Barbados	11.44	11.44
Cuba	11.38	11.38
USA, Hawaii	11.29	
Argentina, 1	11.26	
Zambia	11.23	
Reunion	11.08	
Colombia	11.07	11.07
Mauritius	11.06	
Japan, 1	11.02	
Dominican Rep.	10.94	10.94
South Africa	10.89	
USA, Florida	10.50	
Peru	10.42	10.42
Madagascar	10.42	
India, south	10.22	
Philippines	10.17	
Argentina, 2	9.90	
Taiwan	9.90	
Nigeria	9.49	
Indonesia	9.47	
Sudan	9.46	
Zaire	9.34	
Bolivia, 1	9.20	9.20
Guadeloupe	9.06	9.06
Tanzania	8.98	
Trinidad	8.97	8.97
USA, Louis	8.70	
Guyana	8.57	8.57
Jamaica	8.55	8.55
Thailand	8.35	
Mexico	8.30	8.30
Brazil	7.94	7.94
Puerto Rico	7.75	7.75
Ivory Coast	7.64	
Average	10.24	9.65

Appendix A5.2: Sugar productivity in various countries

6. Price Ceilings, Domestic Prices and International Prices: An Analysis of Monthly Data.

6. Introduction: Objectives and Methodology

Price controls on agricultural goods have been a feature of Honduran economic policy for approximately 16 years. Recently, several decrees have dramatically reduced the number of goods subject to control. The removal of these controls have been part of an overall thrust to liberalize the Honduran economy. Nonetheless, several important goods remain under price ceilings; while the government has planned the complete elimination of price ceilings, its commitment to this elimination has often wavered.

What would the effect of maintaining current controls be? Who would benefit from their presence? What would be the cost of maintaining current controls? What would be the cost of reimposing old ones? If we want to know about the costs and consequences of maintaining price controls in the future, we have to first understand how price controls were maintained in the past. What are the principal influences on market-clearing prices? How does the government respond when supply or demand conditions -- and hence the market-clearing price -- changes?

These issues are addressed through the analysis of monthly data -- from both Honduras and world markets, over the ten-year period 1980-1990 -- in the current chapter and Chapter 7.

On the basis of this analysis, we conclude that:

Price-ceiling adjustment in Honduras was largely a result of either domestic inflation, movements in international prices, or both;

- Price ceilings induced some unexpected, undesirable behavior by producers of goods;

- While price ceilings may have been relatively easy to maintain during the 1980's -- due to relatively low inflation rates and falling world commodity prices -- they will be much more difficult to maintain in the future.

There are several basic assumptions underlying our work. First, we believe that two of the critical, observable determinants of domestic market-clearing prices are: (i) the general domestic price level; and (ii) the international price of the good itself, a close substitute, or an input. Second, we believe that authorities must respond -- sooner or later -- to shifts in the market-clearing price. Third, we believe that private agents -- producers and consumers -- will undertake strategies designed to circumvent price ceilings.

The analysis is organized as follows. In Section 6.2, some descriptive information about price controls is presented. Which prices were controlled and when? When were price ceilings readjusted or removed? By how much did nominal and real prices of commodities move as a result of these policy actions? In Section 6.3, we examine more closely the linkage between international and domestic prices. For a tradable good with no international transport costs, the market-clearing price of a good should be exactly its international price, and movements in the former should directly reflect movements in the latter. If transport costs

are sufficiently high (relative to the price of the good), the good will be effectively non-traded, and, within some band, its price should be determined exclusively in home markets. As a "benchmark" for the analysis of price controls, we examine the linkages between international and domestic prices for six goods whose price was uncontrolled over the period 1980-1990. In Section 6.4, we examine price-ceiling determination and adjustment. As expected, raising price ceilings is a discrete or "lumpy" process: nominal prices are held fixed over some amount of time and then adjusted upward by some amount. The question is, then, why did the government choose to readjust price ceilings when they did? Not surprisingly, the government faces pressure to raise price ceilings when either the international price of the good rises or inflation rises. This prediction is formalized into a probit model; the model is tested on time-series data for 7 commodities. We find that, while the strength of our conclusions varies across commodities, the qualitative nature of the conclusions is the same for almost all commodities: the government was forced to raise nominal price ceilings when either (i) domestic prices rose or (ii) the relevant international price rose.

6.2. A Descriptive History of Price Ceilings in Honduras

In Honduras, price controls on agricultural goods were first imposed in 1974. As Table 6.1 shows, the list of goods subject to price controls under the initial decree (Decreto # 297) was extensive. Between 1974 and 1984, this list became longer under subsequent decrees. After 1984, however, the number of controlled goods began to decline. The most recent decree (Number 472-89) freed up prices for several critical items. While these remaining items have been

Table 6.1
Summary of Price Controls - Honduras

Legend: "c" indicates controlled price beginning on date of decree.

Decree:	297	502-81	563-84	1017-84	344-86	463-88	472-89
Month, Day	9/9	12/28	7/6	12/28	4/29	12/28	12/26
Year	1974	1981	1984	1984	1986	1988	1989
Item:							
Lard	c	c	c	c	c	c	c
Sugar	c	c	c	c	c	c	c
Eggs	c	c	c	c	c		
Powdered milk		c	c	c	c		
Pasta	c	c	c	c	c		
Salt	c	c	c	c	c		
Margarine	c	c	c	c	c	c	
Beef	c	c	c	c	c		
Pork meat	c	c	c	c	c		
Chicken meat	c	c	c	c	c	c	c
Milk & deriv.	c						
Fluid milk		c	c	c	c		
Bread	c	c	c	c	c		
Tomato paste	c	c	c	c	c	c	
Semolina	c	c	c	c	c		
Wheat flour	c	c	c	c	c	c	c
Animal feeds	c	c	c	c	c	c	c
Oils	c						
Vegetable oil			c	c	c	c	c
Infant food	c		c	c	c		
Coffee	c		c	c	c	c	c
Yeast			c	c	c		
Canned juice			c	c			
Soups (dehyd.)	c		c	c	c		
Meat flour			c	c	c		
Oat meal			c	c	c		
Raw sugar (panela)	c		c				
Fish			c				
Corn flour			c				
Butter			c				
Cheese			c				
Honey			c				
Past. milk				c		c	c
Baking Powder	c						
Corn starch						c	c

slated for decontrol, political resistance to the idea of decontrol remains strong.[1]

For most goods, ceilings were subject to periodic revaluation. Indeed, the price revaluation process appears to be "discontinuous" or "bumpy": the government maintains some nominal price over a period of several months, and then readjusts the nominal price in a step-like fashion. Table 6.2 reports major increases (i.e. greater than or equal to 3%) in the nominal prices of goods whose price was continually controlled since the initial decree. The total percentage increases in nominal prices are also reported. Table 6.3 reports similar information for those goods whose price was at sometime subject to control. If the price of the good rises sharply upon decontrol, this change is noted as well. This table also presents a comparison between the average monthly growth rates of prices (real and nominal) of the controlled periods and the uncontrolled periods. The evidence strongly suggests that price controls were binding: for all goods except vegetable oil, the average growth rate of nominal prices rose to a much greater degree during the uncontrolled period than during the controlled period. Furthermore, in all but three cases -- eggs, margarine, and white bread -- the real price grew less during the control period than during the non-controlled period. [2]

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[1] A good example of such resistance is the August, 1990 nullification of plans to increase the controlled price of fluid milk.

[2] While this is not a terribly surprising finding, it is not trivial either. If it were to be the case that the controlled periods' prices grew more quickly than the non-controlled periods prices, we might conclude that the authority imposed price controls precisely when upward pressure on prices was the greatest.

Table 6.2
Adjustments in Price Ceilings, January 1980-June 1990
Goods Whose Prices Were Always Controlled

Fluid Milk

Jan. 1981	4.2%
Jan. 1982	5.7
Nov. 1985	3.7
Jan. 1987	3.0
Jan. 1989	9.5
Mar. 1989	4.4
Jul. 1989	9.6
Aug. 1989	6.1
Cuumulative Change Jan 1980 - June 1990	56%

Sugar

Jan. 1981	4.5
Jan. 1982	26.1
Oct. 1988	3.2
Jan. 1989	8.9
Cuumulative Change Jan 1980 - June 1990	50%

Chicken

Jan.-Mar. 1981	5.4
Jan. 1986	9.3
Jan. 1989	4.9
Jan. 1990	5.8
Feb. 1990	4.9
Apr. 1990	7.6
Cuumulative Change Jan 1980 - June 1990	70%

Wheat Flour

Jan. 1981	3.1
Jan. 1982	12.0
Sep. 1983	3.6
Jan. 1989	5.8
May 1989	5.8
May - Jul. 1989	11.4
Jan. 1990	4.5
Cuumulative Change Jan 1980 - June 1990	40%

Vegetable Lard

Jan. 1985	4.4
Nov. 1986	3.3
Apr.-Jul. 1989	7.1
Jan. 1990	4.6
Cuumulative Change Jan 1980 - June 1990	21%

Table 6.3
Price Ceiling Revaluations
Goods Not Subject to Continual Controls

Vegetable Oil

		Avg. Monthly Chg. Nom.	Avg. Monthly Chg. Real
Control Period: Jan. 1980-Dec. 1981		.7%	.0004%
Discrete Change: Jan. 1981	9.4%		
Non-Control Period: Jan. 1982-Jun.1984		.3%	-.27%
Control Period: Jul. 1984-Jun. 1990		.10%	-.48%
Discrete Change: Jan. 1985	3.8%		
Cuumulative Change Jan. 1980-June 1990	34.0%		

Coffee

		Avg. Monthly Chg. Nom.	Avg. Monthly Chg. Real
Control Period: Jan. 1980-Dec. 1981		.045%	-.60%
Remark: While ceilings were not readjusted, during this period, prices rose rose 24% during uncontrolled period (Jan. 1982-Jun. 1984)			
Non-Control Period: Jan. 1982-Jun.1984		.82%	.21%
Control Period: Jul. 1984-Jun. 1990		.26%	-.32%
Discrete Change: Feb. 1990	13.7%		
Discrete Change: Mar. 1990	4.5%		
Discrete Change: Apr. 1990	8.5%		
Cuumulative Change Jan. 1980-June 1990	40%		

Table 6.3 (Cont'd.)
Price Ceiling Revaluations
Goods Not Subject to Continual Controls

Powdered Milk

		Avg. Monthly Chg. Nom.	Avg. Monthly Chg. Real
Non-Control Period: Jan 1980-Dec.1981		.90%	.23%
Control Period: Jan. 1982-Dec. 1988		.25%	-.17%
Discrete Change: Jan. 1982	13.7		
Discrete Change: Jun-Aug 1982	4.8		
Discrete Change: Jan. 1984	5.3		
Non-Control Period: Jan 1989-Jun.1990		4.76%	3.46%
Cuumulative Change Jan. 1980-June 1990	124%		

Remark: Price Rose 13.7% upon removal of ceilings in Jan. 1989.

Beef

		Avg. Monthly Chg. Nom.	Avg. Monthly Chg. Real
Control Period: Jan. 1980-May. 1986		.41%	-.13%
Discrete Change: Jan. 1981	6.2%		
Discrete Change: Jan. 1982	10.6%		
Discrete Change: Jan. 1989	5.4%		
Non-Control Period Jun. 1986-Jun. 1990		1.65%	.93%
Cuumulative Change Jan. 1980-June 1990	97%		

Eggs

		Avg. Monthly Chg. Nom.	Avg. Monthly Chg. Real
Control Period: Jan. 1980-May. 1986		.2%	-.35%
Discrete Change: Mar.-Apr. 1980	3.5%		
Discrete Change: Jan. 1981	6.1%		
Discrete Change: Jan. 1983	5.7%		
Non-Control Period Jun. 1986-Jun. 1990		.36%	-.36%
Cuumulative Change Jan. 1980-June 1990	58		

Table 6.3 (Cont'd.)
Price Ceiling Revaluations
Goods Not Subject to Continual Controls

Spaghetti/Pasta		Avg. Monthly Chg. Nom.	Avg. Monthly Chg. Real
Control Period: Jan. 1980-May. 1986		.27%	-.27%
Discrete Change: Mar.-Jul. 1980	14.7%		
Non-Control Period Jun. 1986-Jun. 1990		.74%	.02%
Cuumulative Change Jan. 1980-June 1990	54.0		

Margarine		Avg. Monthly Chg. Nom.	Avg. Monthly Chg. Real
Control Period: Jan. 1980-May. 1988		.45%	-.02%
Discrete Change: Aug. 1980	6.0%		
Discrete Change: Jan. 1981	4.6%		
Discrete Change: Feb.-May. 1982	6.9%		
Discrete Change: Jan. 1984	6.7%		
Discrete Change: Jan. 1985	3.4%		
Non-Control Period Jun. 1986-Jun. 1990		1.04%	-.12%
Cuumulative Change Jan. 1980-June 1990	58		

Remark: Price Rose 5.4% upon removal of ceilings in Jan. 1989

Table 6.3 (Cont'd.)
Price Ceiling Revaluations
Goods Not Subject to Continual Controls

Pork

		Avg. Monthly Chg. Nom.	Real
Control Period: Jan. 1980-Dec. 1988		.42%	-.054%
Discrete Change: Oct. 1980	7.5%		
Discrete Change: Jan. 1981	4.6%		
Discrete Change: Jan. 1982	15.3%		
Non-control Period: Jan. 1989-June 1990		1.34%	.17%
Cuumulative Change Jan. 1980-June 1990	72%		

Remark: Price Rose 5.8% upon removal of ceilings in Jan. 1989.

