COSTS, BENEFITS AND FOOD CONSUMPTION IMPACT OF THE BRAZILIAN WHEAT POLICY

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ABSTRACT

Large government interventions in Brazil's wheat sector in recent years have raised questions with regard to possible negative effects on resource allocation, expenditure on foreign exchange, and the drain on the public budget. The present study was an attempt to identify and to measure the main effects of these policies on welfare, income distribution and trade.

Brazilian wheat policy as the subject of this study is made up of two relatively separate components--production and consumption policies. Both components derive from a number of frequently articulated national goals: self-sufficiency in wheat supply, control of inflation, provision of cheap food for the urban population, and improvement in the distribution of income. In order to implement its policies, the central government has maintained both a monopolistic and a monopsonistic role in the wheat market, thus making it the only seller and buyer of both imported and domestically produced wheat. Moreover, the government has maintained rigid control over prices at the producer, wholesale, and retail levels.

This study has four main objectives: (a) to estimate the aggregate impact of Brazilian wheat policy on the levels of domestic production, consumption and imports; (b) to estimate aggregated subsidy, social, and foreign exchange costs, as well as the social benefits of this policy; (c) to estimate the income distribution effects of the wheat consumption policy for a selected area in Brazil, and to compare them with those of a similar policy for rice; and (d) to evaluate the fiscal cost and cost-effectiveness of three alternative consumption policies for Brazil.

The basic analytical tools used were standard partial equilibrium and comparative static analyses, whenever necessary making use of the concepts of economics surplus. The first part of the analysis was made at a national level. The impact of production and consumption subsidies on the quantities produced, consumed and imported, with and without the interventions were estimated, as were the welfare effects for producers, consumers and for society as a whole, during the period 1966-82.

In the second part of the analysis the disaggregated effects of the consumption policy on the relative and absolute gains for consumers by expenditure class in the metropolitan area of Belo Horizonte and rural areas of the states of Minas Gerais and Espírito Santo were estimated for the year 1974-75. In the last part of the analysis, alternative consumption policies were evaluated, with special emphasis on improvement in the nutritional status of low-income consumers.

Estimates of the effects of the production subsidy or tax on domestic production showed for the period of 1966-82 that, with exceptions of 1973-76 and 1979-81, the changes in production from one year to another were positive and varied according to the magnitudes of the producer and border prices and the autput level of the respective year. The change in production as a percentage of the level of production that would have resulted if world (border) prices had prevailed was never greater than 23.6 percent. Moreover, from 1974 through the end of the period, the producer's subsidy was not sufficient to offset the tax implicit in the overvalued cruzeiro except in two years - 1977 and 1978.

The changes in consumption as a consequence of the consumption subsidy were positive and varied according to the level of consumer

and border prices and the consumption level of the respective year. The largest relative change in consumption was in 1980 when the consumption subsidy was at its highest level or 85.1 percent and the total consumption was at it highest level or 6, 802, 036 MT. Because of this, in 1980 the total observed consumption of wheat grain was 60.9 percent higher than it would have been if there had been no consumption subsidy at all. It should be noted that a major component of the consumption subsidy came from the distortion in the exchange rate.

In total, the wheat production policies for the whole period represented a tax on producers of approximately 7 billion cruzeiros of 1977, which corresponds to 350 million dollars. This was due in part to the rise in the price of wheat in the world market in the mid-and late 1970's, at which time the domestic price set by the government fell short of the border price. In addition, the overaluation of the cruzeiros represented a tax on producers.

The social costs of the producer policies was around 2 billion cruzeiros, or 97 million dollar, and the estimated expenditure on foreign exchange induced by the policies was estimated to be more than 391 million dolars. This latter result was contrary to the stated objectives of the explicit producer policy. Because of these failures, the wheat production policy was unsatisfactory in terms of its stated objectives.

The total cost of the wheat consumption subsidy for the whole period was 122.5 billion cruzeiros, or 6.1 billion dollars. Of this total, by our estimates consumers captured 85 percent or 5.2 billion dollars. However, because of spillover effects (approximately one-third of the total subsidy) manipulations by the millers (another one-third, estimated by Pereira Soares (1980)), and because the social costs amounted to 15 percent of the total costs of the sub-

sidy, only 19 percent of this cost was captured by the true target group. An important conclusion thus is that the wheat consumption subsidy is a poor program in terms of cost-effectiveness. This conclusion is reinforced with the results obtained through the alternative consumption policies analysis in which a general price subsidy for bread was ranked in third place and had a unit cost five times greater than that for a food stamp program.

In terms of foreign exchange expenditure, the wheat subsidy program cost Cr$ 44.3 billion or US$ 2.2 billion dollars, an expenditure not in accord with one of the objectives of the wheat production policy, which was to achieve a saving in foreign exchange. The effects of the production and consumption policies together are the sum of the individual effects of each policy.

From the disaggregated analysis one can conclude that, even though the gains in consumer welfare are slightly biased towards high-income groups, the wheat consumption subsidy contributed to the income redistribution objective by creating a more equal distribution of actual income. When the same subsidy costs for wheat were shifted to rice in a simulated general price subsidy, the result was that the distribution of the gains now were slightly biased toward the low-income groups. However, two main considerations should be made. The first is that even if a cut in the wheat consumption subsidy (or the simulated rice subsidy) harms the low- and medium-income group more, the drop in real expenditure is low (less than 2 percent). Second, the nutritional impact in terms of calories was very low--less than 1.5 percent of the total calorie intake per capita.

Some final conclusions, based on the cases studied, are that the wheat consumption subsidy is not a good policy for redistribut-

ing income, nor is it a good instrument for dealing with malnutrition problems. The alternative policy analysis showed that if consumption of any of the products considered (wheat bread, rice and edible beans) is to be subsidized, the subsidy should be through a target-oriented program such as a food stamp program. The food stamp program is shown to be four to ten times cheaper than a general price subsidy, and two to six times cheaper than a targed-oriented price subsidy.

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INTRODUCTION

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This introduction is divided into two parts. The first part deals with production policy, with emphasis on the reasons of the chosen policy of self-sufficiency. The second part deals with consumption policy, and speculates on the reasons for its particular form. At the end of each of these two parts some questions are raised which should be of interest to policy makers.

Wheat Production Policy

The production side of Brazilian wheat policy has a fairly long history. Wheat was introduced in Brazil in the first quarter of the 16th century by the first settlers. However, there is no indication in the history of Brazilian agriculture that the wheat crop ever at any time developed sufficiently to satisfy domestic demand. Prior to the mid-1930's, because of the absence of a guaranteed market for domestically produced wheat, farmers in the southern states of Brazil (Rio Grande do Sul and Santa Catarina) had little incentive to increase wheat production beyond the amount required to satisfy their own needs. Thus there was little surplus to be marketed. In the mid-1930's the government established a chain of experiment stations to develop production technologies suitable to Brazilian conditions. However, cultivated area and production remained relatively small until 1967 (Table 1), reflecting the high cost of production, poor soils, serious disease problems, difficult climatic conditions, and inadequate scientific and technical support.

Starting in about 1967, cultivated area and production began to increase at a fairly rapid rate, reaching record highs in area in 1979 and in production in 1976 (Table 1). As a whole, however, production has been relatively unstable, primarily because of climatic conditions and diseases, which have made wheat production a relatively risky activity. Since wheat is an off-season (winter) crop in Brazil, it conflicts little with the main in-season (summer) crop, soybeans. The machinery, labor, and some chemical inputs applied to wheat are complementary with soybean production. On the negative side, however, the chronologies of the two crops do not fit perfectly. Soybean production can be reduced around 15 percent, on average, because of the delay in planting while waiting

Table 1 Cultivated Area, Production and Average Yields of Wheat, Brazil, 1962-82

Year	Area (Ha) A	Production (MT) B	Yield (Kg/Ha) B:A
1962	258,221	255,404	989
1963	302,122	97,811	324
1964	300,542	213,691	711
1965	354,680	221,576	625
1966	385,028	298,523	775
1967	561,987	364,870	649
1968	845,693	693,598	820
1969	1,299,518	1,146,319	882
1970	1,861,204	1,734,972	932
1971	2,008,215	2,038,632	1,015
1972	2,340,431	693,399	296
1973	1,604,305	1,934,439	1,206
1974	2,212,643	2,848,040	1,287
1975	3,110,830	1,582,587	509
1976	3,520,709	3,037,864	863
1977	3,020,831	2,012,842	666
1978	2,794,365	2,700,707	966
1979	4,104,144	2,881,186	702
1980	3,318,501	2,702,130	814
1981	2,063,747	2,223,632	1,077
1982	2,960,010	1,802,337	609

Source: Banco do Brasil (1979, 1983).

for the wheat harvest. In the northern part of the states of Paraná, São Paulo, and Mato Grosso, however, the overlap period is in the fall, when the soybean harvest delays wheat planting.

Because of the risks associated with the production of wheat and the penalty to soybean yields when double-cropped with wheat, there is a large annual variation in area planted to wheat as individual farmers adjust their planting to changing conditions. In recent years the area planted to soybena has increased more rapidly than the area planted to wheat as some farmers have opted to plant soybean alone and not risk a potential failure in the wheat crop. After 1972, the area in soybeans increases faster than that in wheat and in 1980, 8.6 million hectares were planted to soybeans while only 3.3 million hectares were planted to wheat.

The few alternatives to wheat in the winter season include pasture, oats, flax and rapeseed. Pasture requires an associated livestock enterprise and is not a viable alternative for all soybean producers. Oats and flax have limited markets. Rapeseed is a new crop being tested at the experiment station level and if viable would have a market similar to soybeans with possible application as a substitute for diesel oil.

Guaranteed producer prices have been used to stimulate domestic production of wheat ever since 1938. In recent years the producer price has been set by the National Supply Council (CONAB) and made public by the National Supply Superintendency (SUNAB) through reports of deliberations known as portarias. The purchase of the domestic production is made by the Bank of Brazil according to rules designed to avoid frauds, such as those which occurred in the past. These frauds gave rise to such concepts as "paper wheat" and "wheat nationalization".

Both kinds of fraud had their roots in a dual price system. Because of the production subsidy built into the guaranteed producer price, the price of domestically produced wheat was above the world free market price, while the price of imported wheat was below the free market price because of the implicit consumption subsidy that resulted from a more favorable exchange rate for wheat imports. the "paper wheat" fraud was of two types. The first consisted of an agreement between miller and producer for a pseudo-purchase of national wheat which gave the miller the right to acquire a corresponding quota of the cheaper imported wheat. The second type appeared after Government Decree Number 40,316 of November 8, 1956, which determined that the price of domestically produced wheat consisted of two parts, one paid by the miller at the moment of purchase from the producer, and the other paid by the Bank of Brazil when the producer presented the receipt of sale. With this system it became only a matter of acquiring a receipt of sale for quantities greater than were actually sold, or even for nonexistent sales, in order to profit.

The "wheat nationalization" fraud consisted of taking the low-priced wheat imported by the miller through the quota system and following it back to the farmer, from where it returned "nationalized" as being produced domestically at a cost of almost twice that of the imported wheat. Thus, in order to profit through either of these frauds it was necessary only to know how to manipulate the bureaucratic mechanisms.

In order to put an end to the frauds described above, the government on November 9, 1962 approved a Resolution which named the Bank of Brazil as the only direct buyer of domestically produced wheat (for details, see Pereira Soares, 1980, and Knight, 1971). As a consequence of the earlier fraud schemes, data on domestic

wheat collected prior to 1962, the date of the government Resolution, are not considered reliable. Since 1962 these frauds have occurred with less frequency.