White Bread

		Avg. Monthly Chg. Nom.	Real
Control Period: Oct. 1980-Dec. 1988		.28%	-.19%
Discrete Change: Jan. 1983	13%		
Non-control Period: Jan. 1989-June 1990		.55%	-.61%
Cuumulative Change Jan. 1980-June 1990	70%		

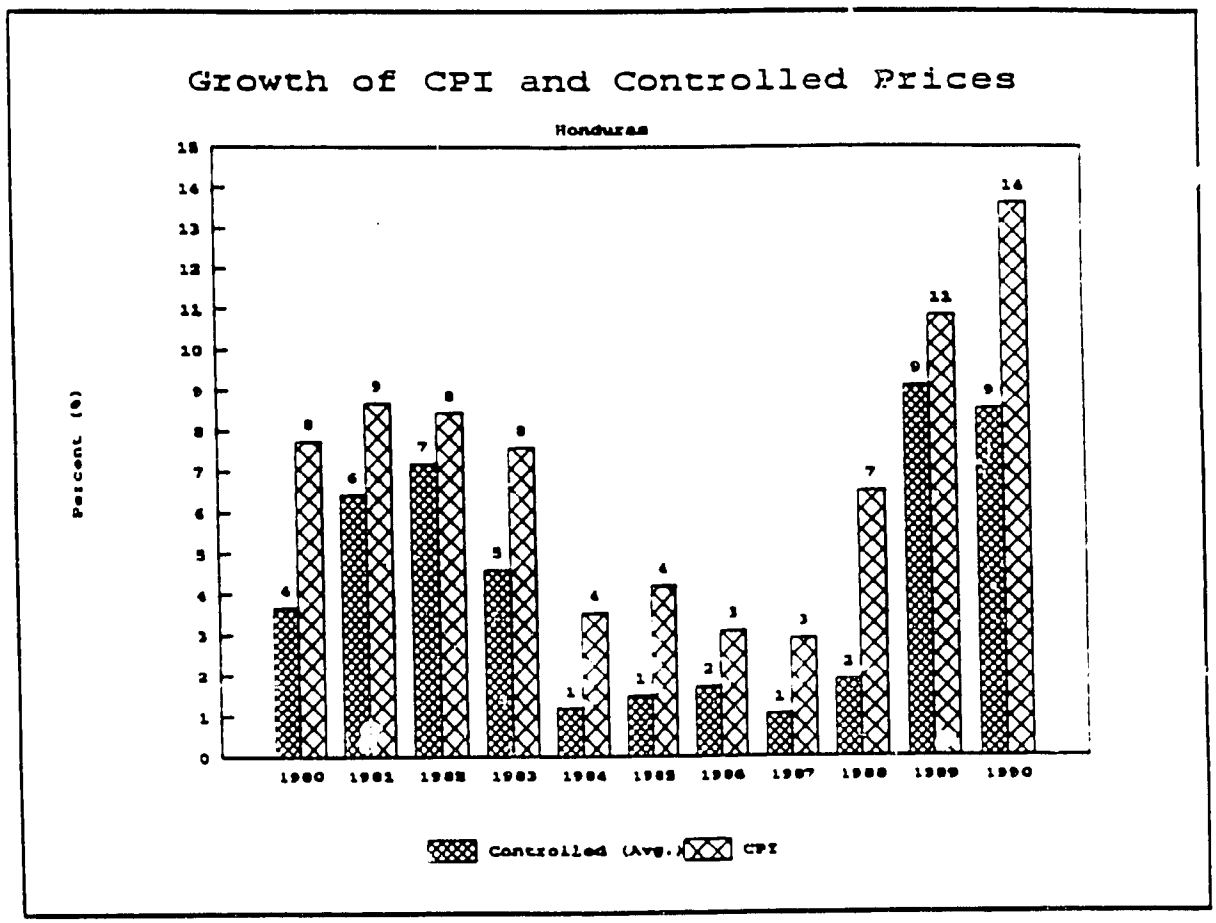
Remark: Price Rose 18.9% upon removal of ceilings in Jan. 1989.

To What Degree Did Changes in Controlled Prices Reflect Domestic Inflation?

Increases in the nominal price of the controlled goods tend to reflect domestic inflation, albeit imperfectly. If inflation rose in any given year over a previous year, so would the (unweighted) average price-ceiling readjustment, but to a smaller degree. Figure 6.1 juxtaposes growth rates of the overall CPI with the average growth rate of all controlled prices. [3] In all years, the average percentage increase in nominal prices is less than the CPI growth rate. Nonetheless, changes in the averages of the controlled goods tend to increase or decrease through time when inflation increases or decreases.

[3] The average is unweighted. In any year, a good is included in the average only if it was subject to controls for the entire year. Thus, the goods included in the average change from year to year.

Figure 6.1
Growth Rates of Honduran CPI and (Unweighted) Average of Controlled Prices
Figure of 1990 is January - June
Source: Banco Central de Honduras



6.3 Linkages between Domestic and International Prices

From a policy standpoint, we wish to know how domestic prices will behave if price ceilings are lifted. Will movements in international prices be transmitted domestically in the short-run? In the long-run? For most agricultural goods, prices are determined in world markets. A small, open economy such as Honduras's, is generally assumed to be a price-taker in world markets. Thus, movements in world prices are important for two reasons:

(i) Movements in international prices should be an important factor in domestic price determination. Thus, if we want to know what will happen to a price if it is decontrolled, a good indicator may be the movements in the international price.

(ii) As well, large deviations between the growth rate, in real terms, of a controlled domestic price and a world price (holding fixed the exchange rate) serve as a rough indicator -- a benchmark -- of how "badly" prices are out of line -- i.e. how great would the deadweight losses be if controls were to remain in place?

The linkages are examined in the following manner. First, we review some simple theory. Second, we empirically examine the linkages between world prices and some uncontrolled domestic agricultural prices. Third, we empirically examine the linkages between world prices and some controlled domestic agricultural prices.

6.3.1 International-Domestic Price Linkages in Theory

Consider a small, open economy such as Honduras. In a world of homogeneous goods, no transport costs, and unchanging government policies, movements in international prices should be perfectly transmitted to domestic prices.

However, under some conditions, movements in international prices may not be transmitted -- at least in the short-term -- to movements in domestic prices. Among these conditions are:

- The presence of a domestic price stabilization scheme in which inventories are accumulated during times of low prices and are decumulated during times of high prices.

- If the country destroys some of the crop during times of low prices.

- If transport costs, relative to the value of the good, are sufficiently high, the good becomes non-traded. In this case, it can be shown that, within some band, prices will be domestically determined.

6.3.2. Some Evidence From Goods Whose Prices Were Not Controlled

As a benchmark for a study of controlled prices, the relationship between domestic prices of five agricultural goods never subject to controls -- corn, rice, potatoes, bananas, and cheese -- and prices of their international counterparts are examined. For each good, the real international price is approximated by the U.S. Dollar price on a major commodity exchange, divided by the U.S. wholesale price index:[4] $p^*_i = P_{\$i}/USWPI$

[4] The wholesale, rather than consumer, price index is utilized as the wholesale price index consists, to a greater degree, of internationally traded goods prices.

Similarly, the real domestic price is computed as the nominal domestic (Lempira) price divided by the Lempira consumer price index:

$$p^D_i = P^D_i/CPI(Lempira)$$

While the length of the data series are not exactly the same for each good, the earliest data point is January, 1980 and the latest is June, 1990.

It is evident that growth rates of U.S. and Honduran prices may, in fact, diverge. Figure 6.2, presents both U.S. and Honduran price growth rates over the entire period. Of the 5 commodities, all but bananas suffered a real decline domestically, while all but cheese suffered a decline in world markets. Thus, not only may domestic and world prices diverge for long periods of time, there is no systematic cross-commodity pattern to this divergence.

Figures 6.3 - 6.7 present the indices (February 1985=100) for both domestic and international prices. Casual inspections suggests that, while some longer swings in international prices are often accompanied by shifts in the same direction of domestic prices, the latter does not seem to follow the shorter-term swings of the former.

Tables 6.4 and 6.5 present a more formal analysis of the prices data. Table 6.4 presents summary statistics: means, variances, and coefficients of variation for domestic and world prices. Table 6.5 presents results from the following regression on the indices of both prices:

$$\Delta \log P_i(domestic) = a_0 + a_1 \, d \log P\ (int)_i$$

Figure 6.2
Comparison of Growth Rates of Domestic Real and World Real Prices
Selected Uncontrolled Commodities