Self-sufficiency in wheat production has been a policy goal pursued by the government for a long period of time. It has pursued this goal primarily through a producer price policy that guarantees prices above world market prices. In addition, however, considerable resources have been provided for the development of marketing facilitities. These facilities include cooperatives for supplying inputs, the Bank of Brazil for purchasing the output, and CIBRAZEM (the Brazilian Storage Company) for storing and distributing the production to mills throughout the country.

The main arguments used to justify the goal of self-sufficiency can be grouped in three basic categories--economic, political and romantic[1]. The economic category includes three arguments. The first is based on foreign exchange considerations, and argues that wheat imports consume valuable foreign exchange which should be reserved for imports more essential to Brazil's growth[2]. A second argument is that many resources have already been invested in machinery, marketing structures and other kinds of human and physical capital, and that those investments, as well as the people who depend on them, should not be abandoned since the resources involved are not perfectly mobile. The third argument is that foreign countries, including some of Brazil's major suppliers, subsidize wheat production and therefore Brazilian producers must be subsidized if they are to compete with foreign exports.

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[1] These arguments were set forth by Knight (1971).

[2] This has been the basis of much of Brazil's more general import-substituting posture.

In an attempt to evaluate these arguments, Knight (1971) noted that: "It may be considered that the main economic argument is that wheat production should not be rapidly reduced, because this policy would involve a waste of resources already committed to wheat or wheat-soybean production, as well as considerable social costs. No valid economic arguments exist (however) for increasing wheat production further until research and extension have drastically altered the efficiency with which resources can be employed in this activity".

Since it is not possible to justify the self-sufficiency policy followed by the government in terms of short-run economic efficiency, one might go further and think in terms of long-run efficiency along the lines of an "infant industry" argument. On this grounds the expectation would be that increasing production over time would either drive production costs down or give rise to some positive externalities.

Data on the evolution of production costs for wheat over time, however, indicate that they have almost always been equal to the price guaranteed by the government for the respective year[3]. Moreover, the guaranteed price from 1967 through 1982 was almost always above world prices, the exception being 1973-74 and 1980, when world prices were above domestic producer prices because of a large increase in world wheat prices. The infant industry argument, therefore, does not appear to be relevent.

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[3]FECOTRIGO (1983) and the World Bank (1982).

To evaluate the foreign exchange savings argument, one can take as a criterion the domestic resource cost of a one dollar saving in wheat imports. Previous studies have found that coefficient to be 2.20[4], 2.47[4], 2.00[5] and 1.35[6] for 1967, 1968, 1971 and 1967-1977, respectively. This means that it cost at least US$ 1.35 in domestic resources to save one dollar in wheat imports, and in some years it cost significantly more.

These data suggest that the production subsidy has not only driven a wedge between domestic and world prices, but it might also be worsening the foreign exchange situation. That would be the case if the resources were being attracted to the production of wheat at the expense of some other exports that would be socially profitable in terms of generating foreign exchange.

The political arguments favoring domestic wheat production are based on the supposed value of economic autarky. One such argument is that in case of a world war the country might be strongly penalized because of high wheat consumption and the need to depend heavily on imports. A second argument is that countries that supply a large part of these imports might impose economic pressures on Brazil. A third is that there is always the possibility of a large rise in wheat prices in the world market, such as occurred in the mid-1970's, and that paying these prices might create political difficulties at home.

Regarding these political reasons for subsidizing domestic wheat production, Knight (1971) noted that: "It should be remembered, however, in weighing these essentially non-economic arguments,

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[4]Knight (1971).

[5]Mendonça de Barros (1974).

[6]Pereira Soares (1980).

that wheat is not indispensible, and that the production of many low-cost substitutes could be rapidly increased in the event of a future emergency".

The romantic reasons for pursuing the domestic production of wheat are the least important of the three broad sets of arguments set forth above and will not be considered here[7].

Few studies have attempted to evaluate the real and monetary effects of the wheat production policy over time[8]. But because of current high rates of inflation, the government, recently has been forced to cut expenditures in order to balance the budget. As a consequence, questions have been raised about all kinds of subsidies. In the case of wheat subsidies, policy makers would benefit from answers to the following questions: What has been the total treasury cost of the programs? What have been the gains in producers' welfare? What have been the social costs of the subsidies? What have been the savings or losses in foreign exchange? And, what has been the real increase in production due to the subsidies?

The present study will attempt to provide answers to these questions.

Wheat Consumption Policy

The consumption side of Brazilian wheat policy has a more recent history even thogh wheat, in the form of French bread, macaroni and wheat flour, has been a staple in the consumer's food basket ever since colonial days. Only since 1972, however, when an explicit

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[7] For details, see Knight, op.cit.

[8] See Contador (1974), Pereira Soares (1980) and Knight (1971).

systematic general consumption subsidy was instituted, has the per capita consumption of wheat shown a clear tendency to increase (Table 2). This subsidy has been a major factor impending the attainment of self-sufficiency in wheat production, especially after 1972, since it contributed strongly to keeping the ratio of domestic production to consumption low (Table 3). As a result, imports have supplied an average of approximately 70 percent of domestic consumption in the last 17 years (Table 3).

Wheat is the major food item imported in Brazil. Both consumption and imports have had a clear tendency to increase over time, with a peak reached for both values in 1980. The value of wheat imports as a share of total value of imports trended downward prior to 1971, but thereafter it has fluctuated around 3 to 4 percent, in large part because of the consumption subsidy.

According to Carvalho, the main reason for providing an explicit consumption subsidy in the period after 1972 has been to reduce domestic price inflation, and specifically to escape the effects of the increases in the world price of wheat in the mid-1970's[9]. Concern was also expressed about maintaining the nutritional status of low-income groups. The subsidy was instituted in the expectation that the world price of wheat would soon return to the low levels that prevailed before the increase. However, real wheat prices (1967=100) did not return to the old levels of US$ 60 to US$ 70 per MT which prevailed in the late 1960's and early 1970's. Instead, the price of wheat rose to US$ 148 in 1974, went down to US$ 61 and US$ 71 in 1977 and 1978, and rose again to US$ 90 and US$ 81 in 1980 and 1981, respectively.

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[9] Carvalho (1981).

Table 2 Per Capita Consumption in Kg of Wheat, Rice and Beans in Brazil, 1966-1981

Year	Wheat[1]	Rice[2]	Beans[2]
1966	29.2	43.6	23.4
1967	27.9	45.8	27.2
1968	32.3	45.9	24.6
1969	32.0	41.8	21.7
1970	32.6	47.8	21.5
1971	33.6	42.9	25.7
1972	34.5	48.9	24.9
1973	37.9	43.2	20.2
1974	40.0	40.7	19.4
1975	42.1	42.3	19.4
1976	46.9	52.1	15.0
1977	47.5	48.5	19.4
1978	49.9	40.0	17.4
1979	52.5	45.2	-
1980	57.1	47.0	-
1981	50.0	50.4	-

Sources: [1]Data on consumption are taken from Table 3 and on population from Banco Central (1982).

[2]FIBGE (1).

Table 3 Consumption and Imports of Wheat Grain and Selected Ratios, Brazil, 1966-1982

Year	Consumption[1] MT (1,000) A	Imports[2] MT (1,000) B	Relative Shares (B/A)x100	(C/A)x100[3]	(D/E)x100[4]
1966	2,448	2,394	98	8	10.5
1967	2,404	2,446	102	10	10.8
1968	2,884	2,621	91	10	7.6
1969	2,908	2,356	81	20	6.6
1970	3,034	1,969	65	32	4.1
1971	3,209	1,711	53	47	3.3
1972	3,378	1,797	53	56	5.1
1973	3,798	2,946	76	12	4.6
1974	4,116	2,399	58	40	3.3
1975	4,437	2,082	47	56	3.9
1976	5,064	3,426	68	25	3.4
1977	5,252	2,608	50	51	2.5
1978	5,656	4,334	77	27	3.8
1979	6,097	3,651	60	38	3.4
1980	6,802	4,755	70	38	3.7
1981	6,098	4,360	72	38	3.2
1982	6,101	4,144	68	30	3.1

Sources: [1]SUNAB (1983), [2]FIBGE (1), [3]C= ($production_{t-1}$ - $seeds_t$)

[4]D=FOB value of wheat imports obtained from Banco do Brasil (1979, 1983).

[4]E=FOB value of all Brazilian imports obtained from FGV (1).

The impact of consumption subsidies on inflation is not as straighforward as proponents of such subsidies appear to believe. Obviously, in a narrow sense such subsidies can lower the cost of living of particular groups in society. Moreover, wheat products weight heavily in the calculation of the general price index. Hence, on the surface, such subsidies would appear to contribute to reducing measured inflation. However, the government costs of such subsidies contribute to the budget deficit and, consequently, are a general cause of inflation, as has been shown in the case of Egypt (Scobie, 1983) and Pakistan (McCarthy and Taylor, 1980).

Ferreira e Silva (1981) estimated that as of November 1980 a reduction of the consumption subsidy by 25, 50 and 100 percent would have increased the general price index by .57, 1.14 and 2.27 percent, respectively, other thing equal[10]. If one recognizes that during 1980 the inflation rate in Brazil was 110 percent, then it would appear to make little difference, except in a distributional sense, to have an inflation 2.27 percent higher by cutting the entire consumption subsidy. Since the impact on the measured rate of inflation of eliminating the subsidy would not be great, and that it would have a one-time effect, then the question remains, "Why doesn't the government eliminate it?" The answer to this question leads to the other major reason for maintaining the consumption subsidy--that the subsidy is supposedly relevant to lowering the price of wheat products to benefit low-income groups who are heavily dependent on those products.

Few studies have been made of this issue[11]. Those that have

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[10] Discussion of inflation in Brazil usually focuses on the "cost of living" (custo de vida).

[11] See Ferreira e Silva (1980), Carvalho (1981) and Williamson Gray (1982).

been made, however, have suggested that the subsidy has benefited medium-and high-income groups more than low-income groups.

At least two issues of interest arise relative to the consumption subsidy for wheat. First, this subsidy has in fact benefited mostly medium-and-high-income groups in society since those groups (2X - over 28X, Table 4) consume more of three major wheat products than the low-income groups (X - 2X, Table 4). Moreover, on a regional basis, the poorer northeast, north and center-west regions have benefited less from the subsidy when compared with the more developed south and southeast regions (Table 5). this is because the former regions have lower per capita consumption than do the southern regions, even though per capita consuption has increased substantially in the poorer regions since 1972.

Despite the bias of the subsidy in favor of medium-and-high-income groups, it is important to note that low-income families spend a larger share of their budget on wheat products (5-6 percent) than do medium-and high-income families (around 1 percent). Thus, in a relative sense a price increase for these products would have a larger relative impact on low-income families. This would occur in a situation in which around 72 percent of the economically active population receives only 25 percent of all incomes[12].

A second issue is that the consumption subsidy has distorted the relative prices between wheat products and rice, beans, corn flour and cassava flour, making wheat products relatively cheaper (Table 6) and stimulating their consumption (Table 4). As a consequence, the producers of rice, beans, corn and cassava, who are usually poor small farmers, have suffered discrimination as a consequence of the wheat subsidies.

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[12] Carvalho, op. cit.