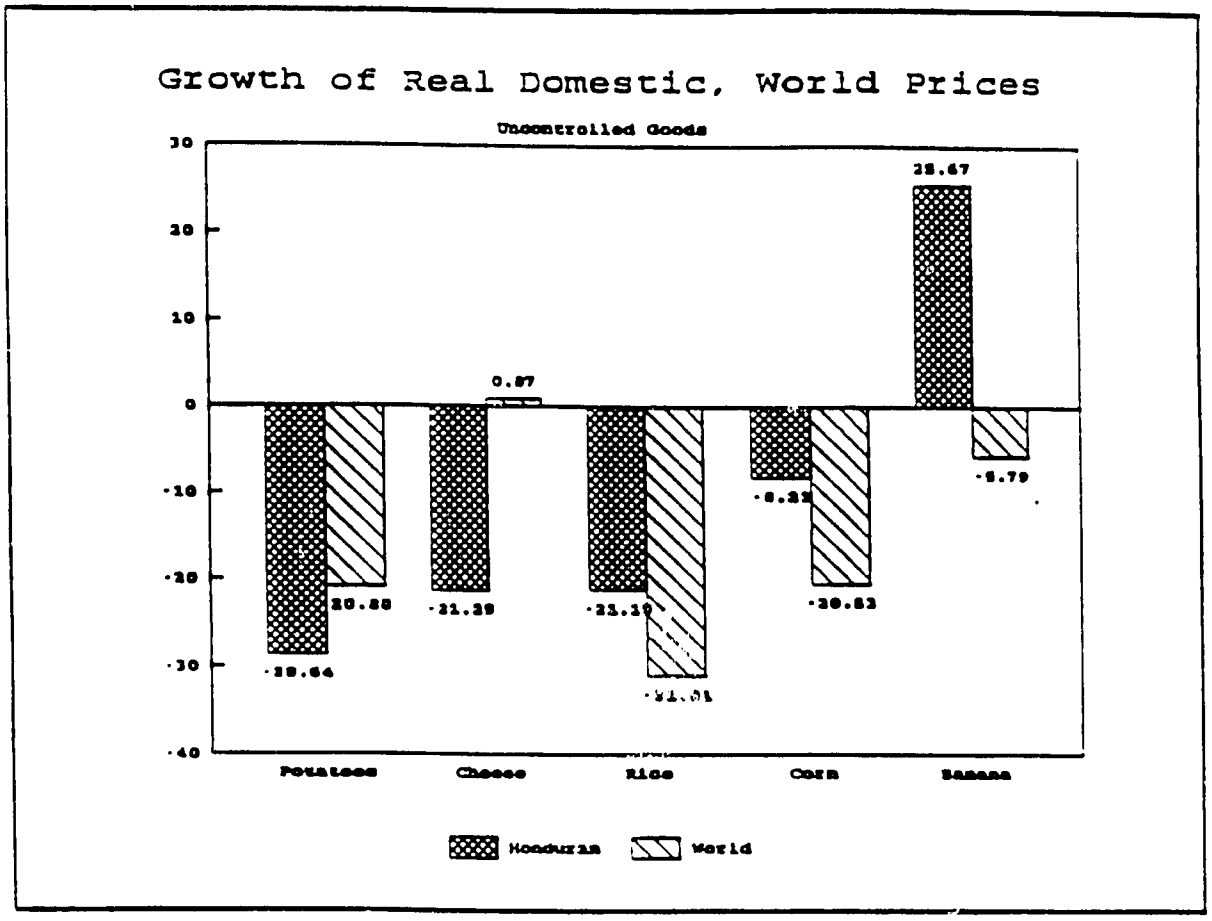


Figure 6.3
World and Domestic Corn Prices

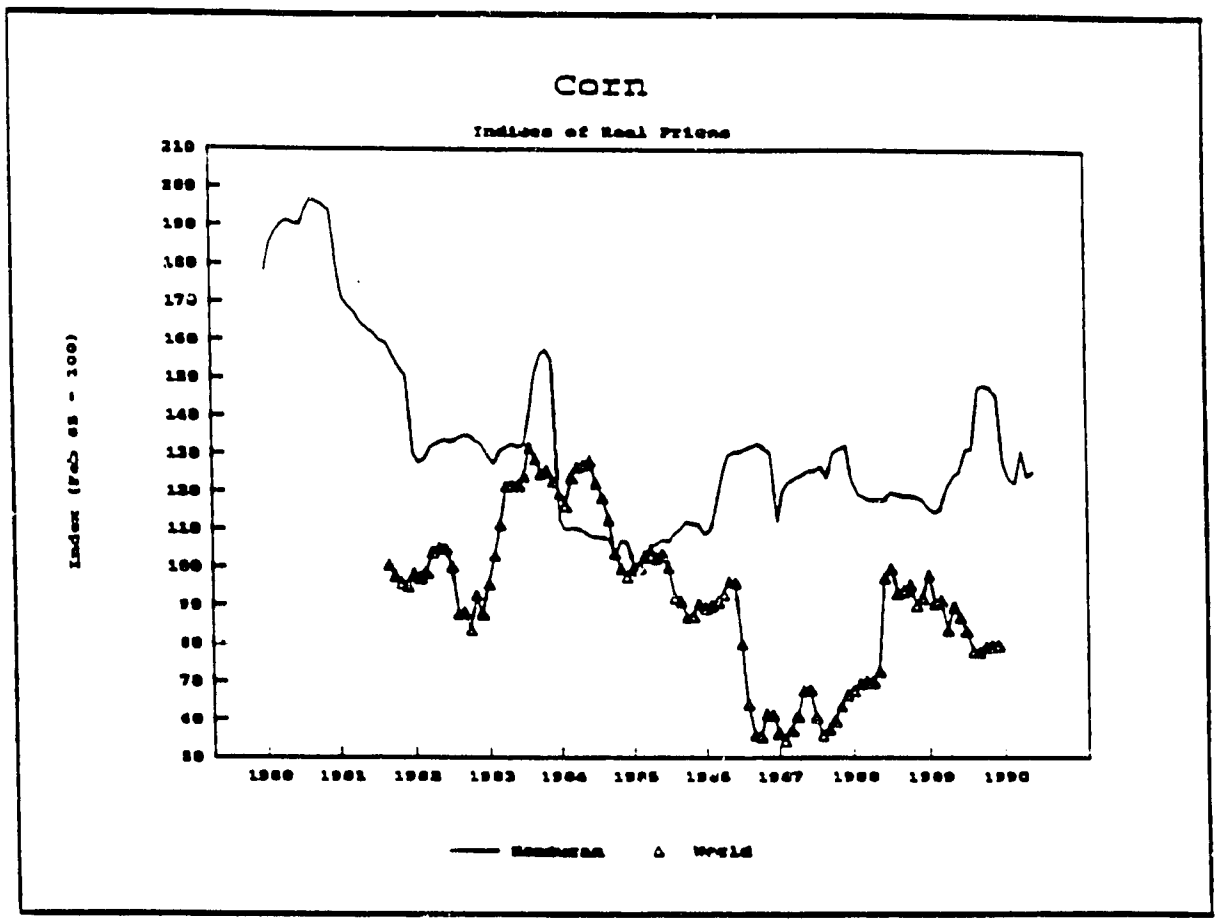


Figure 6.4
World and Domestic Rice Prices

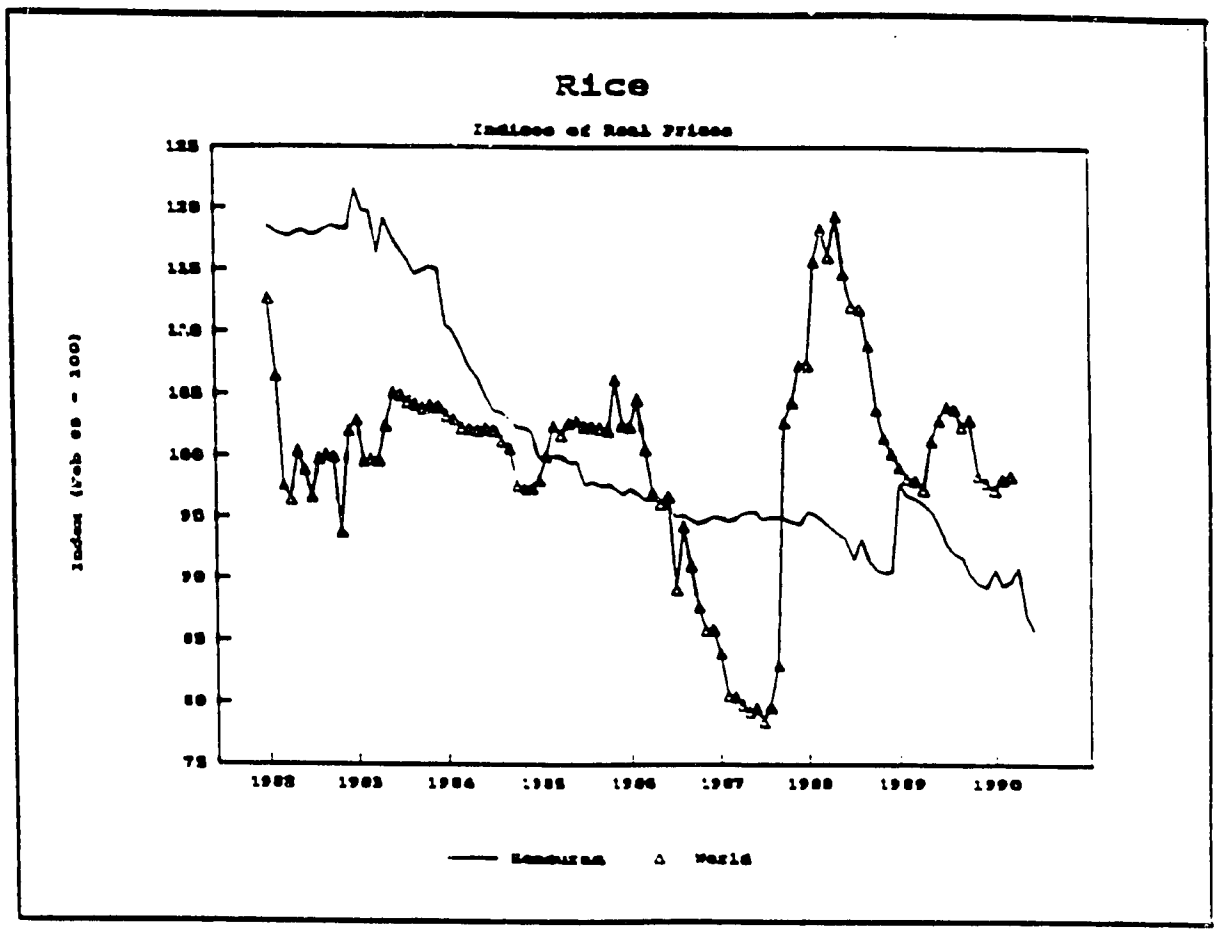


Figure 6.5
World and Domestic Potatoe Prices

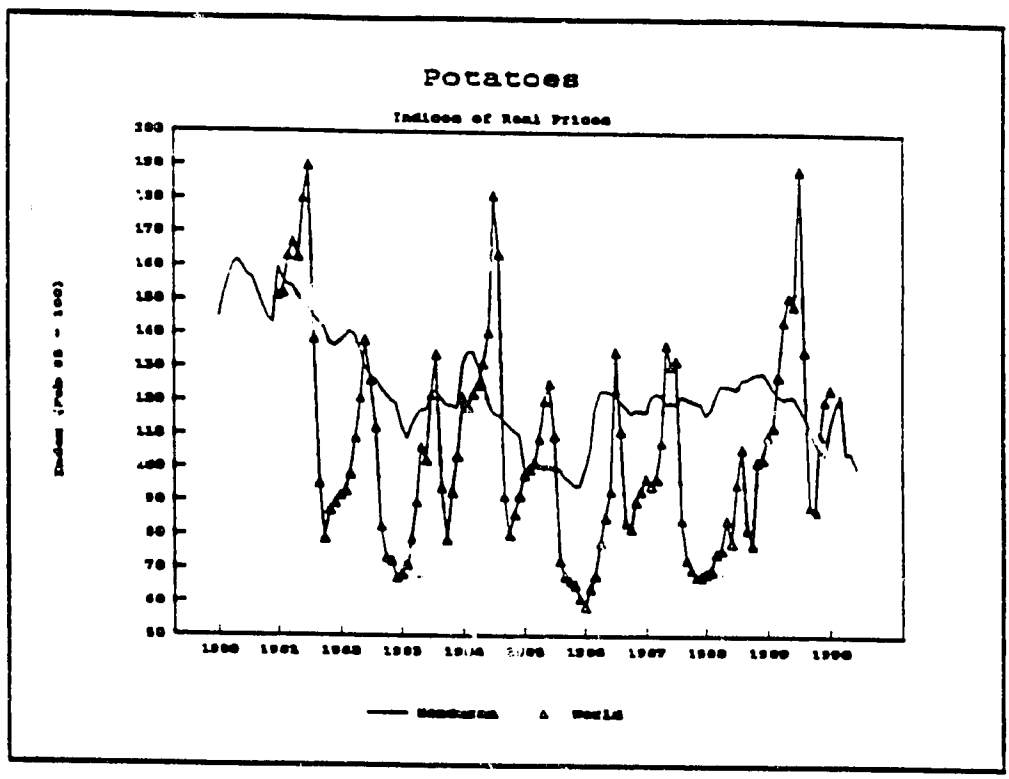


Figure 6.6
World and Domestic Banana Prices

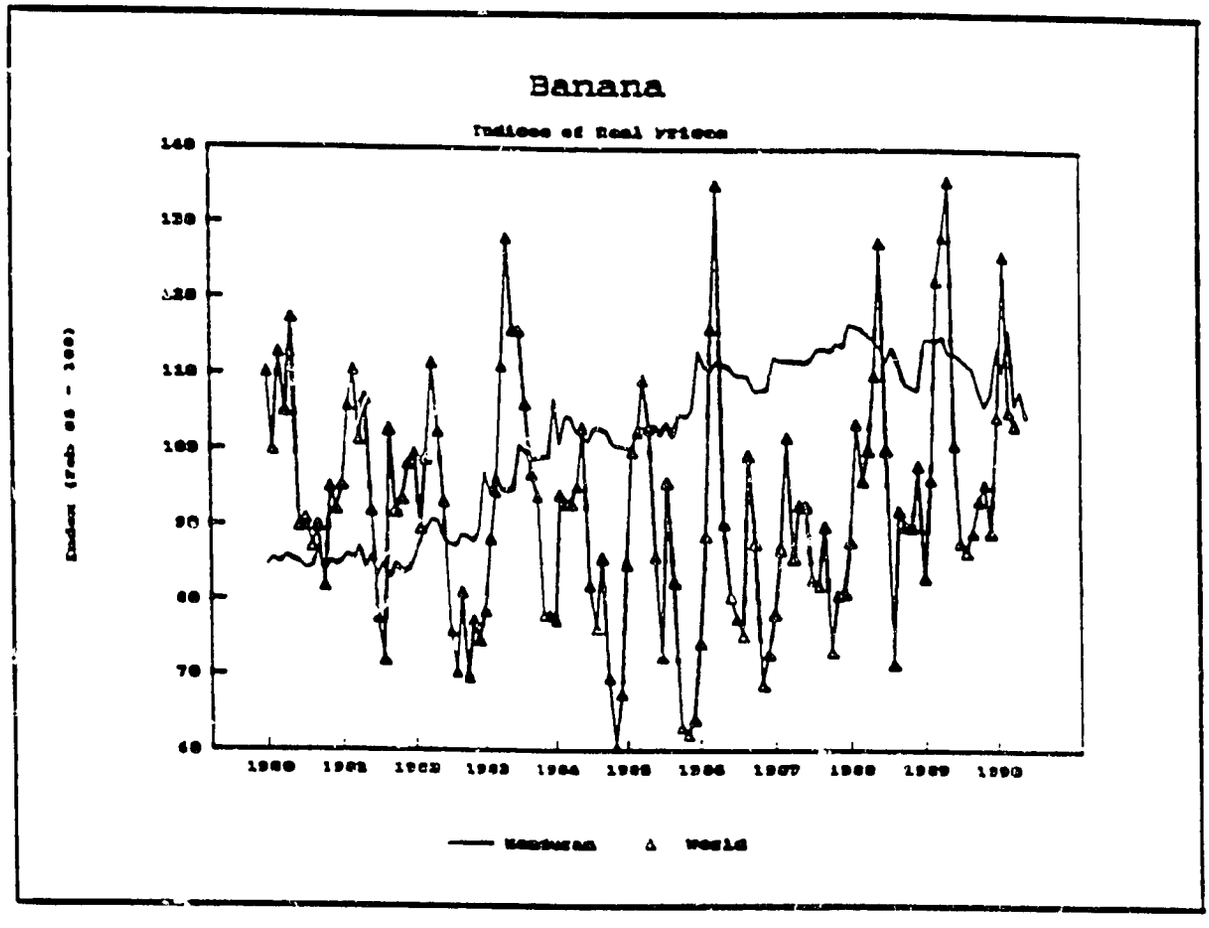


Figure 6.7
World and Domestic Cheeses Prices

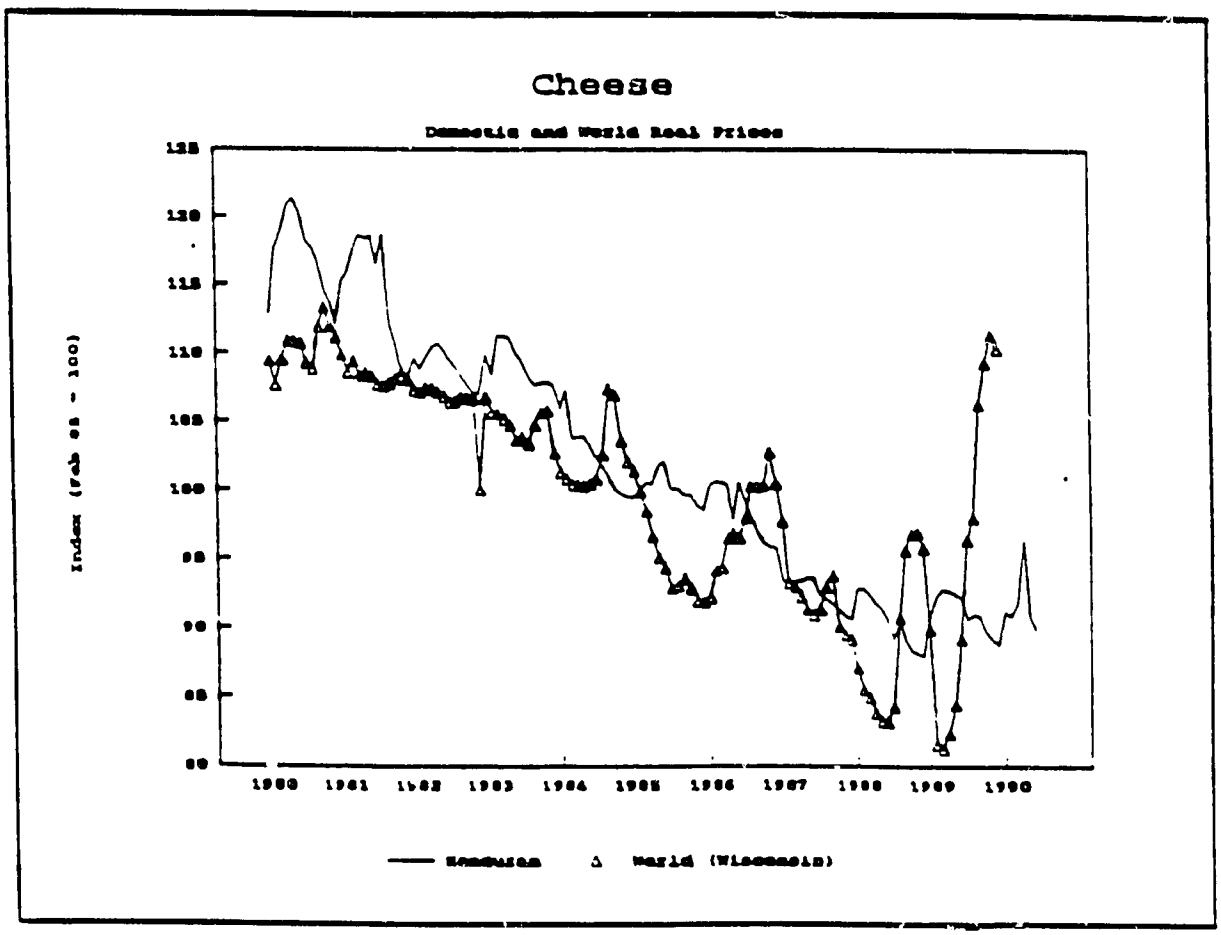


Table 6.4
Summary Statistics, Selected Uncontrolled Prices
Honduras

Commodity	Domestic Price			World Price			Data Span yy:mm-yy:mm
	Mean	Var.	C.V.	Mean	Var	C.V.	
Corn	124.70	201.10	1.61	92.20	415.40	4.51	81:9-89:12
Rice	103.40	91.20	0.88	110.75	602.98	5.44	80:1-90:2
Potatoes	121.62	189.73	1.56	104.50	961.00	9.20	81:1-89:12
Banana	101.30	121.32	1.20	92.86	243.80	2.55	80:1-90:4
Cheese	102.60	90.00	0.88	100.18	68.59	0.68	80:1-89:12

Var.= Variance

C.V. = Coefficient of Variation

Data Source, Domestic Prices: Banco Central de Honduras

Data Sources, International Prices:

1. Corn (Average Cash Price of #2 Yellow Corn at Chicago) U.S.D.A.
2. Rice (U.S. Export Price) I.M.F.
3. Potatoes (Average Cash Price, New York) U.S.D.A.
4. Banana (Export Price, Ecuador) I.M.F.
5. Cheese (Wholesale Price, Wisconsin Assembly Points) U.S.D.A.