Tabble 4 Per Capita Consumption of Wheat (G/person/day) According to Level of Expenditure, Brazil, 1974-1975

Citty		Ave.	X[1]	1-2X	2-4X	4-8X	8-12X	12-20X	20-28X	Over28X
Rio de Janeiro	B[2]	80	45	67	83	91	91	81	77	73
	M[2]	19	22	21	19	19	16	12	12	16
	F[2]	4	1	2	3	6	7	8	13	10
Sao Paulo	B	73	32	60	74	78	83	81	72	62
	M	18	13	14	17	19	24	19	19	18
	F	6	2	3	4	6	9	13	12	16
Porto Alegre	B	102	67	90	102	111	104	111	93	101
	M	15	11	13	16	15	15	10	10	18
	F	28	38	35	34	23	18	13	19	13
Distrito Federal	B	73	28	52	70	81	87	91	89	84
	M	13	4	9	13	15	15	15	10	13
	F	4	0	1	2	4	6	9	7	13
Belem	B	101	69	86	104	121	110	116	109	116
	M	11	3	7	12	16	16	14	13	16
	F	2	0	1	1	3	4	3	6	5

Source: Carvalho (1981).

Notes: [1]X = 1.22 minimum salary per family monthly

[2]B = Bread; F = Wheat flour, M = Macaroni

Table 5 Total and Per Capita Consumption of Wheat per Regions Within Brazil, 1972-81

Region	Total Consumption 1/ MT/year 1972	1981	% Change	Per Capita Consumption Kg/year 1972	1981	% Change
Northeast	654,273 (19.0)	1,302,833 (20.7)	99	22.0	37.5	70
Southeast	1,992,703 (57.7)	3,368,399 (53.5)	69	49.4	71.9	46
South	667,594 (19.4)	1,312,557 (20.8)	97	40.0	69.1	73
North	80,727 (2.3)	183,508 (2.9)	127	22.1	30.8	39
Center-West	54,703 (1.6)	132,703 (2.1)	143	10.6	17.6	66
Brazil	3,450,000 (100.0)	6,300,000 (100.0)	83	35.0	55.3	58

Source: Carvalho (1981).

Note: 1/ Figures in brackets represeent percent of column total (last line).

Table 6 Price of Wheat Flour Relative to Prices of Rice, Beans, Cassava Flour and Corn Flour, Retail Level, Brazil, 1966-1982.

Year	$\frac{Pwf}{Pr}$[1]	$\frac{Pwf}{Pb}$[1]	$\frac{Pwf}{Pcf}$[1]	$\frac{Pwf}{Pcof}$[1]
1966	0.88	0.83	2.00	-
1967	0.69	1.20	1.69	1.85
1968	1.00	1.26	1.93	2.20
1969	1.04	0.73	2.06	2.05
1970	1.17	0.85	1.85	1.85
1971	0.99	0.87	1.45	1.83
1972	0.82	0.88	1.35	1.65
1973	0.90	0.42	1.49	1.59
1974	0.73	0.63	1.40	1.42
1975	0.52	0.53	0.94	0.98[2]
1976	0.50	0.20	0.50	0.83[2]
1977	0.60	0.26	0.65	1.06[2]
1978	0.46	0.38	0.75	0.85[2]
1979	0.35	0.22	0.60	0.75[2]
1980	0.28	0.13	0.43	0.62[2]
1981	0.49[2]	0.21[2]	0.53[3]	0.92[2]
1982	0.36[2]	0.36[2]	0.73[2]	1.40[2]

Source: FIBGE (1)

Notes: [1]P= price; wf = wheat flour; r = rice; b = beans; cf - cassava flour; cof = corn flour.

[2]Average for the city of Sao Paulo - SP.

[3]Average for the city of Fortaleza - CE.

To our knowledge there have been no previous studies of these two important issues that have attempted to estimate the treasury, social and foreign exchange costs, or the consumers' benefits, of the consumption subsidy for wheat, or their relative incidence among income groups. Only one study has attempted to evaluate the alternative products to which the wheat subsidy could be changed in order to diminish the spillover effect[13]. That study did not address the issues listed above.

The government has been urged to phase out these subsidies, especially in light of the drain on the budget. However, given economic, social and political considerations, it has been difficult to do this. In 1980, the government initiated a plan to remove the consumption subsidy gradually, but at the time of this writing it is still high. Moreover, with current high rates of unemployment, and with the economy in disarray, policy makers could benefit from information on both the real and monetary effects of the subsidies, and on possible lower-cost alternatives to help low-income groups other than the wheat consumption subsidy now used.

The remainder of this study is organized in three main parts. The first part lays out the analytical framework, the second part presents and discusses the results, and finally, the last part presents the main conclusions and makes suggestions for future research.

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[13] Williamson Gray, (1982).

ANALYTICAL FRAMEWORK

This section is divided into three parts. Each section presents a model used to carry out the analysis required to reach the objectives of this study.

A Model for the Aggregate of Analysis

Price policy for the Brazilian wheat sector is implemented by means of a multiple price system. The price for the producer is set by the government, generally at levels above world market prices or the price at which the wheat can be imported. The difference between these two prices constitutes the producer subsidy.

The consumer price is the price at which the government sells the wheat to millers. This price has, in general, been below the world price. The difference between these prices is the consumption subsidy.

Graphically, this multiple price system can be presented as in Figure 1, in which SS, DD and WW are the domestic supply, domestic demand and world (export) supply of wheat to Brazil, respectively. The world (export) supply to Brazil is assumed to be perfectly elastic, which means that Brazil is assumed to be a price taker in world markets. This is a plausible assumption since Brazil is a relatively small buyer in world markets, taking an average of only 3.6 percent of total world exports[14].

Standard partial equilibrium and comparative statis analysis which makes use of the concepts of economic surplus will be used as the basic analytical tool for the study. Since the literature on

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[14]Portela de Lima Fernandes (1983).

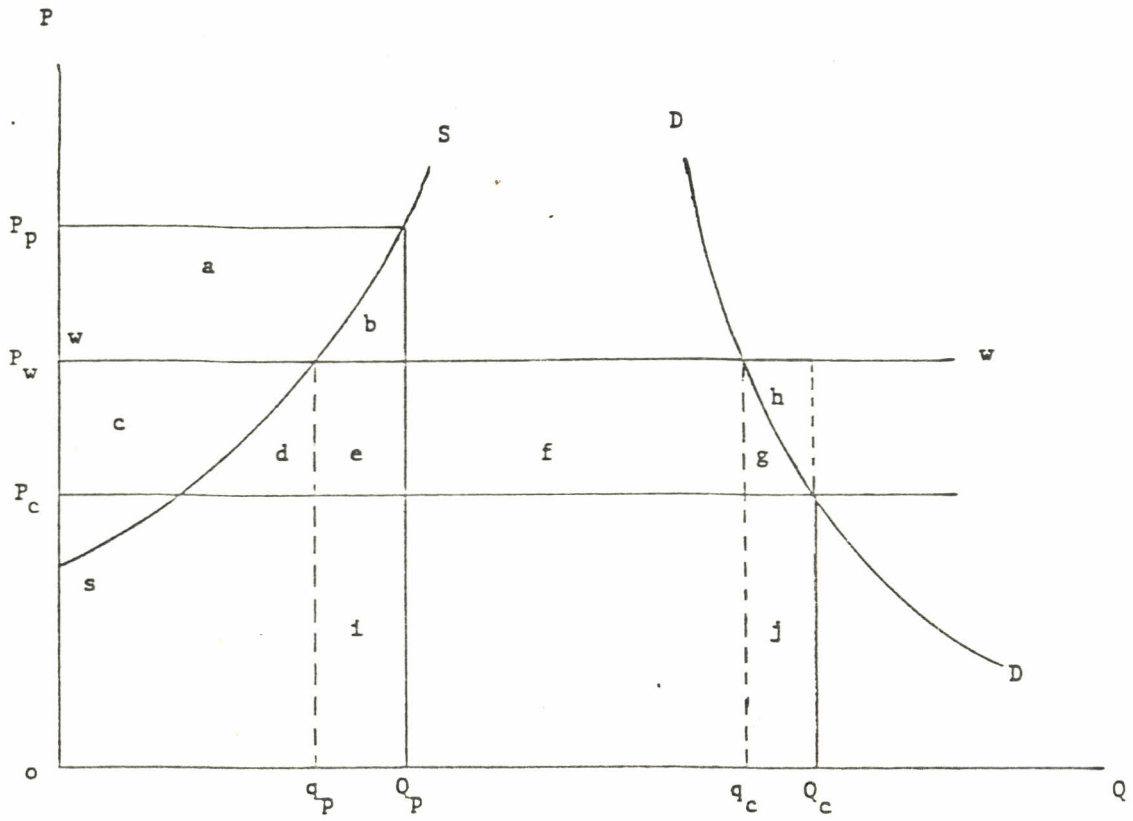

Figure 1. Multiple Price System for Wheat in Brazil.

this approach to policy analysis is rather large, we will not go into the justification and limitations of the approach here. the interested reader can obtain background from Currie, et al. (1971), Just, et al. (1982), and an application along the line sought here, in Barker and Hayami (1976).

The following measures for evaluating the production policy can be derived from Figure 1:

TCP = treasury cost of the production policy subsidy (area (a+b)) (1)

CPW = change in producers' welfare (area a) (2)

SCP = social costs in production (area b) (3)

FEP = foreign exchange effect on production side (area (e+i) (4)

CQP = change in quantity produced $(Q_p - q_p)$ (5)

where: Q_p = quantity produced at subsidized price

q_p = quantity produced at world price.

Assuming a constant elasticity supply curve such as $q = a P^{\varepsilon}$, one can rewrite (1) - (5) as:

$$TCP = (P_p - P_w) Q_p \tag{6}$$

$$CPW = \int_{P_w}^{P_p} a\, p^{\varepsilon}\, dP = \frac{Q_p}{1+\varepsilon} \left[P_p - \left(\frac{P_w}{P_p}\right)^{\varepsilon} P_w \right] \tag{7}$$

$$SCP = TCP - CPW \tag{8}$$

$$FEP = P_w Q_p \left[1 - \left(\frac{P_w}{P_p} \right)^{\varepsilon} \right] \tag{9}$$

$$CQP = Q_p \left[1 - \left(\frac{P_w}{P_p}\right)^{\varepsilon} \right] \tag{10}$$

where:

$$P_p = \frac{P_f + m_a}{GPI} \times 100$$

$$P_w = \frac{P_{CIF} \times ER + m_b}{GPI} \times 100$$

and P_p, P_f, P_w, P_{CIF}, ER, GPI, m_a, m_b, and a are, respectively, the producer price adjusted for the wholesale level, the farm gate price, the border price adjusted for the wholesale level, the CIF price, the equilibrium exchange rate, the general price index, the farm to mill expenses, the port to mill expenses, the domestic supply elasticity, and the supply shifters.

To evaluate the consumption policy, one can derive from Figure 1 the following measures:

TCC = treasury cost of the consumption policy subsidy (area (c+d+e+f+g+h)) (11)

CCW = change in consumer welfare (area (c+d+e+f+g)) (12)

SCC = social cost of consumption policy (area h) (13)

FEC = foreign exchange effect on consumption side (area (h+g+j)) (14)

CQC = change in quantity consumed ($Q_c - q_c$) (15)

where:

Q_c = quantity consumed at subsidized price

q_c = quantity consumed at world price.

Assuming a constant elasticity of demand curve, such as $q = bp^{-\eta}$, one can rewrite (11)-(15) as:

$$TCC = (P_w - P_c)\, Q_c \tag{16}$$

$$CCW = \int_{P_c}^{P_w} bp^{-\eta}\, dp = \frac{Q_c}{1-\eta}\left[\left(\frac{P_c}{P_w}\right)^{\eta} P_w - P_c\right] \tag{17}$$

$$SCC = TCC - CCW \tag{18}$$

$$FEC = P_w Q_c\left[1 - \left(\frac{P_c}{P_w}\right)^{\eta}\right] \tag{19}$$

$$CQC = Q_c\left[1 - \left(\frac{P_c}{P_w}\right)^{\eta}\right] \tag{20}$$

where: P_c, , and b are, respectively, the consumer price, the domestic demand elasticity, and the demand shifters.