Table 6.5
Regression Results: Log Change of Selected Domestic Commodity Prices on International Counterparts
Honduras

$$d \log P_t(dom) = a_0 + a_1 \, d \log P(int)_t$$

	Coefficient Estimates (Standard Errors in Parentheses)			
	a_0	a_1	R^2-adj.	D.W.
Corn	0.0008	0.027	-0.009	1.71
	(0.004)	(0.075)		
Rice	-0.002	-0.023	-0.004	2.15
	(0.001)	(0.036)		
Potatoes	-0.004	0.0207	0.006	1.11
	(0.003)	(0.016)		
Banana	0.0018	0.0083	-0.006	3.01
	(0.026)	(0.015)		
Cheese	-0.002	0.0245	-0.008	2.03
	(0.023)	(0.049)		

For data span, data definitions, and sources, see Table 1.

Once again, movements in the domestic prices of the goods in question do not seem to reflect movements of their international counterparts. The regression results in Table 6.5 are poor for all commodities. Importantly, as Table 6.4 shows, for 3 goods -- corn, rice, potatoes -- international prices are more variable (have a higher coefficient of variation) than their domestic counterparts.

As each commodity is somewhat different, no single explanation of price behavior exists. Thus, each commodity is examined individually.

Basic Grains: Corn and RiceNo discussion of the economics of either corn or rice in Honduras is complete without some reference to the Instituto Hondureno de Mercadeo Agricola (IHMA). One of IHMA's prime responsibilities is the stabilization the price of basic grains - corn and rice, as well as beans and sorghum. (IMHA also retains a monopoly on the importation of wheat.)

The existence of IHMA is a possible explanation for the relatively low variance of corn and rice prices; IHMA seems to have smoothed out transitory movements in world corn and rice prices. For both commodities, the coefficient of variation of the domestic price is less than one-quarter that of its foreign counterpart. However, IHMA seems to have shielded corn producers from longer-run drops in the real world price of corn as well. Over the period 1985-1990, while real world corn prices dropped, domestic real corn prices rose slightly.

Potatoes

While none of the six commodities examined appeared to be closely linked with their foreign price, potatoes provided the best of results of a poor lot. However, over the period 1980-1990, the world and domestic prices had similar

growth rates. As well, the coefficient of variation of domestic potato prices was less than one-ninth that of its international counterpart. There is no airtight explanation for this observation. A possible explanation lies in the fact that potatoes are heavy and costly to transport, relative to their value.

Bananas

The behavior of banana prices are difficult to explain. While over the 1980-1990 period, banana prices fell in international markets, they rose markedly in domestic markets. Domestic prices were also much less volatile, by an approximate factor of 2. This presents a puzzle for several reasons. Bananas are a staple of the Honduran diet; their elasticity of demand is probably quite low, and thus prices should be very sensitive to shifts in a supply curve, domestic or foreign, and hence domestic prices should be more volatile. However, bananas are perishable; there may be two separate banana markets whose prices are rendered largely unrelated through the existence of transport costs.

Cheese

Between 1980 and 1988, the growth rates of world and domestic cheese prices were both negative (-12% and -22%). World cheese prices were also somewhat less volatile than their domestic counterparts. This close relationship is also somewhat surprising, since the domestic cheese (queso blanco) is generally not considered a good substitute by consumers for the typical cheeses found in, say, the United States. The domestic price of cheese may, instead, merely be a reflection of declining world milk prices over the same period.

The close relationship between domestic and world cheese prices appeared to end in 1989 when world prices of cheese (and dairy products in general) rose sharply -- approximately 15% between January of 1989 and June of 1990. Over that period, real domestic prices of cheese increased to a much lesser degree, by about 1%.

Conclusion

The goal of this section was to learn about what might happen to controlled prices if they are de-controlled. In order to understand the answer to this question, we examined some uncontrolled prices as a benchmark. In fact, it was quite hard to generalize from the history of six commodities. While the growth rate of domestic prices cannot deviate from international prices in the long-run, they may do so to a large degree in the short-run. Indeed, some of the world/domestic relationships present a puzzle. Movements in two of the prices -- corn and rice -- appear to have been smoothed by IHMA. IHMA also seems to have attempted to peg corn prices above a sustainable long-run equilibrium. Two prices series, potatoes and bananas -- appear to be much less volatile domestically than abroad. Cheese prices appeared to follow roughly the same growth path as international prices in the long run, but exhibited sharp deviations in the short-run, especially during the 1989-1990 period.

6.4 The Determination of Controlled Prices

In this section, the linkages between international prices, domestic inflation, and controlled goods prices are examined. As Figures 6.8 and 6.9 show, while virtually every good whose nominal price was controlled suffered a real decline domestically, the real international prices of virtually all controlled items exhibited declines over the controlled period, as well. However, when a comparison of different goods is made, the degree to which domestic real price declines corresponded to real international price declines is less clear. As the charts show, while the world prices of most of these commodities tended to fall during the 1980's, visual inspection suggests only an imperfect correspondence between international and domestic price growth rates.[5]

In order to understand movements of controlled prices, one must understand the policy rule which the domestic authority acts by, either explicitly or implicitly. While there is only an imperfect correspondence between international price movements and movements in domestic market-clearing prices, international price movements, as well as domestic inflation, should be taken into account by the domestic authority that sets the price ceilings. The evidence presented in this section suggests that this is indeed the case. We first develop and then estimate a model of price-ceiling determination. We apply this model to explain the determination of price ceilings for several goods in Honduras over the period 1980-1990 : beef, milk (powdered and fluid), chicken, wheat flour, white bread,

[5] Simple regression analysis revealed a positive but insignificant relationship between domestic real price growth and world real price growth.

Figure 6.8
Growth Rates of Domestic and International Prices:
Eggs (Jan/81 - Dec/88), Wheat Flour (May/80 - Apr/90),
Vegetable Oil (Jan/84 - Dec/89), Coffee (Jul/84 - Dec/88),
Pork (Jan/84 - Dec/88), Source: BACH, USDA, IMF

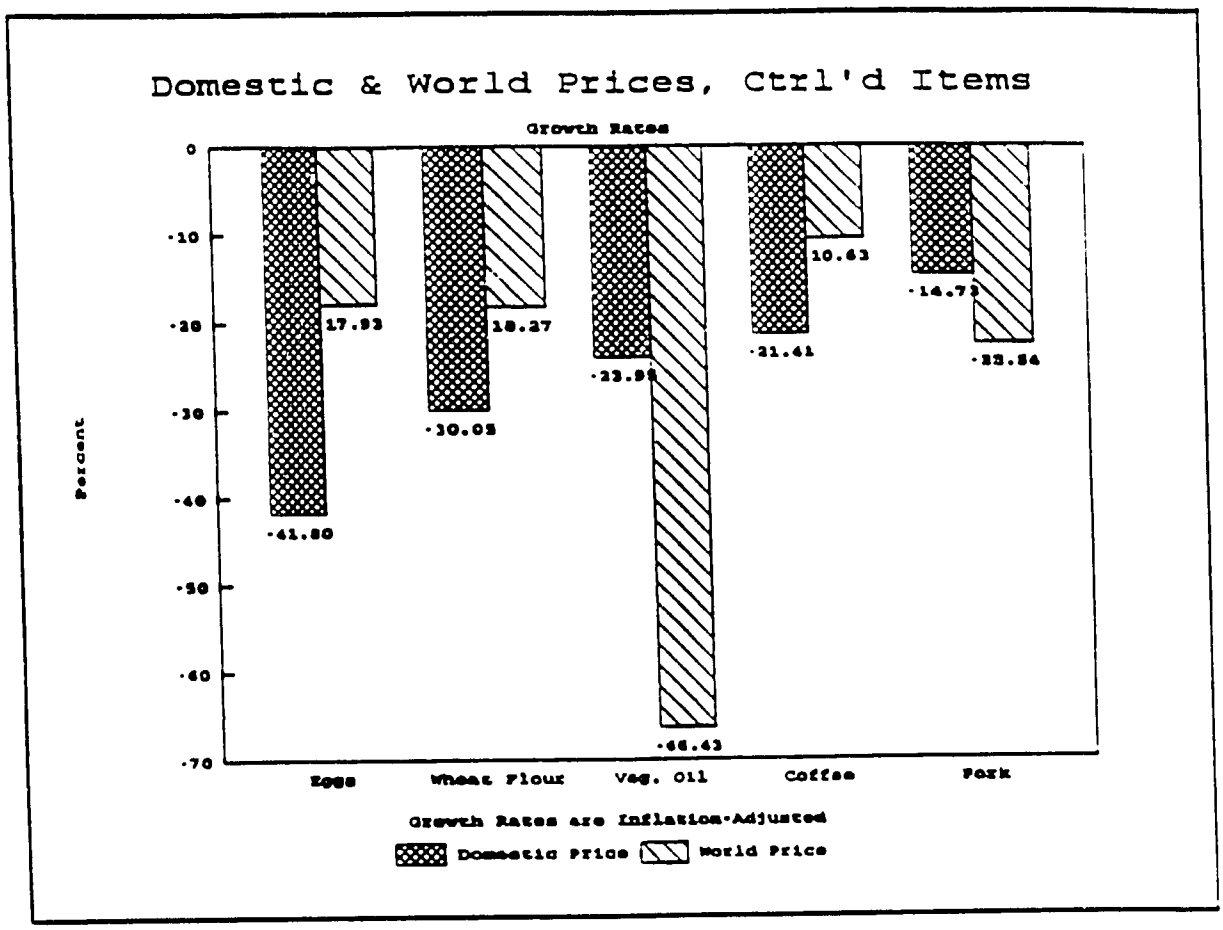
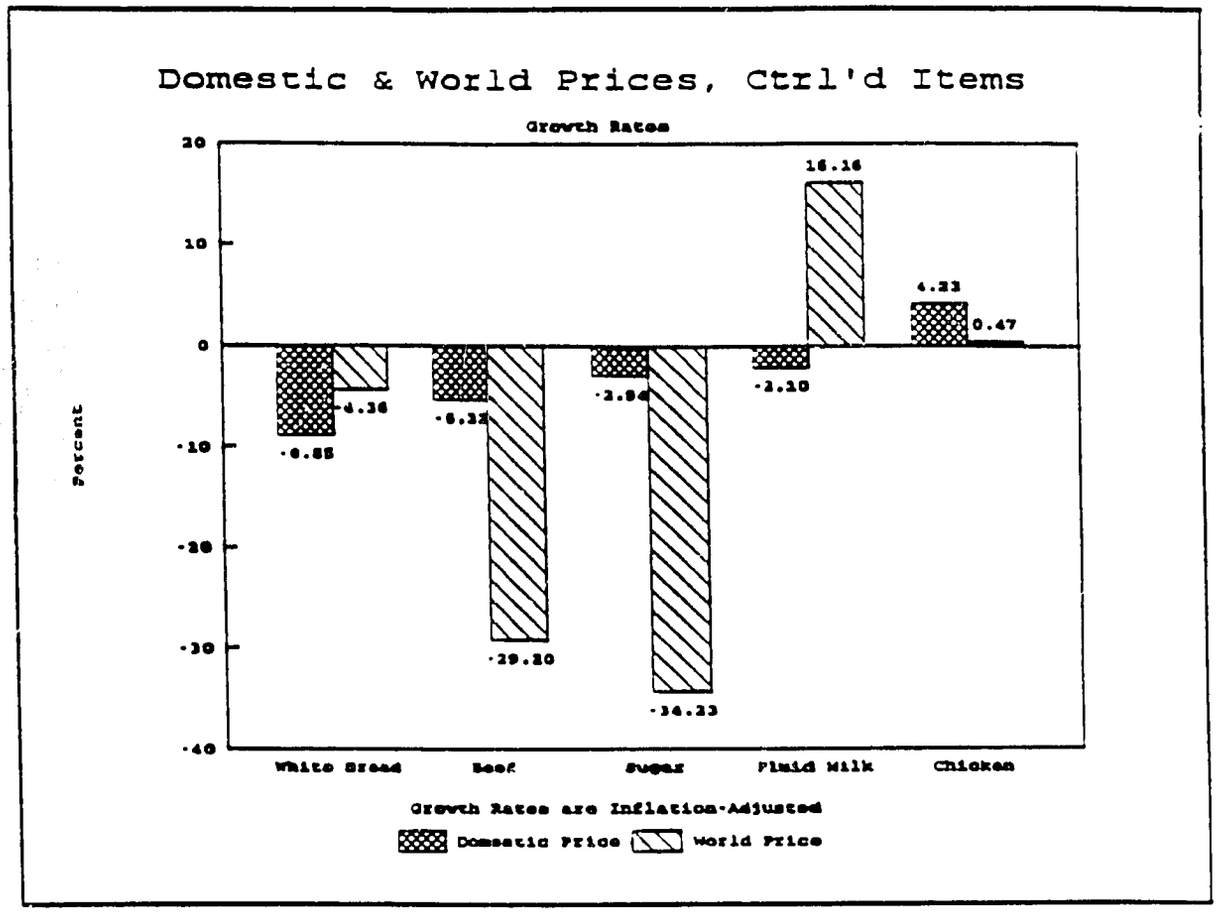


Figure 6.9
Growth Rates of International and Controlled Domestic Prices:
White Bread (May/80 - Dec/88), Beef (Jan/80 - Apr/86),
Sugar (Jan/80 - Apr/90), Fl. Milk (Jan/80 - Jun/90),
Chicken (Jan/83 - Dec/89), Source: BACH, USDA, IMF



and sugar.[6] Quite simply, we formalize what factors the domestic authority must examine -- specifically the deadweight losses accruing to producers and (some) consumers -- when it contemplates an adjustment of a non-binding price ceiling. Additionally, price-ceiling adjustments are "bumpy", taking place at discrete intervals. Thus, we may hypothesize that the explanatory variables must reach some "threshold" level before price ceilings are readjusted. This feature must be accounted for in the empirical estimation.