Finally, the net effects of the wheat policy can be summarized as:

$$TTC = TCP + TCC \tag{21}$$

$$CSW = CPW + CCW \tag{22}$$

$$TSC = SCP + SCC \tag{23}$$

$$NEF = FEP + FEC \tag{24}$$

$$CI_t = CQC_t - [(SP_t + SW_t) - CQP_{t-1}] \text{ 15/} \tag{25}$$

where: TTC, CSW, TSC, NEF, CI_t, SP_t, SW_t and CQP_{t-1} are, respectively, total treasury cost, change in social welfare, total social cost net effect on foreign exchange, change in imports of wheat, in years t, quantity of seeds used in year t at subsidized producer price, quantity of seeds used in year t if the world price had prevalied, and change in quantity produced in year t-1.

15/ The expression $\{-[(SP_1 - SW_t) - CQP_{t-1}]\}$ represents the net change in production in year t-1 available to human consumption in year t after adjustment for seeds used in year t.

The determination of the three main prices to be utilized in the analysis just described (P_f, P_c and P_w) involves two main mechanisms: (1) government intervention (P_f and P_c) and (2) free market forces (P_w). In the first semester of each year, before the planting season, the government, through the National Supply superintendency (SUNAB) makes public the wheat producer price for the year. The political and economic forces involved in the determination of the producer price include the two big cooperatives of wheat and soybean producers in the states of Rio Grande do Sul (FECOTRIGO) and Paraná (OCEPAR), the government institutions--Comission for Production Financing (CFP), and the Ministry of agriculture and the Ministry of Planning through their bureaucratic and political forces. Basically, these institutions start the bargaining process with estimates of the cost of production for wheat in the year, and from that, they consider other aspects such as self-sufficiency goals, and so on.

The determination of the miller prices (P_c) during the year are primarily a result of the willingness of the government to have a cheap food policy, but for reasons that are not clear, at least on the surface. Some argue that since wheat products are an important component of the consumer price index, then any time the government wants a lower inflation rate for a specific month it is necessary only to maintain the wheat price unaltered. However, this argument has to be viewed with care.

The imported price (P_w), which is determined in the world market, has little government interference in its determination other than the exchange rate policy followed during the period. As a rule, that policy has been to maintain an overvalued currency in order to subsidize imports, especially capital goods, for the industrialization of the country. This exchange rate policy works as an implicit import subsidy for wheat also, however, thus keeping P_w artificially

low domestically.

The nominal rate of protection for producers (NPP) and the nominal rate of protection for consumers (NPC) are used as measures of price distortion that result from government intervention. Those are calculated as percentages of the world or border price, as follows:

$$NPP = \frac{P_p - P_w}{P_w} \times 100 \qquad (26)$$

$$NPC = \frac{P_w - P_c}{P_w} \times 100 \qquad (27)$$

The border are calculated using the shadow price of exchange rate for each year and "correcting" for Cr$ (cruzeiros) of 1977 at the wholesale level, taking into account the respective marketing margins. Producer prices are also measured at the wholesale level in Cr$ (cruzeiros) of 1977 by taking into account the respective marketing margins.

As pointed out by Bale and Lutz (1981), the use of wholesale prices can be justified in a practical sense, since the wheat grain undergoes transformation into various products between the wholesale and retail levels. As a consequence, a single retail price does not exist for wheat grain.

Given the unavailability of data on stocks, the levels of stocks will be assumed to remain constant and unchanged.

A Model for the Disaggregated Analysis

The model used to carry out the disaggregated analysis (which applies only to the consumption policy) is similar to that used for the aggregated analysis of the consumption policy. The main differ-

ence is that the aggregated result in this case is made up of the sum of the consumers's surplus of all income classes for each wheat product.

The case for one wheat product j and two income strata (i=1,2) is shown in Figure 2. Figures 2a and 2b represent alternative income situations, and Figure 2c the aggregated market. d_j and D_j represent the respective disaggregated and aggregated demand curves for the particular wheat product, with the aggregated curve of Figure 2c being the horizontal sum of the disaggregated markets. P_o^j and P_1^j and q_o^{ji} and q_1^{ji}, Q_o^j and Q_1^j are the prices and quantities with subsidy and without price subsidy, respectively, for the wheat product j. Then, using procedures similar to those for the aggregated analysis, policy measures similar to those found in that section can be derived by utilizing the areas a_i, b_i, c_i and f_i (Figures 2a and 2b).

Assuming a constant elasticity demand curve of the form $q_{ji} = a_{ji} P^{-\eta_{ji}}$ for each wheat product j and each income strata i, and generalizing for n income strata and m wheat products, one can derive the following formulas to conduct the disaggregated analysis for a specific year:

$$TCC = \sum_{j=1}^{m} \sum_{i=1}^{n} TCC_{ji} = \sum_{j=1}^{m} \sum_{i=1}^{n} (P_1^j - P_0^j)\, q_0^{ji} \tag{28}$$

$$CCW = \sum_{j=1}^{m} \sum_{i=1}^{n} CCW_{ji} = \sum_{j=1}^{m} \sum_{i=1}^{n} \int_{P_0^j}^{P_1^j} a_{ji} P^{-\eta_{ji}} dp =$$

$$\sum_{j=1}^{m} \sum_{i=1}^{n} \frac{q_0^i}{1-\eta_{ji}} \left[\left(\frac{P_0^j}{P_1^j} \right)^{\eta_{ji}} P_1^j - P_0^j \right] \tag{29}$$

$$SCC = TCC - CCW = \sum_{j=1}^{m} \sum_{i=1}^{n} SCC_{ji} \tag{30}$$

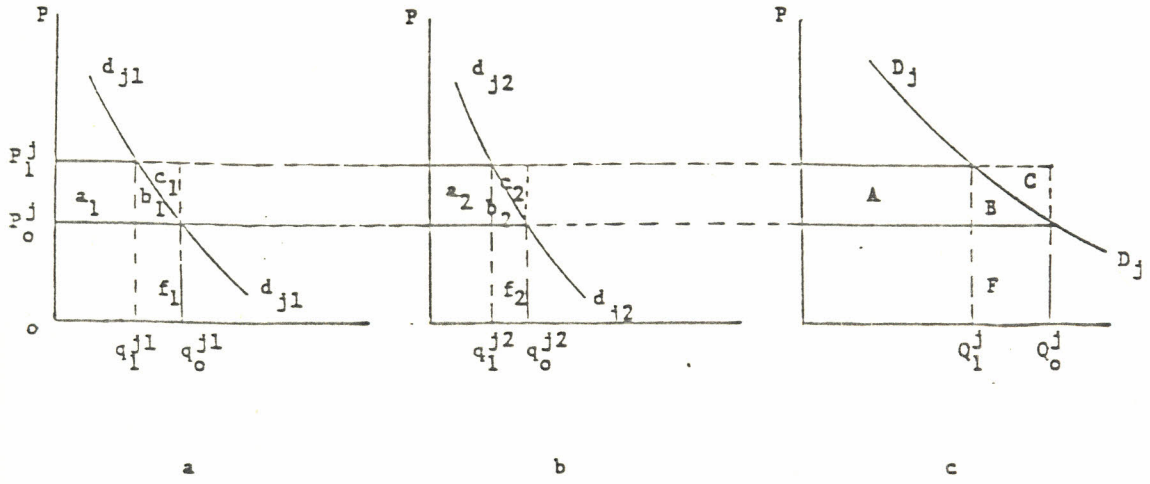

Figure 2. Hypothetical Market for a Specific Wheat Product Under Two Income Strata Situations and for the Aggregate Market.
Notes: (1) a and b represent alternative income strata;
(2) c represents the aggregated demand.

$$CQC = \sum_{j=1}^{m} \sum_{i=1}^{n} CQC_{ji} = \sum_{j=1}^{m} \sum_{i=1}^{n} q^{ji} \left[1 - \left(\frac{P_0^j}{P_1^j} \right)^{\eta_{ji}} \right] \qquad (31)$$

where:

TCC = the total treasury cost on the consumption side for a specific wheat product

CCW = the change in consumers' welfare

SCC = the social cost of the subsidy

CQC = the change in quantity consumed

η_{ji} = the constant demand elasticity for wheat product j in each income strata i, where j = 1, 2, ...m and i = 1, 2, ...n. P_o^j and P_1^j are the prices of the specific wheat product j with and without the consumption subsidy, respectively, and a_{ji} is the demand shifters for each product j in each income strata i.

To estimate P_o^j and P_1^j the following formulas can be used:

$$P_0^{wf} = P_{wg} \times Q_{wg} + O_c^{wf} \qquad (32)$$

$$P_1^{wf} = \frac{P_{wg}}{1 - CS_{wg}} \times Q_{wg} + O_c^{wf} \qquad (33)$$

$$P_0^j = P_0^{wf} Q_{wf}^j + O_c^j \qquad (34)$$

$$P_1^j = P_1^{wf} Q_{wf}^j + O_c^j \qquad (35)$$

where:

P_k^{wf} = the price of wheat flour with the consumption subsidy, k=0, and without the consumption subsidy, k=1

P_{wg} = the price of wheat grain for the millers

Q_{wg} = the quantity of wheat grain required to produce one kilogram of wheat flour

O_c^{wf} = other costs involved in the production of wheat flour

CS_{wg} = the percent value of the average consumption subsidy calculated for a respective year from the aggregated analysis

P_i^j = the price of wheat product j with the wheat consumption subsidy, k=0, and without the consumption subsidy, k=1

Q_{wf}^j = the quantity of wheat flour required to produce one kilogram of the $j^{\underline{th}}$ wheat product

O_c^j = other costs involved in the production of the $j^{\underline{th}}$ wheat product.

Since we know, from secondary sources, P_0^{wf}, P_{wg}, Q_{wg}, CS_{wg}, P_0^j and Q_{wf}^j, we can calculate O_c^{wf} and P_o^{wf} from equations (32)-(33), and by substituting them in equations (34)-(35) obtain O_c^j and P_1^j.

After calculating the change in consumers' welfare by income strata, one can go further and derive the respective Lorenz curve for the distribution of the gains in consumers' welfare and compare that distribution with the "Lorenz curve" resulting from the expenditure distribution of the families in the respective income strata[16]. The relative bias of the wheat consumption subsidy with respect to low or high income consumers can then be evaluated.

A Model for Analysis of Alternative Consumption Policies

Among many questions to be answered before any policy option is chosen, questions of fiscal cost and cost-effectiveness are perhaps the most important, if one considers that public resources are scarce and therefore must be allocated as efficiently as possible. In this section, we present a simple model suggested by Reutlinger and Selowsky (1976) to estimate the fiscal cost and cost-effective-

[16] For details on the theory of the Lorenz curve, see Kakwani (1980).

ness of three basic policy options for improving the nutritional status of target groups in any society.

Two large typologies of policies are identified for study: country-wide and target-group-oriented programs. In the first case all segments of society are benefited in the process of benefiting the target or deficient group; in the second case only the target group receives the benefits, i.e. there is no spillover effect. The country-wide policy to be considered is a general price subsidy while the target-oriented programs include a food stamp program and price subsidy.

Let us assume that the policy objective is to increase the consumption of a specific food in the targed group by a fraction of the initial consumption of that food item by the target group. Let α represent the share of consumption of that food by the target group (in the present case a low-income group).

If there are only two consumer groups, the target group, or low-income group (p), and the remaining, or richer group (r), with respective price elasticities of demand for the food item, η_p and η_r, one can define:

$$\eta_t = \eta_p + (1 - \alpha)\eta_r$$

where η_t is the total (absolute value) demand price elasticity for the commodity expressed as the weighted average of the demand elasticites (absolute value) of both groups.

First let us derive an expression to compute the fiscal cost (FC) of a general price subsidy taking into account the policy objective defined above and the parameters of supply and demand for the targed group or the whole population whenever necessary. Departing from the definitions of supply and demand elasticities and consider-

ing the market equilibrium after the general price subsidy has been instituted, we obtain two equations of the form:

$$\eta_p = \frac{dq}{dp^d} \cdot \frac{P_o}{q_o} \rightarrow dp^d = \frac{\lambda}{\eta_p} P_o \qquad (36)$$

$$\eta_t dp^d = \varepsilon_t dp^s \rightarrow dp^s = \frac{\eta_t}{\varepsilon_t} dp^d \qquad (37)$$

where:

q_o = quantity of the commodity consumed by the target group or αQ_o, where Q_o is the total consumption of the aggregated consumers

dp^d, dp^s = percent changes in the demand and supply prices, respectively

ε_t = elasticity of total supply for the commodity.

Substituting equation (36) into equation (37) we obtain:

$$dp^s = \left(\frac{\eta_t}{\eta_p}\right)\left(\frac{\lambda}{\varepsilon_t}\right) P_o \qquad (38)$$

Denoting FC as the fiscal cost of the general price subsidy under consideration, we can write:

$$FC_G = (dp^d + dp^s)\left(Q_o + \eta_t\, dp^d \frac{Q_o}{P_o}\right) \qquad (39)$$

and after substituting (37) and (38) into (39) we obtain:

$$FC_G = P_o\, Q_o \frac{1}{\eta_p \alpha}\left(1 + \frac{\eta_t}{\varepsilon_t}\right)\left(1 + \lambda \frac{\eta_t}{\eta_p}\right) \qquad (40)$$

and if $\varepsilon_t \rightarrow \infty$, which implies that the product has an infinitely elastic supply curve (which could be the case if it is an imported product for which the country is a small buyer in the world market),

then equation (41) becomes:

$$FC_G = P_o Q_o \frac{1}{\eta_p \alpha}\left(1 + \lambda \frac{\eta_t}{\eta_p}\right) \qquad (41)$$

In order to obtain the unitary cost of the general price consumption subsidy, UC_G, (i.e., the cost incurred by the government for each additional unit of the consumption good by the targed group) it is only necessary to divide equations (40) and (41) by dq, (i.e., the total increase in consumption of the good by the target group with respect to the initial consumption level of the target group) as follows:

$$UC_G = \frac{FC_G}{\lambda \alpha Q_o} \qquad (42)$$

In order to derive expressions for the fiscal cost and the unitary cost of target-oriented programs using the same set of parameters as above, one can depart from Figure 3. Figure 3 represents the market for a food product that is relevant for the (low-income) target group, where D_p presents the demand by that group as a function of initial income Y, and S_p represents the excess supply faced by the target group. $S_p = S_t - D_r$, where S_t and D_r are respectively the total supply and demand by the non-target (upper-income) group.

Initial consumption and price are q_o and P_o, respectively.

The objective of the policy as set forth earlier is to induce an increase in consumption of the food product by the target group by $\lambda = \Delta q/q_o$. Let us first derive some basic expressions that will be used later in computing the fiscal and unitary costs of the alternative policy options for the target group.

The increase in price needed to induce an increment in supply equal to Δq is equal to Δ_1. Denoting ε_p as the elasticity of supply

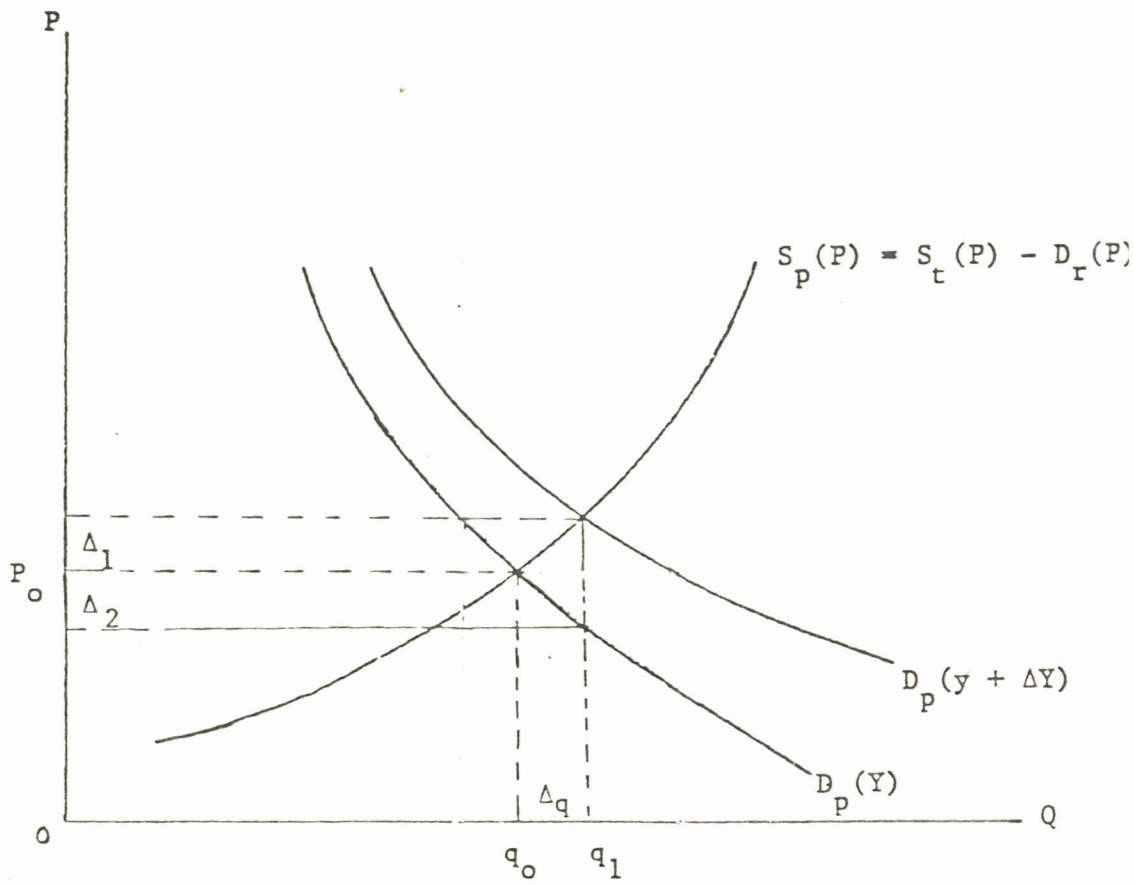

Figure 3. Hypothetical Market for a Relevant Food Product for a Target Group.

faced by the target group, the following expression may be defined[17]

$$\varepsilon_p = \frac{\Delta q/q_o}{\Delta_1/P_o} \rightarrow \frac{\Delta_1}{P_o} = \frac{\lambda}{\varepsilon_p} \qquad (43)$$

If the decline in price required to induce the target group to increase consumption by λ is equal to Δ_2, then the following expression may be defined (in absolute value):

$$\eta_p = \frac{\Delta q/q_o}{\Delta_2/P_o} \rightarrow \frac{\Delta_2}{P_o} = \frac{\lambda}{\eta_p} \qquad (44)$$

Now let us derive the respective formulas for calculating the fiscal cost and unitary costs of a price subsidy and a food stamp program.

First, let us consider the possibility of subsidizing just the consumption of the target group. Then the fiscal cost of that subsidy will be:

$$FC_s = (q_o + \Delta q)\ (\Delta_1 + \Delta_2)$$

Substituting from equations (43) and (44) and recalling that $q_o = \alpha Q_o$ and $\Delta q = \lambda \alpha Q_o$ one obtains:

$$FC_s = P_o Q_o\, \alpha\lambda\ (1 + \lambda)\ \left(\frac{1}{\varepsilon_p} + \frac{1}{\eta_p}\right) \qquad (45)$$

and if $\varepsilon_p \rightarrow \infty$, then:

$$FC_s = P_o Q_o \frac{\alpha\lambda}{\eta_p} (1 + \lambda) \qquad (46)$$

and the unitary cost UC_s will be:

$$UC_s = \frac{FC_s}{\alpha\lambda Q_o} \qquad (47)$$

---

[17] An expression for ε_p as a function of ε_t, α and η_r can be obtained by working out $S_p = S_t - D_r$, and obtaining $\varepsilon_p = \frac{\varepsilon_t}{\alpha} + \left[\frac{1-\alpha}{\alpha}\right] \eta_r$.

Next, let us consider the cost of a food stamp program. The question now is "What is the value of the income transfer or the fiscal cost FC_{FS} required to induce an increase in physical consumption of a specific product i by the target group by Δq?" Note that the value of the transfer must be able to finance the increment Δq--valued at the new supply price of the product--as well as finance the increased cost of the old consumption q_o. The transfer or fiscal cost of the program becomes:

$$FC_{FS} = \Delta_1 (q_o + \Delta q) + P_o \Delta q$$

$$FC_{FS} = P_o Q_o \alpha\lambda \left(\frac{1 + \lambda}{\varepsilon_p} + 1\right) \qquad (48)$$

If $\varepsilon_p \to \infty$, then:

$$FC_{FS} = P_o Q_o \alpha\lambda$$

The unitary cost of the additional consumption due to the program is given by:

$$UC_{FS} = \frac{FC_{FS}}{Q_o} \qquad (49)$$

RESULTS

This section is divided into three parts. In the first part we present and discuss the results for the aggregated analysis. In the second part we do the same thing for the disaggregated analysis, considering only the consumption side. In the third part we evaluate a set of alternative policies that could be considered as substitutes for the wheat consumption subsidy.

Aggregated Analysis

The Behavior of Real Prices and the Estimated Nominal Rates of Protection

Estimates of the real prices of wheat at the producer, miller and border price levels are presented in Table D.1, Appendix D. Producer prices are farm gate prices adjusted to the mill level; miller prices are the prices set by the government, and include the consumer subsidy; and border prices are the CIF prices evaluated with the shadow foreign exchange rate and adjusted to the miller level, exclusive of the consumer subsidy.