6.4.1 The Motives of (and Constraints Facing) Policy Makers

In order to model the price ceiling adjustment process, we assume that the government is performing a "balancing act": through price controls, it is attempting to help (i.e. "buy the support") of one group in the economy; it must do so, however, at the expense of other groups in the economy. As these deadweight losses from price controls rise, governments thus face pressure to raise or entirely eliminate price ceilings.

Price ceilings benefit some consumers -- those consumers who are at the "front of the line" for purchasing the good -- at the expense of other consumers

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[6] The list of commodities analyzed is limited by data availability. In order to have sufficient data to be analyzed, the commodity had to (i) be under price controls which were apparently binding for at least 5 years, (ii) appear to have at least 3 episodes in which the price ceiling was adjusted by a non-trivial amount (greater than 1%), and (iii) have a readily available world price for the good itself, an input to the good, or a close substitute

[7] This feature of the data is known technically as a censored distribution.

-- those at the "back of the line". While producers lose, their loss is mitigated if the good in question is exportable to world markets.

As a preliminary benchmark, consider once again a good which is tradable in international markets. As an extreme case, consider a good whose transport costs are zero. In particular, assume initially that it costs producers nothing to have their goods shipped to world markets.

If a good is exportable, for example, domestic producers respond to price controls by diverting their outputs to world markets. Indeed, under our extreme assumptions, domestic consumers are the only losers under price controls: if the controlled price is less than the world price, domestic producers simply supply all of their output to world markets and none to domestic markets.

Price controls on importables, however, are different for several reasons. First, in the case of Honduras, several importables -- most notably wheat and powdered milk, are imported on concessionary terms.[8,9] Nonetheless, for most imported goods, if the domestic price is not high enough to cover costs for importers, consumers lose, while foreign producers lose almost nothing.[10]

Thus, we can summarize the effects of changes in the domestic price level and the own-price of the good on world markets on producers:

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[8] The largest program for such imports is U.S. Public Law 480. Much milk and virtually all wheat imports are covered under this law, which typically provides for concessionary financing. For more detail, see Norton and Benito (1987).

[9] Since these concessionary terms are widely regarded as a donation from the U.S. and Europe, the question arises: "How do we price a gift?"

[10] This, of course, stems from the fact that Honduras is small relative to the world: thus, the share of a foreign producer's goods sold to Honduras is very small.

If the domestic price level rises:

- all domestic producers lose
- some domestic consumers lose, while others gain

If the international price of the good rises:

- all domestic consumers lose
- domestic producers lose nothing if tranport costs are zero.
- the loss for domestic producers rises with transport costs.

6.4.2 An Empirical Model of Price Ceiling Adjustment

Nominal price ceilings are held constant for some period of time until conditions of supply and demand -- i.e. foregone consumer or producer surplus, international prices, etc. -- reach some "threshold" level, at which the price ceiling is readjusted. While it is hard to speculate about what determines this "threshold" level, it is plausible to consider a government which calculates the changes in support due to gains or losses by different groups. Quite simply, then, when the loss in support (from the losers in the price-control scheme) outweighs the gain in support (from the beneficiaries of the price-control scheme), the government raises the price ceiling.

Data limitations and the econometric implications of this model -- as discussed in Appendix I -- make the estimation of an actual price-adjustment value quite difficult. Instead, it is more convenient to think of price-ceiling adjustment as a discrete choice -- i.e. a yes-or-no proposition. Thus, we (econometrically) ask the following question:

"What factors affect the probability that the authority will raise the nominal price ceiling?"

The empirical results were moderately successful. They present evidence that:

(i) Increases in domestic inflation, in the current month and the past four to eight months, greatly increased the probability that a price ceiling would be readjusted, and;

(ii) Increases in the world real price of the same or similar good also increased the probability that a price ceiling would be readjusted.

For each of the commodities, two estimations were performed, one with the current through 4 lags of international prices and inflation and one with the current through 8 lags. Generally, these results are statistically significant; the results tend to be much stronger for the domestic inflation variable than for the international price variable. Nonetheless, the quality of the results vary somewhat across commodities. Thus, it will be useful to discuss each commodity separately.

Wheat Flour and White Bread: Of the commodities examined, the "most successful results" are found for the case of wheat flour and white bread; both the growth rate of the own-price (in this case the world price of wheat flour) and domestic inflation strongly increase the probability of readjustment. For example, a one-percent increase in the growth rate of world prices of wheat over the preceding four months increases the probability of adjustment by approximately 3%. A one-

percent increase in inflation in the past four months increases the probability of readjustment by about 30%. All results are strongly statistically significant.

Beef: The results for beef were of predicted sign. With respect to domestic inflation rates, the results were quite strong, but with respect to the international price, the results were not strong.[11] Because Honduras is an established exporter of beef, and domestic producers can clearly divert products to foreign markets, we should clearly expect changes in international prices to have a strong influence on the probability of readjustment. In fact, while increases in the growth of international prices do, in fact, increase the probability of readjustment, the effects are statistically significant in only a subset of the estimations.

Chicken: The results for chicken were similar those for beef. The domestic inflation variable moved in the right direction, significant in the 8-lag specification. As well, increases in the growth rate of the international price of chicken also increased the probability of a readjustment. However, this effect was not statistically significant. While chicken is not considered to be a major export or import of Honduras, chickens are clearly traded on world markets.

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[11] We examine the behavior of the of the domestic "costilla de res" price While the Honduran CPI includes several cuts of meat, we assume that the prices of these goods move together and the costilla de res price as the "representative" price.

Powdered and Fluid Milk: Much as in the case of beef and chicken, results for both powdered and fluid milk can also be characterized as much stronger for the domestic inflation variable than for the international price variable. The world price of non-fat dry milk is utilized here. It is quite reasonable that this world price is not closely linked to domestic fluid milk prices: since fluid milk is highly perishable (i.e. transport costs are high), it might be, for all intents and purposes, a non-tradable.[12] While the result on powdered milk is still puzzling, it becomes less puzzling when one considers that controls were taken off at the end of 1988, immediately prior to a major upsurge in both world and domestic prices. One may speculate that controls at or near the pre-1989 levels would not have been sustainable since January 1989.

Sugar: The most puzzling result is that for sugar. Sugar is clearly an exportable. Nonetheless, movements in world prices of sugar seemed to have exerted a negative and significant influence on the nominal domestic price ceiling. However, the domestic inflation rate coefficient exhibits the right sign and is significant for the 8-lag model. Thus, the sugar results are puzzling, in that they are suggestive of a government policy which desired to unambiguously decrease consumer welfare. No explanation for this observation is offered here.

[12] Some anecdotal evidence of Honduran dairies shipping their milk over the border to El Salvador, however, contradicts the assertion that fluid milk is a non-tradable good.

6.5. Summary and Conclusions

While there is near unanimity among economists with respect to drawbacks of price ceilings, policy makers often resist calls for their removal. This resistance is most likely not the result of ignorance of basic economics. Rather, while policy makers understand the deadweight losses to producers and some consumers associated with price ceilings, they also understand -- perhaps too well -- the gains which accrue to some consumers.

The purpose of this section is to translate the preceding analysis of price determination and price controls into policy relevant terms. What advice can we add, beyond the basic textbook analysis of price controls? What empirical evidence, specific to the case of Honduras, can we use to guide policy?

There are two important points to be learned:

1. While price controls may have been relatively easy to maintain in the past, they may not as easy to maintain in the future.

As we have seen, nominal price ceilings tend to be responsive -- and ought to be responsive -- to movements in both the domestic rate of inflation and the world price of the good in question. As of August 1990, the annualized rate of inflation was an unprecedented 41%. As well, in the post-1989 period, prices of several goods -- principally dairy products -- have risen sharply in world markets.

2. Decontrolling prices does not mean that all fluctuations in world prices will be transmitted to domestic markets. A concern of policy makers is often price stability, rather than price maintenance per se. While volatile international prices may induce volatile domestic prices, this is not true for all goods. A good example was that of potatoes, a good for which transport costs are high relative to output price and are thus (essentially) non-traded. Furthermore, it may be possible to smooth out international price fluctuations through some sort of "inventory" scheme. It should be stressed that this scheme -- unlike the current operation of IHMA -- should be run on a profit-making basis. It should not be subsidized, and its purpose should not be to artificially maintain a price higher than the long-run equilibrium price.

Appendix: A Formal Econometric Model of Price Ceiling Adjustment

Nominal price ceilings are held constant for some period of time until conditions of supply and demand -- i.e. foregone consumer or producer surplus, international prices, etc. -- reach some "threshold" level, at which the price ceiling is readjusted.

We can quantify this in the following manner. Call Δp^* the optimal price ceiling change -- i.e. that price ceiling change at which the marginal support (i.e. marginal benefits minus marginal costs, in support terms) exactly equals zero. The value of Δp^* is different from zero only if some vector of exogenous variables (i.e. changes in the international price and the domestic price level) Z exceeds some critical value. Thus, we obtain a system of equations. First, we have the "optimal price-ceiling change" equation:

$$\Delta p^* = \gamma Z + \text{error} \qquad \text{(i)}$$

Next, we incorporate the notion of a threshold value of Z. We call the observed change in the price ceiling Δp. The observed change in the price ceiling is equal to the optimal price ceiling if γZ exceeds some critical value γZ^*, but zero otherwise:

$$\Delta p = \Delta p^* \quad \text{if} \quad \gamma Z >= \gamma Z^* \qquad \text{(ii)}$$

$$= 0, \text{ otherwise} \qquad \text{(iii)}$$

The model here is similar to models used in the labor supply literature which estimates labor supply response by positing a minimum reservation wage below which no hours worked are observed.[13]

It is well known that ordinary-least squares estimation of equation (i) yields biased estimates of γ. Instead, one should think first of the <u>probability</u> that $\gamma Z >= \gamma Z^*$. Thus, the proper procedure is to estimate the parameters of the probability distribution function:

$$Pr(\Delta p >= \Delta p^*) = 1 - F(-\gamma Z) \quad \text{(iv)}$$

Equation (iv) can be estimated using standard <u>probit</u> techniques.

While many models were tried for each commodity, two simple formulations appeared to suffice all commodities in question:

<u>Model (i)</u>: The probability of a price change is a function of the <u>sum</u> of current and 4 lags of both the domestic inflation rate in Honduras (π) and the log change in the world prices of the particular commodities (Δ log pwt), plus a constant. That is,

---

[13] Formally, the choice of price-ceiling change (or hours worked) has a <u>truncated</u> distribution. An extended discussion of models similar to the one presented here may be found in Maddala (1983).

$$Pr(\Delta p >= \Delta p^*) = 1 - F(\alpha + \gamma 1 \sum_{t=0}^{4} \Delta \log p^w_t + \gamma 2 \sum_{t=0}^{4} \Delta \log \pi_t) \qquad \text{(iv)}$$

Model (ii): Same as model (i), but with 8 lags rather than 4:

$$Pr(\Delta p >= \Delta p^*) = 1 - F(\alpha + \gamma 1 \sum_{t=0}^{8} \Delta \log p^w_t + \gamma 2 \sum_{t=0}^{8} \Delta \log \pi_t) \qquad \text{(iv)}$$

Overall Results Table 6.6 reports the following results for each of the seven commodities:

- Estimates and standard errors (in parentheses) of each of the coefficients α, $\gamma 1$, and $\gamma 2$

- Chi-squared test statistics and corresponding significance levels of log-likelihood ratio statistics for omission/inclusion of the international own-price growth rate (ρ_1), the domestic inflation rate (ρ_2), and both variables (ρ_{12}).[14]

- The log-likelihood statistic for the entire regression, λ

- The number of observations (N)

In each model, we expect both $\gamma 1$ and $\gamma 2$ to be greater than zero. We expect $\gamma 1$ to be positive and significant if the good in question is a tradable good: a rise in the international price should force the domestic price-control authority to raise its price ceiling as well. As well, unless the control authority desires to target only a specific group of consumers -- those who are at the "front of

[14] That is, if we run an unrestricted regression (in which all variables are included) and a restricted regression, we obtain log-likelihood statistics λ_u and λ_r. The log-likelihood statistic utilized to test the restriction is $2*(\lambda_u - \lambda_r)$. This term is distributed Chi-square, with degrees of freedom equal to the number of restrictions.

Table 6.6[15]
Probit Analysis, Price-Ceiling Readjustment

	α	γ_1	γ_2	ρ_1	ρ_2	ρ_{12}	λ	N
Wheat Flour								
Model (i) 4-lag	-2.24	1.72	28.05	10.23	1.51	11.07	-30.73	115
	(0.38)	(1.38)	(9.30)	(.0013)	(.21)	(.0039)		
Model (ii) 8-lag	-2.62	1.99	21.58	10.50	9.90	20.42	-26.05	111
	(0.50)	(0.92)	(7.21)	(0.001)	(0.002)	(0.00)		
International Price: Wheat, U.S. (Source: IMF)								
White Bread								
Model (i) 4-lag	-1.69	3.62	14.90	5.80	1.30	6.80	-28.5	99
	(0.38)	(1.50)	(13.10)	(.016)	(0.25)	(0.03)		
Model (ii) 8-lag	-1.73	1.51	10.08	1.87	1.17	2.91	-28.2	95
	(0.46)	(1.10)	(9.27)	(0.17)	(0.27)	(0.23)		
International Price: Wheat, U.S. (Source: IMF)								
Beef								
Model (i) 4-lag	-2.80	3.23	27.90	1.08	1.14	1.81	-7.8	65
	(0.38)	(1.50)	(13.10)	(.29)	(0.28)	(0.38)		
Model (ii) 8-lag	-2.62	1.07	14.09	0.19	0.53	0.86	-8.4	65
	(1.15)	(2.43)	(19.20)	(0.65)	(0.46)	(0.64)		
International Price: Beef, U.S. (Source: IMF)								

γ_1 = coefficient on current + lagged (real) international price growth rate (Standard error in parenthesis)
$\eta 2$ = coefficient on current + lagged domestic inflation (Standard error in parenthesis)
ρ_1 = Chi-squared of likliehood-ratio statistic, omission vs. inclusion of international price variable, (significance level in parentheses).
ρ_2 = Chi-squared of likliehood-ratio statistic, omission vs. inclusion of domestic inflation variable, (significance level in parentheses).
ρ_{12} = Chi-squared of likliehood-ratio statistic, omission vs. inclusion of both international real price growth-rate and domestic inflation variable, (significance level in parenthesis).
λ = log-likelihood statistic of regression
N = number of observations

Table 6.6 (Cont'd)

	α	γ_1	γ_2	ρ_1	ρ_2	ρ_{12}	λ	N
<u>Chicken</u>								
Model (i) 4-lag	-2.09	1.96	17.69	1.48	0.85	2.15	-14.4	75
	(0.55)	(1.61)	(19.07)	(.22)	(0.35)	(0.34)		
Model (ii) 8-lag	-3.15	2.05	29.20	1.41	3.44	3.64	-12.4	75
	(0.98)	(1.73)	(15.73)	(0.23)	(0.06)	(0.14)		
<u>Fluid Milk</u>								
Model (i) 4-lag	-1.94	0.82	16.83	0.59	3.27	3.61	-29.8	115
	(0.36)	(1.07)	(9.30)	(.44)	(0.70)	(0.16)		
Model (ii) 8-lag	-1.93	0.91	9.36	0.36	1.75	3.07	-30.1	115
	(0.42)	(1.01)	(7.07)	(0.54)	(0.18)	(0.21)		
International Price: Non-fat Dried Milk, U.S. (Source: USDA)								
<u>Powdered Milk</u>								
Model (i) 4-lag	-2.45	0.28	15.82	0.33	1.42	1.44	-13.2	115
	(0.54)	(1.54)	(13.25)	(.85)	(0.23)	(0.48)		
Model (ii) 8-lag	-2.88	2.22	16.19	0.30	2.70	2.71	-12.4	115
	(0.69)	(4.04)	(9.80)	(0.58)	(0.10)	(0.25)		
International Price: Non-fat Dried Milk, U.S. (Source: USDA)								
<u>Sugar</u>								
Model (i) 4-lag	-1.86	-1.31	14.52	4.99	2.69	7.29	-34.4	115
	(0.35)	(0.58)	(8.93)	(.00)	(0.10)	(0.03)		
Model (ii) 8-lag	-2.31	-1.20	14.99	8.28	4.65	11.64	-31.1	115
	(0.46)	(0.41)	(6.99)	(0.00)	(0.04)	(0.00)		
International Price: Sugar, Carribean. (Source: IMF)								

the line" or whose consumption baskets are heavily concentrated in the good in question -- the inflation rate coefficient ($\gamma 2$) should be positive and significant. The empirical results were moderately successful, in the sense that, with few exceptions, the signs of $\gamma 1$ and $\gamma 2$ were as predicted, and chi-square statistics for omitting these variables ($\rho 1$, $\rho 2$, and $\rho 12$) were often significant at the .05 level or better.

Wheat Flour and White Bread: The "most successful results" are found for the case of wheat flour and white bread; $\gamma 1$ is positive (as predicted) for both goods and both models, and test for exclusion of the own price variables, ρ_1, are significant at the .05 level or greater for the 4-lag model in both goods and for the 8-lag model in the case of wheat flour. As well, estimates of $\gamma 2$ are positive for both goods and models, and tests for omission $\rho 2$ were significant at a level greater than .05 for the 4-lag wheat flour model. Finally, the tests rejecting the joint restriction of $\gamma 1$ and $\gamma 2$ to zero, $\rho 12$, were significant at the .05 level or better in 3 of the 4 cases. Thus, we can conclude that movements in international wheat prices were a key determinant of price ceiling adjustments of both wheat flour and white bread. These adjustments reflected, in turn, the changes in the price paid by IHMA on the world market.

As well, the evidence suggests that movements in the Honduran inflation rate were a determinant of price-ceiling adjustment in these two goods.

Beef. The results for beef were quite plausible.[16] Because Honduras is an established exporter of beef, and domestic producers can clearly divert products to foreign markets, we should clearly expect $\gamma 1$ to be positive. In fact, while Table 6.6 shows that both $\gamma 1$ and $\gamma 2$ were estimated to have the correct signs, and while $\gamma 1$ exhibited a t-statistic greater than 2 for the 4-lag model, none of the exclusion tests $\rho 1$, $\rho 2$, or $\rho 12$ were significant at the critical .05 level. Thus, the results for beef, while in the expected direction, are not very strong.

Chicken. The results for chicken were similar to beef: plausible, but not strong. While chicken is not considered to be a major export or import of Honduras, chickens are clearly traded on world markets. Estimates of $\gamma 1$ and $\gamma 2$ were positive as expected, but only $\rho 2$ was significant at the .05 level or greater for the 8-lag model.

Powdered and Fluid Milk. Results for both powdered and fluid milk can also be characterized as plausible but weak: while estimates of $\gamma 1$ and $\gamma 2$ were positive, in no case was $\rho 1$, $\rho 2$, or $\rho 12$ significant at the critical .05 level. In examination of the t-statistics (i.e. ratios of the γ coefficients to their standard errors), one finds somewhat stronger results for the inflation rate variable than for the non-fat dry milk price variable. A possible explanation exists for fluid milk: since fluid milk is highly perishable (i.e. transport

[16] We examine the behavior of the of the domestic "costilla de res" price. While the Honduran CPI includes several cuts of meat, we assume that the prices of these goods move together and the costilla de res price as the "representative" price.

costs are high), it might be, for all intents and purposes, a non-tradable.[17] While the result on powdered milk is still puzzling, it becomes less puzzling when one considers that controls were taken off at the end of 1988, immediately prior to a major upsurge in both world and domestic prices. One may speculate that controls at or near the pre-1989 levels would not have been sustainable since January 1989.

Sugar The most puzzling result is that for sugar. Sugar is clearly an exportable. Nonetheless, movements in world prices of sugar seemed to have exerted a negative and significant influence on the nominal domestic price ceiling; estimates of $\gamma 1$ are negative, and values of $\rho 1$ exceed the critical values for both 4- and 8- lag models. However, the domestic inflation rate coefficient $\gamma 2$ exhibits the right sign and $\rho 2$ is significant for the 8-lag model.

Thus, the sugar results are puzzling, in that they are suggestive of a government policy which desired to unambiguously decrease consumer welfare. No explanation for this observation is offered here.

[17] Some anecdotal evidence of Honduran dairies shipping their milk over the border to El Salvador, however, contradicts the assertion that fluid milk is a non-tradable good.

7. Switching From Controlled to Uncontrolled Uses: An Example From the Dairy Sector

It is extremely difficult to directly gauge the output effects of price controls in Honduras. Quantity data is available only on a yearly basis, and this data is not of high quality. Thus, so far, this report has had little to say regarding the direct quantity responses of price controls.

In this section, we provide some indirect (but quite strong) evidence of how dairy producers respond to unchanging nominal price ceilings in Honduras. There exists anecdotal evidence that domestic Honduran producers ship their goods to neighboring countries.[18] A more measurable response, however, comes in the diversion of fluid milk to other uses.

Hondurans consume cheese (queso blanco) and cream-like condiment (mantequilla crema). The output price of queso blanco was controlled for a short period during 1984, and the price of mantequilla crema has never been subject to ceilings. Since milk is used in the production of cheese, a simple economic analysis would predict that (i) as the real price of fluid milk falls, more milk will be diverted into cheese production, and (ii) as cheese production increases (i.e. its supply curve shifts to the right), the real price of cheese should fall as well. Thus, the real prices of milk and cheese should be closely linked. Some crude quantity data supports this prediction. Fluid milk used in the production of cheese is recorded as going to "productos artesanales" as opposed to "consumo

[18] This observation was relayed to me in several conversations with Dr. Magdalena Garcia of ADAI.

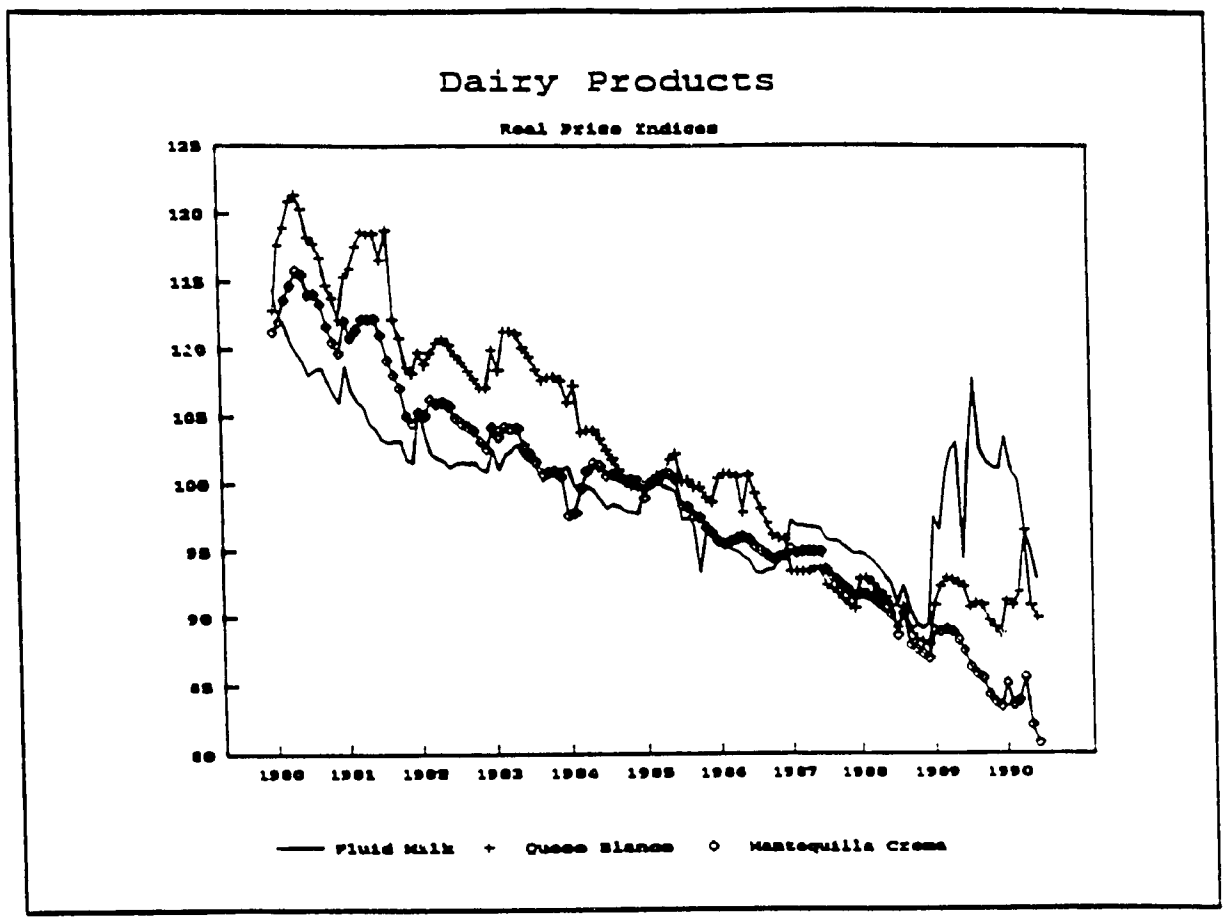
aparente" (apparent consumption). Indeed, evidence suggests, there have been high and rising quantities of fluid milk reported to be used in "productos artesanales" in recent years. Less obvious is the linkage between milk and mantequilla crema. While mantequilla crema requires the cream portion of non-homogenized milk, mantequilla crema may be adulterated with milk. [19] Thus, for mantequilla crema as well, reductions in the real price of milk should be accompanied by rightward shifts in the supply curve of milk, and a decrease in the quality and hence a leftward shift in the demand curve for mantequilla crema; thus the real prices of milk and mantequilla crema should be closely linked.

Visual inspection, as well as formal econometric analysis (detailed in Appendix II) verifies both of these propositions. Figure 7.1, which plots the real prices of fluid milk, queso blanco, and mantequilla cream against time, clearly shows that all three real prices appear to fall together between 1980 and 1989; the price of milk rises after 1989 and the price of cheese appears to follow, albeit to a lesser degree.

The relationship between domestic milk prices, cheese prices, and mantequilla crema prices are formally examined through the use of an econometric model. A number of different specifications were tried, all of which yielded the same result: real milk prices were positively and very significantly related to both queso blanco and mantequilla crema prices. The explanatory power of past and current milk prices was in addition to other factors which might determine either

[19] Dr. Magdalena Garcia suggested to me that such adulteration appeared to be taking place. As well, the author conducted an informal survey of Hondurans, every one of whom reported that mantequilla cream seemed to be getting thinner all the time!