Prices at the miller level showed a tendency to decline almost steadily up until 1980, Figure 4, when the lowest price for the period was observed (Cr$ 516, or only 19 percent of the highest price of Cr$ 2,707, in 1965, which is arbitrarily taken as a base of comparison) Table D.1, Appendix D. To understand this trend, it is useful to divide the series into two distinct periods: the first covering the prdiod up to 1972, and the second covering 1973 through 1982. Prior to 1972, the tendency of miller prices to decline in real terms was mainly caused by the downward trend in world prices, represented here by border prices. From 1974 through 1982, the downward trend in miller prices was in large part a

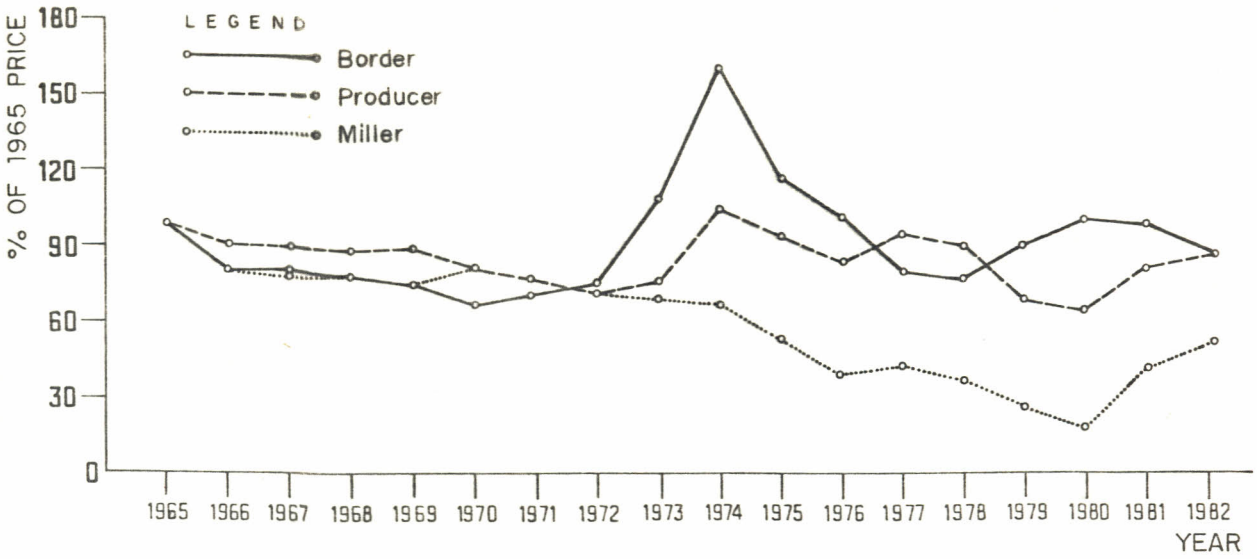

Figure 4- Behavior of Prices.

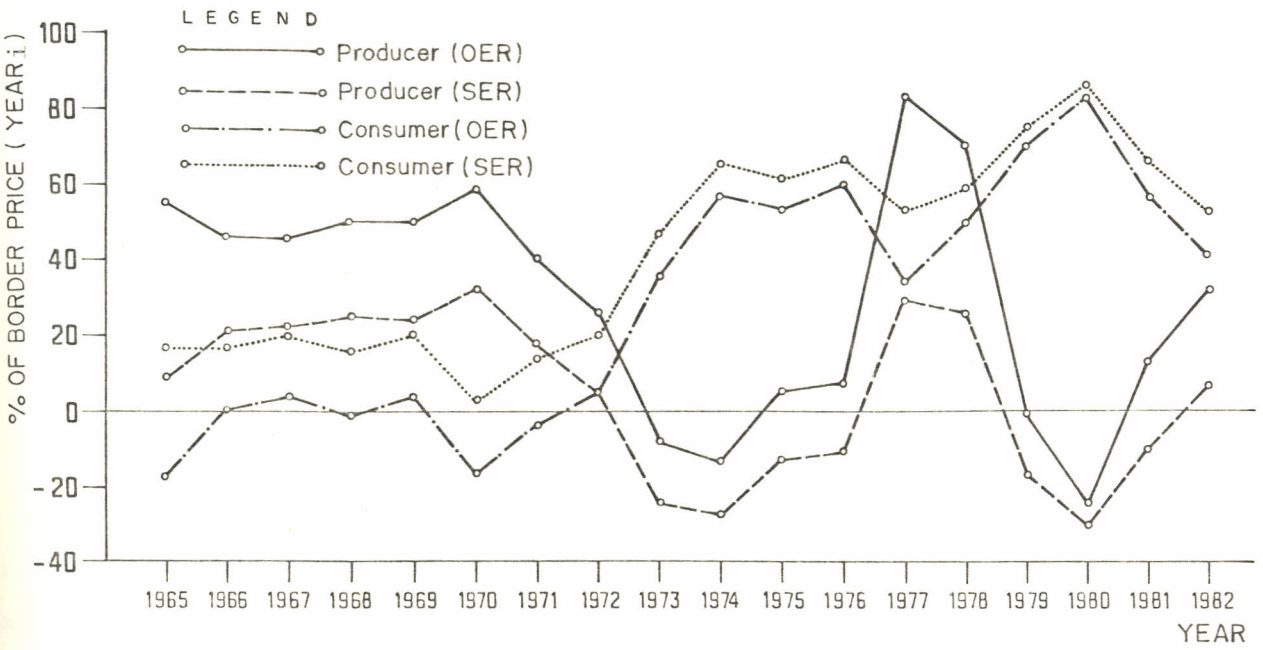

Figure 5- Subsidy Levels

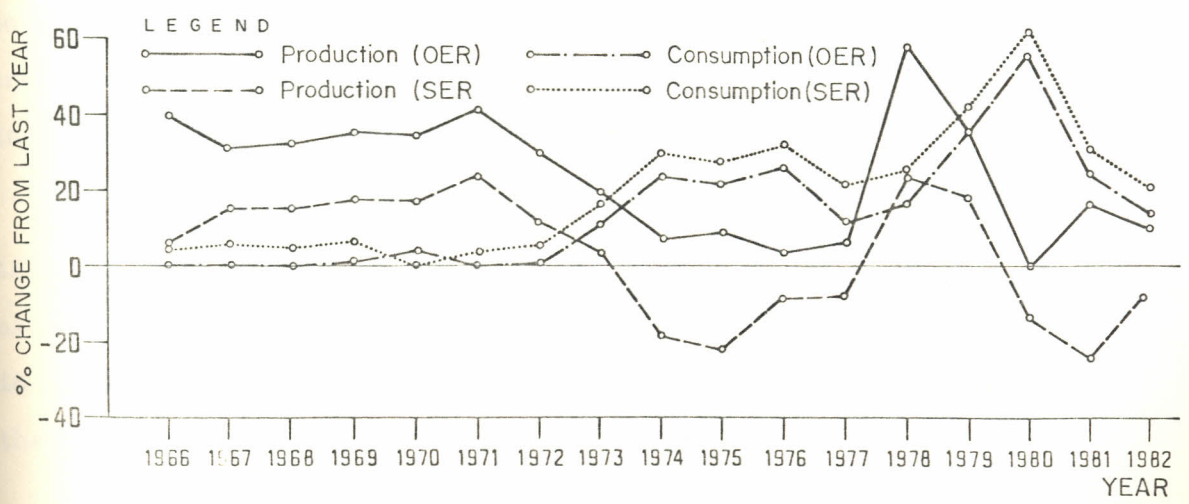

Figure 6- Production and Consumption Impact

consequence of the explicit general consumption subsidy.

In the same two periods described above, producer prices experimented rather different trends. From a peak in 1965, the real price at the producer level declined up through 1972. World prices were declining in this period, but domestic producer prices were not permitted to decline as much. The observed decline was primarily a result of year-to-year variations in the level of the producer subsidy set by the government and/or inflation. From 1973 through 1982, producer prices showed a varied pattern. From 1973 until 1978 they showed a recovery in real terms, compared to the lower level of 1972. This recovery was associated with high world prices in the period from 1973 until 1976. The government seems to have followed world prices in setting its guaranteed prices to producers. In the years which were exceptions, 1973-1976 and 1979-1981, however, the producers were in effect taxed (Figure 5 and Table D.2, Appendix D.), with the result that the govenment was implicity transfering income from the producers to other sectors of the economy.

Finally, border prices had a tendency to decline from 1965 until 1970, following the same behavior that had prevailed since the late 1940's (see Marin and Brokken, pg. 159, 1983). After 1970, border prices experienced a cyclical pattern with two peaks, one in 1974 and another in 1980. Both of these were caused in part by crop failures in the Soviet Union, but also by moneraty phenomena in international commodity markets, (Figure 4).

The production and consumption subsidies calculated as a percentage of the border price evaluated at the official and at the shadow exchange rate are shown in Table D.2, Appendix D, and represented in Figure 5. Taking account of the distortion in the exchange rate, the production subsidy was positive in 11 years of the period and

and negative in 7 years. In the years in which the production subsidy was negative, the producers were in fact taxed, of course. This occurred because the border price happened to be far above the guaranteed price set by the government for the domestic producers, the guaranteed price generally has been set at the end of the first semester of each year.

The government pursued a consistent policy of import substitution on the production side up until 1972. Thereafter, even though guaranteed producer prices were set at levels higher than those of 1972 and 1973, they fell short of the border prices, with the exception of the years 1977, 1978 and 1982. This was so considering the shadow price of foreign exchange to calculate the border price, because in doing so we are working with the true opportunity cost of wheat in the world market.

At least two facts can help explain the above behavior: (1) the instability in the world market for wheat, reflected in the rises and declines in border prices after 1972; and (2) the overvaluation of the cruzeiro with respect to the U.S. dollar. As can be seen in Figure 5 when the production subsidy is calculated using the official exchange rate, the producers were taxed during only three years, 1973, 1974 and 1980, and in two of those years the border prices were at their peak. However, when the overvaluation of the cruzeiro is taken into account, producers are perceived to receive a lower subsidy. This is because the overvalued currency served as an implicit (export) tax for producers, since it caused domestic prices to be lower than they would be in the absence of the overvaluation.

On the consumption side, the subsidy was mainly an implicit subsidy up until 1972 due primarily to the overvaluation of the cruzeiro (Table D.2, Appendix D). An overvalued currency is an impli-

cit (import) subsidy for consumers since it causes domestic prices to be lower than they would be in the absence of the overvaluation.

After 1972, because of an upturn in the world prices of wheat and the end of P.L. 480 (1971) purchases on concessionary terms, the government subsidized wheat consumption explicitly every year through 1982[18]. It should be noted that if the distortion in the value of the currency is ignored, it appears that consumers were explicitly taxed (Table D.2, Appendix D) during four years of the 1965-1971 period. This apparent tax is due to the policy vis-a-vis concessional food purchases. Under this policy, wheat was purchased on the concessionary terms of P.L. 480, below world prices and with long-term financing. It was sold in the domestic market at higher prices in order to obtain revenue to finance the wheat subsidy for producers[19]. Of course, this apparent tax disappears when the distortion in the exchange rate is taken into account.

Production, Consumption and Import Effects

Estimates of the effects of the production subsidy or tax (1973-76 and 1979-81, see Table D.2, Appendix D, third column) on production are presented in Table D.3, Appendix D, and represented in Figure 6. As can be seen, with the exceptions of 1973-76 and 1979-81, the changes in production are positive and vary according to the magnitudes of the producer and border prices and the output level of the respective year[20]. The change in production as a per-

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[18] Banco do Brasil (1979).

[19] Hall (1980).

[20] Recall that Table D.3, Appendix D presents changes in production in year t-1.

cent of the level of production that would have resulted if world (border) prices had prevailed was never greater than 23.6 percent. Moreover, from 1974 through the end of the period, the producers' subsidy was not sufficient to offset the tax implicit in the overvalued cruzeiro except in two years (1977 and 1978).

The changes in consumption as a consequence of the consumption subsidy were positive and varied according to the level of consumer and border prices and the consumption level of the respective year. The largest relative change in consumption was in 1980 when the consumption subsidy was at its highest level (85.1 percent, Table 8, last column) and total consumption was at its highest level (6,802,036 MT, Table A.2, Appendix A). In 1980 the total observed consumption of wheat grain was 60.9 percent higher than it would have been if there had been no consumption subsidy (Table D.3, Appendix D, column 5). It should be noted that a major component of the consumption subsidy came from the distortion in the exchange rate. In evaluating the trade effects of the policies, it is of interest to determine the separate effects of the production policies. These are identified as the partial change in imports, column 6 of Table D.3, Appendix D.