Figure 7.1
Real Price Indices, Dairy Products
Source: BACH



queso blanco or mantequilla crema prices. In order to capture "other factors", the final specification of the model -- which is discussed in detail in Appendix II -- includes past own prices, as well as past and current milk prices. Thus, in the case of queso blanco, the function estimated was:

$$p(\text{queso blanco, current}) = f(\underset{+}{p(\text{queso blanco, past})}, \underset{+}{p(\text{world cheese, past+current})}, \underset{+}{p(\text{milk, past+current})})$$

Here, we expect past prices of queso blanco to be significantly positive, incorporating "other factors" in the queso blanco market. Also, world cheese prices enter positively (but not significantly) into the function. Importantly, past and current milk prices are positive and significant.

Similarly, the function estimated for mantequilla crema was:

$$p(\text{mantequilla crema, current}) = f(\underset{+}{p(\text{mantequilla crema, past})}, \underset{+}{p(\text{milk, past+current})})$$

Here, once again, we expect past prices of mantequilla crema to be significantly positive, incorporating "other factors" in the mantequilla crema market. Once again, past and current milk prices are positive and significant.

Summary

There is nearly universal agreement among economists that one of the important implications of binding price ceilings is that, whenever possible, firms and consumers will attempt to circumvent them. We have found strong

evidence supporting this proposition in dairy markets. Simply put, dairy producers divert milk from a controlled use (i.e. fluid milk for direct consumption) to uncontrolled uses (i.e. queso blanco, mantequilla crema). Evidence for this proposition was found by examining the relationship between prices of the controlled and uncontrolled goods.

Of course, from the standpoint of the economy, such diversion is not costless. The gain to the consumer from diversion to the uncontrolled item does not necessarily cancel out the losses to the consumer for the controlled items. As well, since a real price reduction in the controlled good implies a real price reduction for the uncontrolled good as well, diversion entails a mitigation but not an elimination of the deadweight losses borne by producers.

Appendix: A Formal Model of Price Determination in Dairy Markets

Do milk prices have explanatory power for other dairy product in addition to other factors in market for these products? In order to formally examine this question, we develop a causal price model whose principal building block is the random-walk hypothesis. The random-walk logic is quite simple:

- The current price of a good must reflect information which market agents -- suppliers and demanders -- have about both current and future events. A timely example of this is oil-prices: if people expect a decline in the supply of oil at sometime in the future, the price of oil will rise today.

- Often, then, the best predictor of future prices is the current price. We can express this in an equation:

$$p_t = pt\text{-}1 + error_t \qquad (II.1)$$

The error term in equation (II.1) is on average zero. If, at any particular time, the error term is not zero, it is because something unexpected happened between times t-1 and t.

- Often the mistakes or errors can be captured in other variables. Suppose, for example, that we believe that some other variable, x, helps to predict p_t. We say that it does so because it provides additional information (i.e. it tells us something in addition to pt-1 about the expectations about future events that are formed by market participants). Thus, in order to test the hypothesis that current and lagged values of x help to explain p_t, we run the following regression:

$$p_t = \alpha + \sum_{i=0}^{I} \beta_i p_{t-i} + \sum_{i=0}^{I} \gamma_i x_{t-i} + \text{error}(u)_t \quad \text{(II.2)}$$

In order to test for whether current and past values of x help to explain p_t, we also run a regression <u>omitting</u> all the values of x (i.e. <u>restricting</u> estimates of the γ_i to be <u>zero</u>).

$$p_t = \alpha + \beta\ p_{t-1} + \text{error}(r)_t \qquad \text{(II.3)}$$

Equation (II.2) is called an "unrestricted" regression, while equation (II.3) is called a "restricted" regression. While the former should explain p_t better than the latter, we want to know <u>how much</u> better. We answer this question by comparing the sums of the squared error terms in the former and the latter; a test statistic using the two is computed. If the degree to which the former equation explains p_t better than the latter is statistically significant, we say that "x" causes p_t.[30]

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[30] This terminology is standard: see Sims(1972), and Granger(1969). Formally, the following test statistic is computed:

$$F = [(SSE(r)-SSE(u)/r]/[URSS/(n-k-1)]$$

Where SSE(r) = the sum-of-squared errors from the restricted regression, SSE(u) = the sum-of-squared errors from the unrestricted regression, r= number of restrictions, n=number of observations, and k=number of explanatory variables.

Estimates of The Model: Cheese

For the case of cheese prices, we consider the possibility that both real domestic milk prices and real world cheese prices help explain domestic cheese prices. We use the current and lags 1 through 12 of these prices. Thus, we run the following regression:

$$p(ch)_t = \alpha + \sum_{i=0}^{12} \beta_i p(ch)_{t-i} + \sum_{i=0}^{12} \gamma_{m,i} p(m)_{t-i} + \sum_{i=0}^{12} \gamma_{w,i} p(chw)_{t-i} + \text{error}$$

where p(ch) = the real domestic price of cheese, p(m) = the real domestic price of fluid milk, and p(chw) = the real world price of cheese. The results for this regression, along with the exclusion tests and their significance levels, are reported in Table 7.1. The results are quite clear: while world cheese prices add little explanatory power to current domestic cheese price above and beyond past domestic cheese prices, both current and past domestic prices of fluid milk do add explanatory power. With a confidence of at least 95%, we reject the exclusion of both current and past milk prices.

Estimates of the Model: Mantequilla Crema

The model estimated for mantequilla crema is somewhat simpler, in that we do not include world cheese prices. Instead, we estimate the regression:

Table 7.1
Cheese Price Determination

$$p(ch)_t = \alpha + \sum_{i=0}^{12} \beta_i p(ch)_{t-i} + \sum_{i=0}^{12} \gamma_{m,i} p(m)_{t-i} + \sum_{i=0}^{12} \gamma_{w,i} p(chw)_{t-i} + \text{error}$$

p(ch) = the real domestic price of cheese
p(m) = the real domestic price of fluid milk
p(chw) = the real world price of cheese.

	Version		
Coefficient Estimates	(i) Unrestricted	(ii) $\gamma_m=0$	(iii) $\gamma_w=0$
α	-9.9 (4.98)	0.87 (1.89)	-10.8 (4.12)
$\Sigma\ \beta i$	0.77	0.97	0.87
$\Sigma\ \gamma_{m,i}$	0.18		0.23
$\Sigma\ \gamma_{w,i}$	0.13	0.01	
F-tests, restriction of γ coefficients to zero	γ_m, γ_w	γ_w	γ_m
Current + lags =0	2.04** (0.009)	0.881 (0.574)	3.24** (0.0005)
Current = 0	1.686 (0.192)	0.393 (0.531)	5.75** (0.018)
Lagged = 0	1.77** (0.034)	0.873 (0.575)	2.69** (0.004)
R^2-adj	0.984	0.979	0.986
Degrees of Freedom	69	82	88
Durbin-Watson	2.11	1.95	1.92
Data Span	80:1-90:2	80:1-90:6	80:1-90:2

** indicates rejection of restriction at 95% level or greater.

$$p(mc)_t = \alpha + \sum_{i=0}^{12} \beta_i p(mc)_{t-i} + \sum_{i=0}^{12} \gamma_{m,i} p(m)_{t-i} + \text{error}$$

where all symbols are the same and p(mc) = the real domestic price of mantequilla crema. Table 7.2 shows that the results for mantequilla crema are qualitatively similar to those for cheese: With a confidence of at least 95%, we <u>reject</u> the exclusion of both current and past milk prices.

Table 7.2
Mantequilla Crema Price Determination

Regression:

$$p(mc)_t = \alpha + \sum_{i=0}^{12} \beta_i p(mc)_{t-i} + \sum_{i=0}^{12} \gamma_{m,i} p(m)_{t-i} + \text{error}$$

p(mc) = the real domestic price of mantequilla crema

α	-0.94
(Std. error)	(2.15)
$\Sigma\ \beta i$	0.98
$\Sigma\ \gamma_{m,i}$	0.016
F-Test: current+lags =0	3.25**
	(0.00057)
F-Test: current=0	11.92**
	(0.0009)
F-Test: lagged = 0	3.42**
	(0.0004)
R^2-adj	0.989
Degrees of Freedom	88
Durbin-Watson	1.9
Data Span	80:1-90:6

** indicates rejection of restriction at 95% level or greater.

8. Conclusions and recommendations

8.1 Conclusions

We get several strong results from our analysis. The price control mechanisms in Honduras, both direct and indirect, have resulted in much smoother price paths than the prices for the same goods in the international markets. While this smoothing "protected" the consumers and producers from international shocks, it also prevented the domestic market from allocating the costs generated by weather shocks between the consumers and the producers. The price controls forced the producers to bear the costs of these weather shocks.

There exists a strong relationship between the (controlled) price of wheat flour and the prices of the other three basic grains. The long term decline in the price of wheat flour (effected, in part, by a fixed nominal price in the face of slow but continuing inflation) has driven down the prices of corn, rice, and beans. The GOH has been aided in maintaining the price controls on wheat flour by the concessionary rates it gets from the seller countries, and, particularly, the United States Public Law 480 program.

From analysis of production functions, it appears that the price controls has shifted the gains from technological progress from the producers to the consumers, or at least, from the rural workers to the urban consumers. The declining prices have reduced production of both corn and rice and have substantially reduced the implicit wages in both of these industries.

If international prices had been in effect in Honduras, the price of the

consumed basket of goods would have been higher. While the cost of the sample basket of goods would have risen for the poorer members of the economy, it would have risen considerably more for the richer sectors. It might be claimed that the price controls have aided the rich relatively more than they have helped the urban poor. Measuring the prices using export prices rather than import prices results in smaller increases for consumers of all income brackets and regions, and the very poorest face virtually not increase in costs.

The very poorest of the Honduran population live in rural areas. It is clear that the price controls have not substantially reduced the cost of the agricultural goods they consume and that they have had a very negative effect on the wages that they could have earned.

Analysis of the monthly data, supports the above conclusions. In addition, it points out the difficulties that the GOH has in attempting to maintain nominal price controls in the face of higher domestic inflation and increasing international prices for agricultural goods. The increases in the exchange rate that took place in early 1990 further add to the difficulty in maintaining these controls. Unrealistically set domestic prices result in the rational response of producers to shift, as much as possible, production from goods with controlled prices to goods whose prices are not controlled and in which they can earn normal returns. This is illustrated by our discussion of milk and cheese.

8.2 Recommendations

Increases in the prices of agricultural goods are required to improve the economic situation of the rural population. While it is possible to

increase the controlled prices and pass these increases through to the producers, this method causes the urban consumers to place the blame for the price increases directly on the government in power and especially on the government's price control office. For those goods whose domestic prices are currently near international prices, simply releasing the controls and allowing imports would prevent rapid rises but should eventually result in higher prices for the producers.

It seems unlikely that releasing controls will cause a decline in the domestic price of any of the goods. Even in the case of african palm oil, which is experiencing an unusally low international price, a tariff rate of twenty percent should be able to keep the price at its current level. Since there has been considerable (GOH encouraged) investment in african palm, for reputational reasons, it is reasonable that the GOH continue to protect these producers, at least for some additional years.

The price of wheat flour should be increased and the imports be reduced. While there appears to be considerable demand for wheat flour and its products, much of this is price driven and results from the relatively low price of these goods relative to traditional grains. Reducing wheat imports and raising the price of wheat should result in increased production of the traditional grains and increased income for the Honduran farmer.

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ANNEX

Observations on the System of Price Controls in Honduras

Observations on the System of Price Controls in Honduras

by George T. McCandless Jr.

ABSTRACT

Under its agreements with a number of international organizations, the GOH is committed to reducing the number of items under price controls. Only four of the items included in the previous list of controlled items (the 1988 list) have been released. Remaining under control are seven food products, detergents and laundry soap, petroleum derivatives, cement and rebar, three inputs into shoes, matches, fertilizers, concentrated animal feed, and pharmaceuticals.

Especially with respect to price controls on agricultural goods, the poorest of the Honduran population and subsidizing the relatively better off. Releasing (or at very least, raising) the prices for these goods, should substantially improve the welfare of the rural population and reduce the flow of migrants into the cities. Rather than price controls, it might be better to allow unrestricted imports of many of the controlled items. While it is not necessary that much be imported, the possibility of free imports reduces the oligopoly rents that producers can extract.

If the GOH chooses to keep some goods under price controls, it is probably better to set the prices using rules rather than discression. The current method of setting prices based on cost studies using information supplied by the industry, can fail to incorporate new technologies. Setting domestic prices based on some pricing rule based on the international prices of goods, the Honduran exchange rate, and the price of the good in neighboring countries allows for smoother changes in prices and automatically incorporates changes in international methods of production. Further, it reduces the negative political reactions that arise every time the government announces a new and large price change.

A substantial portion of the paper deals with price controls on specific commodities. The GOH is formulating plans to release many of the goods still controlled, but is resisting actually carrying out the changes. The main reason for the delay seems to be (or at least is articulated to be) the fear of monopoly power on the part of producers. Many goods will not have their prices decontrolled until the GOH determines an alternative to price controls for dealing with the market power of firms.

OBSERVATIONS ON THE SYSTEM OF PRICE CONTROLS IN HONDURAS

by George T. McCandless Jr.

"Only God can set prices." attributed to Mohammad

1. General overview

Under its agreements with USAID, IBRD, and, probably, IDB, the GOH is committed to reducing (with the objective of eliminating) the number of items under price controls. The agreement between the GOH and the government of the United States for Public Law 480 signed on March 29, 1990, specifically calls for the elimination of controls on all food products. To this date, only four of the items included in previous list of controlled items (Acuerdo #463-88) have been released from controls. (The current list of controlled items is found in Acuerdo #472-89.) The four items that were released are margarines, tomato paste, school books, and carpentry nails. Remaining under control under Decreto 91 are seven food products, detergents and laundry soap, petroleum derivatives, cement and rebar, three inputs into shoes, matches, fertilizers, and concentrated animal and chicken feeds (see attached copy of Acuerdo #472-89). By a different law the price of pharmaceuticals are set by the government.

From an economic point of view, price controls can be a very inefficient way to make income transfers to the poorest sectors of the economy. While reduced prices for items in the consumo popular can reduce the cost of these items for the urban poor, at least for agricultural products, they do so at the expense of the rural poor. Price controls are probably irrelevant to the incomes of the very poorest of the rural population, since they are either producing at subsistence level, receiving salary in kind, or using wage income to purchase locally produced products (although reduced prices for agricultural goods result in reduced real wages for workers in agriculture). For rural wage earners and members of the rural poor who have enough land to enter commercial production, price controls on their output is essentially a tax imposed on them to subsidize the consumption of the urban population. Since price controls reduce the price of goods for all members of the economy, they also subsidize consumption of groups that probably should not receive a subsidy, such as the urban middle and upper classes. There is also some evidence that price controls on agricultural products not only reduce exports, but reduce production and encourage imports of agricultural products.

In addition, if prices are set based upon cost studies of local industries, with appropriate markups and profit margins, then the inefficiencies that are already in that industry are allowed to continue and the industries are not forced to modernize or adapt to new technologies. It is not possible to expect the members of the ministry that sets the prices to acquire the knowledge of each industry that firms in the industry would have incentives to acquire. Therefore, there is no way to monitor the development of each industry over time.

From the political side, continuing price controls when the economy is under stress in very costly. In an inflationary environment, the prices of the controlled goods need to be changed fairly frequently. Every time a change

is announced, it provides substantial negative news for the government in power. The negative reactions can be as strong as the riots in Venezuela last year, or at best produces a negative image for the party in power and reduces its chance to win the next election.

If price controls absolutely cannot be avoided for political reasons or for reducing monopoly rents in nontraded goods with single producers, then a flexible way to set the prices is to connect them directly to some international price or a set of international prices. A very specific formula of domestic price in terms of the exchange rate and some collection of foreign prices is probably best. For example, the domestic price of a Swiss made medicine could be some function of the retail price in Switzerland, the free market Swiss franc-Lempira exchange rate, and the price of the medicine in neighboring countries (particularly El Salvador and Guatemala). There is a range between the marginal variable cost of production of a medicine and the monopoly price determined by the local, probably fairly elastic, demand curve for this product. Where in this range the local price is located can be determined by negotiation between the producer and the local government. The result of that negotiation generates the function with respect to the Swiss, El Salvador, and Guatemalan price (in my example) that is to be used in the formula. The price of the good in neighboring countries should be included in the function since too low a domestic price with respect to neighboring countries would generate subsidized exports of the imported medicine. This happened in Venezuela in the 1980's as subsidized fertilizers, medicines, and automobiles were exported, illegally, into Colombia. The GOH might use this kind of pricing formula for petroleum products as well as pharmaceuticals.

For goods traded on international markets, such as wheat flour, or for which close substitutes are traded, such as powdered milk, it is not necessary for the government to set prices. Allowing unrestricted importations of these goods and unrestricted access to foreign exchange to do so will set upper bounds on their prices and make price controls unnecessary.

The requirement that importers have unrestricted access to foreign exchange in order for international prices to serve as a ceiling on domestic prices demands a unified, free market in foreign exchange. Honduras currently has two separate markets for foreign exchange. The official interbank rate and an unofficial parallel market rate. Over the last year, the parallel market has maintained an often large premium over the official rate. One way to form a single market is to allow the Bolsa de Valores to be a trading place for currency. The government would buy the foreign exchange it needs in the Bolsa (or through the banks that trade directly among themselves or trade in the Bolsa). This would generate a central legal market place without the restrictions that the government currently imposes on trades. The prices quoted in the Bolsa would serve as the reference point for all private currency transactions.

2. Product by product observations

The importation of wheat and the implementation of price controls on wheat flour may have been the most damaging (in the long run) of all the price controls. There is considerable controversy on how to resolve this situation. This controversy comes from two aspects of the flour production business. First, most of the wheat is brought into the country under gift or subsidized loan basis. While these imports of wheat are sold domestically at the world price (and for a long time at an undervalued

exchange rate of 2 lps./$), they do not compete in the normal manner for foreign exchange. The real price of wheat flour (the controlled price adjusted for inflation) has declined steadily since 1970, so that the current price is half of that of 1970. Wheat imports have risen steadily over this period. The main effects of the declining price of wheat has been to encourage substitution of imported wheat for domestically produced corn and rice in the local diet. The reduced demand for these products has driven down the real prices of corn and rice in the local market and has reduced production and, as mentioned above, rural wages relative to what would have occurred without the wheat imports. If wheat had to compete with other imports for foreign exchange, there would certainly have been fewer imports of wheat and higher prices (and therefore, incomes) for the producers of domestic grains. In addition, since the GOH counts the sales of wheat as government receipts, there are additional incentives for them to import wheat. Second, there are only four millers in the country, one of which is a substantial producer. There is understandable fear in the GOH that freeing the price of wheat flour would allow these millers to make extraordinary profits. It has been suggested that allowing imports of wheat flour would set an upper bound on the price the millers can charge without the need for price controls. However, wheat flour imports would have to compete for foreign exchange through normal channels while wheat would still be imported under a concessionary basis. It might be possible to use the threat of, or small amounts of, wheat flour imports to keep the margin of the flour miller to a reasonable level. Note: there is an effort underway to grow wheat in Valle del Angeles. Unfortunately, it is hard to imagine that domestic production of wheat can compete in terms of costs with the major wheat producers of the world and that the GOH would be willing to lose the revenues it gets from the wheat imports.

The domestic retail price of coffee continues to be controlled although the producer price responds to the world price. Approximately eight percent of the total coffee crop goes to domestic consumption, the rest is either exported under the ICO coffee quota or is sold to countries that are not members of the agreement (Eastern Europe countries, for example). The world price of coffee varies considerably from year to year and the Honduran producer prices moves with it. However, the controlled consumer price has shown much less variation over the last few years. One result of the slow movement of the controlled price was that in 1986 the domestic consumer price of toasted and ground coffee in lempiras was below the producer price for coffee beans. Not surprisingly, domestic coffee consumption in 1986 was 25% of what it had averaged for the four previous years. The coffee sold at controlled prices is of inferior quality to the exported type. There is domestic sale of high quality coffee in bean (only coffee ground and toasted and sold in bags has its price controlled at 2.8 lps./lb.) at a price more in keeping with world prices (up to 6 lps./lb.).

The GOH is considering removing the controls on the price of sugar. The price of sugar in Nicaragua is much higher than the domestic price and the expected illegal exportation occurs (from both Honduras and Guatemala). There is concern that shortages of sugar could occur. The simplest method for preventing the shortages is to free the sugar price. Freeing the prices would reduce exports and prevent the shortage.

In the chicken market, the fear of monopoly again appears to dominate the thinking of the GOH. There are discussions under way to free the price of chicken meat but not of animal feed concentrates, a major input into the chicken production process. Since the one producer of animal feed

concentrate, Alcon, is also a major domestic producer of chicken meat, the fear is that they will raise the price of feed concentrates and become not only the monopoly producer of feed, but also of chickens. As in the other products, imports of feed concentrates and encouragement of alternative producers seems a better method of controlling the monopoly than does direct price controls.

The African oil palm cooperative, Copalma, is one of the major producers of crude palm oil and, unfortunately, seems not to be a very efficient producer. It has been purchasing fruit at 135 lps. per metric ton while some of the private processors have been able to offer up to 180 lps. per metric ton. The bulk price of crude palm oil (as of Sept. 6, 1990) was 1440 lps. per metric ton and Copalma has been asking for price increases up to 2800 lps. per ton (the private producers have not been asking for increases). There are four producers and distributors of refined palm oil and vegetable lard, all of whom purchase the same raw material. This number of producers seems to be large enough that the oligopoly argument for controls is not strong.

As has been well covered in the local press, the milk producers have been asking for increases in the price they receive for raw milk and the processors have joined them in asking for increases in the retail price. Compared to processing in Costa Rica, the processors in Honduras take a larger margin (up to 75% of farm price in Honduras and 40% of farm price in Costa Rica) for production costs. The GOH views this as evidence of oligopoly rent extraction.

The Ministry of Comercio Interior is now working on plans to eliminate the controls on laundry soap and, potentially, detergents. There seems to be considerable competition in the laundry soap market. There are at least four domestic producers, each with several brands, and there exists considerable nonprice competition in the form of prizes and other promotions. There is only one domestic producer of detergents. However, the domestic detergent maker faces competition from the laundry soap market and from imported detergents, both from the United States and from El Salvador. The local detergent firm is large enough to be able to compete in a uncontrolled domestic market and, possibly, to export to El Salvador. Under these conditions, the market for each of these goods could be decontrolled with little effect.

It is unlikely that petroleum derivatives will have their prices decontrolled in the near future. While importation of refined product is possible, there is only one major distributor in the country (Texaco) and that firm owns and operates the only domestic refinery (which can be considered obsolete). The prices for petroleum products are prime candidates for being determined as a function of the world prices. However, the international spot price of crude is very volatile, so it would be more appropriate to use a function of the last six months' prices of crude to determine the current price of each of the refined products. This would make the domestic price responsive to changes in international conditions, but not overreact to extremely short term movements in the world price.

There are two types of cement used in Honduras. Grey cement is produced domestically by two firms. White cement (used for walls) is imported, mainly from Mexico. Imports of grey cement require prior approval by the government and are generally restricted. Therefore, the grey cement market is completely domestic. The current producer price is fixed at 7.44 Lps.

per 94 lb. sack in San Pedro Sula. In bulk, cement sells for 167.86 Lps. per metric ton (the metric ton price in 94 lb. sacks is 174.13 lps.). The U.S. FOB Gulf Port price is $58.3 a metric ton (as of November 12, 1990). With an official exchange rate of 5.5 Lps./$, that gives an import price (excluding shipping, port charges, and domestic transport) of 320.65 lps., considerably more than the domestic price. Cement marketers in the U.S. indicate that Mexican grey cement is cheaper than the U.S. equivalent, so that Honduras could probably obtain cement at a price somewhat below the one indicated above. Still, the controlled price for cement is currently much below the world price.

Only a fraction of the market for fertilizers operates at controlled prices, and in many years, none at all. All of the fertilizers used in Honduras are imported, a fair amount from Eastern Europe. Both the organization of coffee growers, Ahprocafe, and Banadesa import fertilizers and sell it directly, Ahprocafe to its members, at prices below the controlled price. The banana companies import their own fertilizer, paying for it with their export earnings. The banana companies alone import between 30,000 and 35,000 tons a year of a total market of between 100,000 and 110,000 tons. Ahprocafe uses foreign exchange gained from coffee sales to finance its imports of fertilizer. The largest portion of the private market goes to Fertica and Cadelga, two private firms that are closely related and often make foreign purchases together. The domestic price for fertilizers was generally below the controlled price until 1987 or 88. From July 1987 to August 1988, the Central Bank allocated very little foreign exchange for the importation of fertilizers. Local demand was sufficient to raise the domestic price of the small amount that was imported above the controlled price. During this period, Banadesa distributed the donations of fertilizers that came from Japan and Canada. The majority of fertilizers are imported in bag, with only one firm operating as a bulk handler.

Matches are all produced domestically. Their importation is restricted and essentially prohibited. The Ministry of Comercio Interior is working on a study for eliminating this item from the list of controls. The market price of matches in both El Salvador and Guatemala is below the controlled price in Honduras. This is an item that can be easily dropped from the list of controls. Prices should drop if imports are allowed without heavy taxes. In addition, the domestic producer should be able to match the technologies in El Salvador and Guatemala and should still be able to maintain the major share of the local market.

Three products on the list of controlled goods in Acuerdo #472-89 are used in the production of shoes. Of these, Tacones (heels) and laminas sinteticas (Compolites) have already been eliminated from the list. The Ministry of Comercio Interior is contemplating the removal of controls on pegamento para zapateria (glue), mainly because it represents such a small portion of the cost of shoes and a shortage of this product would be more damaging to the shoe producers than a slightly higher cost. There appear to be no plans to remove skins and hides from the list of controlled goods. Apparently, the Shoemakers Union is quite strong and had managed to get their inputs on the list of controlled prices. Under the 1986 law, both shoe nails and shoe polish were included in the list of controlled goods. These were eliminated in 1988.

3. Recommendations

A good many of the price controls could be released without much strain on

the Honduran economy. There are so few non-agricultural goods with controlled prices that the effects of releasing them and having moderate increases in their prices would be minimal. Releasing the controls on agricultural goods would probably result in increased prices, but doing so should result in increased rural incomes. If freely permitted, imports can set maximum prices for the majority of the goods still controlled. International prices are currently near the domestic price for some of the currently controlled goods, so that releasing them now and allowing imports should mean that the price does not change much in the short run. Of course, if either the exchange rate deteriorated or international prices rise, the domestic price of these goods will rise.

The specter of oligopoly plagues the movement towards decontrol of prices. In my meetings with them, members of the GOH repeatedly returned to the fear of market exploitation by producers with few competitors. In my discussions with the GOH, it was suggested that a profits tax could be imposed on the producers at the same time that the prices are released as a way of preventing them for increasing their prices "too much". Unless the tax is over 100%, a profits tax does not change profit maximizing behavior of a firm. Suppose that a firm maximizes profits (in a world without a profits tax) by making 10,000 units of its good and charging 2 lempiras a unit. If a 50% profits tax were imposed, the exact same level of output and price would still maximize profits, although the amount of profits the firm could keep would be cut in half. Even if this tax were imposed only on profits above some limit, after tax profits are maximized at the same level of output and price that the firm chose with no taxes. This kind of tax simply does not change the firm's behavior and fails to achieve the desired objectives.

As mentioned in the first section, if the GOH chooses to keep some goods under price controls, it is probably better to do so using rules rather than discretion. One such rule could be a formula that sets the domestic price as a function of the exchange rate (or the domestic price level) and some set of foreign prices. It might be useful to use prices from Guatemala, Costa Rica, and, now, Nicaragua as a part of the set of foreign prices, especially since these are the countries that would be the likely sources of or markets for contraband. One of the major weaknesses of the current system of price controls is that price changes are infrequent, and, even though fairly large, have failed to completely compensate for inflation. A rule that could make the price changes in much smaller increments should alleviate some of the political and economic stress caused by the price control system.