The effect of the production policies was negative up until 1973, and during 1977, 1979 and 1982, (Table D.3, Appendix D). During 1974-77 and 1980-81, the partial changes in imports were positive, indicating that the wheat production policy during the periods 1973-76 and 1979-80 had the effect of increasing wheat imports. This was because of the large distortion in the value of the currency, which more than offset the direct subsidy. If one takes the partial change in imports in year t as a percentage of total imports at free trade as a measure of the ability of the wheat production policy to substitute imports, it can be seen that the maximum

decline in imports was 18.8 percent in 1979, and that during 6 out of 17 years the guaranteed producer price contributed to increase wheat imports by more than offsetting the effects of the overvalued cruzeiro.

Finally, the total effect (taking account of both producer and consumer policies) on imports was negative or small during only three years (1970-72), indicating that the wheat production policy had a relatively small effect on self-sufficiency in wheat production. This was so because of the large increase in wheat imports which resulted from the wheat consumption subsidy, especially after 1972.

This is a good example of conflicting policy objectives. On the one hand, the production policy was designed to substitute wheat imports, while on the other hand, the consumption policy, although not necessarily designed to stimulate wheat consumption, in fact did so, and this in turn required more imports. Thus, the effect of the wheat production policy, as an import substitution policy, was partially or totally overridden by the consumption policy and the distortion in the exchange rate.

In an attempt to isolate the effects that overvaluation of the cruzeiro had on the results of Table D.3, Appendix D the figures in that table were recalculated using the official exchange rate. The results are presented in Table D.4, Appendix D. The production policy is found to have a larger effect when the distortion in the exchange rate is not taken into account. This is because domestic production at world prices would have been lower and the observed production would continue to be the same. On the other hand, the consumption policy has a smaller effect on consumption when the distortion in the exchange rate is not taken into account. Finally, the total change in imports was found to be smaller than when the overvaluation of the currency is taken into account. Thus the over-

valuation of the cruzeiro works as a deterrent to the import substitution policy.

Cost, Benefits and Exchange Rate Effects

The cost, benefits and exchange rate effects of the brazilian wheat policy can be viewed, not only considering the explicit, but also the implicit subsidy (tax) set upon domestic producers and consumers of wheat products, through the price of wheat set periodically by the governament, and through the existing exchange rate policy.

A summary of the measurements of the refer to effects for the period of 1966-82 is shown in Table 7. At the outset on can see that, explicitly, producers and consumers were subsidized, however, when the effect of the overvaluation of the currency during the period was taken into account it showed that, in a net sense producers were taxed and consumers were highly subsidized (compare line with OER with that one of SER for the subsidy (tax) value column in Table 7. This was so because an overvaluated currency works as an export tax for producers and as an import subsidy for consumers.

The gains in welfare for producers, consumers and both grups combined ranged from 81 to 86 percent of the total subsidy value. Exceptionally, for the case of producers, when the distortion on exchange rate was taken into account there was a loss in welfare for that group. The social cost of the brazilian wheat policy ranged from 14 to 39 percent of the total subsidy value, what shows how big these costs can be, as a result of such government interventions. The foreign exchange impacts of the brazilian wheat policy were negatives in all cases, exception made for the case of the production policy analysed under the official exchange rate.

Table 7. Isolated and Combined Total Monetary Effects of the Brazilian Wheat Policy for the Period of 1966-1982.

Sector	Total Subsidy Value= TV US$ million[1]	Change in Welfare % of TV	Social Cost= SC % of TV	Foreign Exchange Effects= FE US$ million	SC/FE
1. Producers					
.whith SER[2]	- 250	- 139	39	- 391	0.25
.whith OER[2]	838	81	19	291	0.54
2. Consumers					
.whith SER	6,136	85	15	- 2,216	0.41
.whith OER	5,871	85	15	- 2,078	0.39
3. Combined 1 & 2					
.whith SER	5,886	83	17	- 2,607	0.39
.whith OER	6,709	86	14	- 1,786	0.54

Source: Calegar (1984)

[1]The respective average values of the SER and OER for 1977 are: US$ 14.1/1 Cr$ and US$ 19.97/1 Cr$

[2]SER= Shadow Exchange Rate and OER= Official Exchange Rate.

If one assumes that one of the major objectives of the wheat production policy is to promote import substitution of wheat, then one can argue that such a government intervention did not work accordingly in a free market situation. Finally, the social cost per dollar of foreign exchange saved or spent, due to the brazilian wheat policy, ranged from 0.25 to 0.54. It means that, in order to substitute wheat import of US$ 1 the government had to spent from US$ 1.25 to US$ 1.54 (see first two lines of last column of Table 7), and each additional US$ 1 of wheat import had a cost ranged from US$ 1.39 to US$ 1.54 (see third and fourth lines of last column of Table 7). All these results are showing that brazilian wheat policy has represented a siziable burden for society as a whole, and in the case of the wheat production policy, it can not be justified as an import substitution policy, because in a free market situation the wheat import tended to increase, due to an implacit taxation of producers as a result of an overvalued exchange rate.

Figures 7 and 8 show the behavior of cost, benefits and foreign exchange effects of the brazilian wheat policy for the period of 1966-82, under the official (OER) and the shadow exchange rates (SER). Based on these figures the following comments can be made:

(1) Up until 1972 the impact of the wheat consumption policy were minor upon the total subsidy value, consumers welfare and expenditures of foreign exchange, however, after 1972, up until 1982 the impact of that policy on the first two elements refer to above had a trend to push them up and on the last one to push it down, (Figure 7).

(2) Consumers were capturing almost all benefits of the wheat consumption policy, meanly until 1972, however as the total value of the subsidy increases the consumers capture less benefits

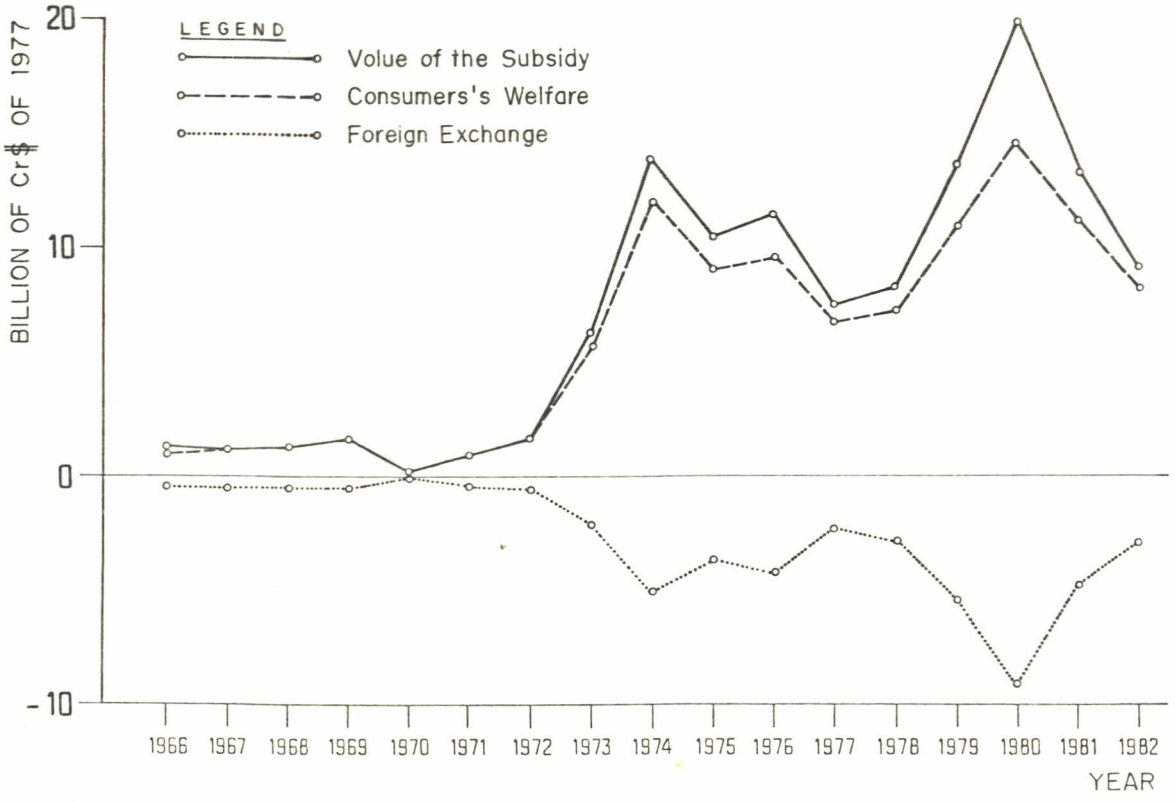

Figure 7- Effects of the Consumption Policy

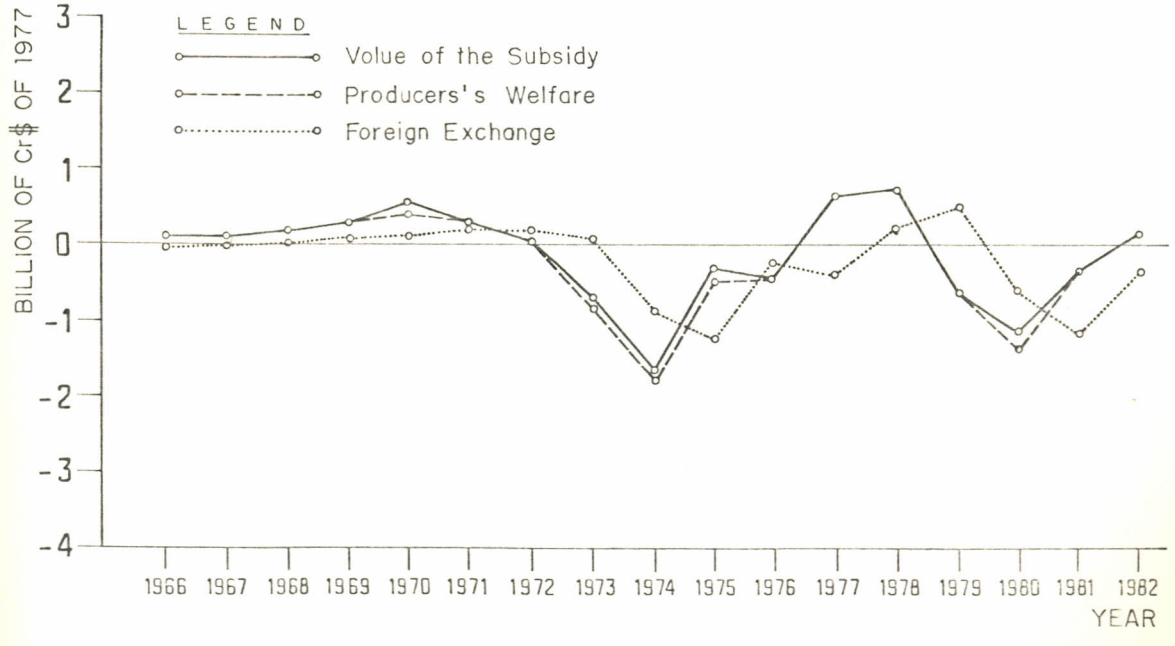

Figure 8- Effects of the Production Policy.

relative to the total value of the subsidy, what implies that the social cost increases, (Figure 7).

(3) The maximum level of the wheat consumption subsidy occurred in 1980, with the respective maximum of expenditure in foreign exchange, due to the high level of wheat imports to supply the domestic market, (Figure 7).

(4) The wheat production policy subsidized producers slightly up until 1972 and during 1978-79, however taxed them during the other years of the period and this was meanly a result of the fluctuation of the wheat prices in the world market, since the lagged world prices seem to be an import referencial price for the brazilian government to set the forward domestic price, (Figure 7).

Disaggregated Analysis

Brazilian wheat policy can be viewed as having two basic income distribution effects. The first is at an aggregated level, in which case the issue is the distribution of the implicit and explicit taxes and subsidies between producers and consumers. That issue was considered in the previous section. The second effect is at a disaggregated level, in which the issue is to consider the distribution of the benefits among producers and consumers by size of farm or by level of income, respectively.

In this section, we examine this second effect and, in particular, the distribution among consumers. Emphasis is put on the distribution effects among consumers because the consumption policy seems to involve a larger redistribution of income than does the production policy. Two basic reasons can be given for this: (1) the larger total subsidy costs of the wheat consumption policy when compared whith the wheat production policy, as showed earlier

and (2) the facts that, to some extent the whole population of the country has the costume of consuming wheat products and, as a rule, only medium and large farmers grow wheat in the southern part of Brazil. An additional reason for concentrating on the consumption policy is that there are more data available for such an analysis. Data on expenditure and consumption of wheat products by income class are available, while parallel data on the distribution of wheat production by farm size are not available[21]:

This section is divided into two parts. In the first part, some general considerations on the disaggregated effects of the consumption policy are presented. In the second part, we present and discuss the results of the model developed earlier to evaluate in more detail the income distribution effects of the consumption policy for a selected area of Brazil.

General Considerations on the Disaggregated Effects

As a basis for the discussion of the disaggregated effects of the consumption policy on consumers from different income classes, the data set collected by FIBGE(1) and some direct price elasticties estimated by Garcia (1978) will be examined. Two main considerations will be emphasized. The first is the effect of the consumption subsidy on consumers' expenditures of wheat products. The second is the effect of the consumption subsidy on calorie consumption from wheat products. In both cases we will consider a specific region of Brazil, Region 4 of the FIBGE survey. (Region 4 encompasses the states of Minas Gerais and Espírito Santo). Within this

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[21] Lopes (1977) has studied the effect of the distortion in the exchange rate by size of farm for Brazil as a whole. He found that taxation by overvaluation the cruzeiro had a regressive income distribution effect. Large producers are able to escape the export tax by reorganizing their resources. This option is not available to the small producer.

region, data on the metro area of Belo Horizonte, are taken to represent the urban area of Minas Gerais, and data on the states of Minas Gerais and Espírito Santo are used to represent the rural area.

For each region of the FIBGE survey the total expenditure and the consumption of wheat products are almost invariably positively correlated with the total expenditures of the family by expenditure class. This positive correlation indicates that the higher the expenditure class, the greater (in absolute terms) are the benefits captured by the consumers in those classes. On the other hand, for the specific case of the metro area of Belo Horizonte (Table 8), the budget share of wheat products is inversely correlated with total expenditure by expenditure class[22]. This suggests that, in relative terms, the lower expenditure classes could gain more from the consumption subsidy than the upper expenditure classes.

Thus, for the urban area considered above, any decline in the consumption subsidy can lead to a decline in real income, since there are few close substitutes for the wheat products. An increase in the price of those products means that within a limited budget, less money will be left to be allocated to other products. Moreover, the medium- and low-income groups will lose more relative to their total expenditures than the high-income groups that have high total expenditures.

In the rural area, both the amount consumed and the expenditures on wheat products increase as one moves up in the expenditure classes. However, the budget shares present a stable maximum for the middle classes, while declining as income increases further.

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[22] Low, medium and high expenditure classes are assumed to be, respectively, the first two, the following five, and the last two classes.

Table 8 Annual Expenditures and Budget Shares Per Capita, Metropolitan Area of Belo Horizonte and Rural Areas of Minas Gerais and Espirito Santo, Brazil, 1974-75

Household Expenditure Classes Cr$	Average Annual Per Capita Expenditure	WP[1] Cr$	BS[2] %	Rice Cr$	BS %	Beans Cr$	BS %	CF[3] Cr$	BS %	Corn Cr$	BS %
METROPOLITAN AREA											
Less than 4500	1,604	56	3.5	70	4.4	44	2.7	15	0.9	13	0.8
4500 - 8999	1,749	57	3.3	105	6.0	51	2.9	13	0.7	14	0.8
9000 - 11299	2,549	86	3.4	154	6.0	60	2.4	19	0.7	14	0.5
11300 - 15799	2,692	87	3.2	144	5.3	53	2.0	9	0.3	12	0.4
15800 - 22599	3,793	111	2.9	164	4.3	63	1.7	15	0.4	12	0.3
22600 - 31599	4,453	122	2.7	143	3.2	54	1.2	10	0.2	10	0.2
31600 - 45199	5,919	143	2.4	132	2.2	50	0.8	9	0.2	10	0.2
45200 - 67799	10,869	182	1.7	154	1.4	60	0.5	12	0.1	9	0.1
Over 67999	27,494	229	0.8	131	0.5	51	0.2	25	0.1	16	0.1
ALL CLASSES	6,755	123	1.8	140	2.1	54	0.8	13	0.2	12	0.2
RURAL AREA											
Less than 2300	530	9	1.6	39	7.3	46	8.6	21	3.9	14	2.6
2300 - 3399	955	19	2.0	77	8.1	70	7.3	28	2.9	39	4.1
3400 - 4499	991	21	2.1	93	9.4	65	6.5	20	2.0	36	3.7
4500 - 6799	1,123	28	2.5	112	10.0	69	6.1	22	2.0	38	3.4
6800 - 8999	1,574	39	2.5	159	10.1	88	5.6	23	1.4	48	3.0
9000 - 15799	1,690	42	2.5	163	9.7	79	4.7	14	0.8	48	2.8
15800 - 22599	2,670	60	2.3	190	7.1	91	3.4	19	0.7	54	2.0
22600 - 31599	3,778	67	1.8	221	5.8	84	2.2	17	0.4	55	0.6
Over 31599	7,863	104	1.3	265	3.4	98	1.2	20	0.3	43	0.6
ALL CLASSES	2,268	48	2.1	172	7.6	87	3.9	21	0.9	50	2.2

Source: FIBGE (3).

Notes: [1]WP = wheat products (wheat bread + macaroni + wheat flour).

[2]BS = budget share

[3]CF = cassava flour

These data support the hypothesis that in rural areas, the consumption subsidy has benefited the higher income groups in absolute terms and, in relative terms, the medium income groups.

A comparison of calorie consumption as a percentage of total calories consumed per day in the metropolitan area with that in the rural areas (Table 9), for the case of wheat products, shows clearly that the wheat consumption policy has discriminated against rural consumers, since wheat products play a smaller part in their diets. Moreover, in both rural and urban areas, the higher the income class, the higher the calorie consumption of wheat products in absolute terms.

Considering the above observations for the urban and rural areas together, one can conclude that a large amount of the budgetary costs of the wheat consumption subsidy was captured by the non-target group--the high- and medium-income people. Thus, the cost effectiveness of this general price subsidy was most likely quite low[23].

For purposes of comparison, data on budget share and calorie consumption for rice, beans, cassava flour and corn were also included in Tables 8 and 9. For the metropolitan area, in terms of budget shares (Table 8), rice is shown to have the largest share among the five products. The implication is that a general consumption subsidy for rice (at the same level as for wheat) would have better redistributive effects if the price elasticities of demand by income classes for both products behaved appropriately.

Upon inspection, it can be seen that for the metropolitan area

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[23]The cost incurred by the government per unit change in nutrient consumption by the target group could have been high, i.e., the effectiveness of the money spent in that program is low.

Table 9 Calorie Consumption Per Consumer Day (Comensal Dia) by Expenditure Class, Metropolitan Area of Belo Horizonte, MG and Rural Areas of Minas Gerais and Espirito Santo, Brazil, 1974-75

Household Expenditure Classes[1] Cr$	Total Calories per Day	WP[2]	%[3]	Rice	%	Beans	%	CF[4]	%	Corn	%
				METROPOLITAN AREA							
Less than 4500	1,457	189	13.0	274	18.8	152	10.4	28	1.9	122	8.4
4500 - 8999	1,824	196	10.7	435	23.8	187	10.3	21	1.2	94	5.2
9000 - 11299	1,852	236	12.7	465	25.0	169	9.1	22	1.2	68	3.7
11300 - 15799	1,903	247	13.0	470	24.7	161	8.5	12	0.6	66	3.5
15800 - 22599	1,933	257	13.3	475	24.6	161	8.3	16	0.8	57	2.9
22600 - 31599	2,027	297	14.7	453	22.3	154	7.6	12	0.6	52	2.6
51600 - 45199	2,138	339	15.9	412	19.3	136	6.4	14	0.7	41	1.9
45200 - 67799	2,170	338	15.6	386	17.8	129	5.9	11	0.5	32	1.5
over 67799	2,323	356	15.3	321	13.8	102	4.4	17	0.7	30	1.3
ALL CLASSES	2,040	289	14.2	423	20.7	146	7.2	15	0.7	52	2.5
				RURAL AREA							
Less than 2300	1,478	33	2.2	186	12.6	297	20.1	245	16.6	150	10.1
2300 - 3399	1,865	57	3.1	272	14.6	296	15.9	213	11.4	250	13.4
3400 - 4499	1,972	75	3.8	337	17.1	284	14.4	179	9.1	291	14.8
4500 - 6799	2,098	88	4.2	410	19.5	311	14.8	176	8.4	270	12.9
6800 - 8999	2,212	104	4.7	465	21.0	301	13.6	149	6.7	271	12.3
9000 - 15799	2,420	123	5.1	551	22.8	302	12.5	117	4.8	294	12.1
15800 - 22599	2,611	161	6.2	557	21.3	321	12.3	134	5.1	232	8.9
22600 - 31599	2,715	169	6.2	660	24.3	286	10.5	110	4.1	234	8.6
Over 31599	2,784	191	6.9	663	23.8	273	9.8	98	3.5	146	5.2
ALL CLASSES	2,354	122	5.2	506	21.5	300	12.7	140	5.9	256	10.9

Source: FIBGE (2).

Notes: [1]The correspondents annual average expenditure classes are the same as those in Table 17.

[2]WP = wheat products (wheat bread + macaroni + wheat flour)

[3] % = percentage of respective total calories.

[4]CF = cassava flour

all other products in Tables 8 and 9 have better target-oriented characteristics than do wheat products (in terms of a general price subsidy to benefit low income people). That is, both budget shares and per capita calorie consumption in general tend to decline as income increases. However, the decline is less rapid for wheat products than it is for the products other than wheat.

Estimates of the price elasticities of demand for the wheat products and for rice are presented in Table 10. These are taken from Garcia (1978). For three wheat products the absolute sizes of these elasticities increases as income level increases, and then decline at higher income level. For rice, the price elasticity declines continuously as family income rises. the elasticities tend to be higher for wheat bread and wheat flour than for macaroni and rice.

The Income Distribution Effect

The effects of the 1974-75 consumption subsidy on the income distribution of the population of the Belo Horizonte metropolitan area were quantified using the data presented in Tabels B.1 and B.2, Appendix B, Table 10, and the formulas developed in Chapter 2. These calculations provide a rough idea of the income distribution effects of the consumption policy when the distortion in the exchange rate is taken into account (Table 11).

The estimated per capita subsidy by income class increases with the increase in expenditure level. This is caused by the larger quantity of wheat products consumed as income increases. The change in consumer welfare as a percentage of total costs decreases from the first to the fourth class and increases thereafter. This is primarily a result of the size and hevavior of the different price elasticities of demand for wheat bread, macaroni and wheat flour

Table 10 Estimates of Direct Price Elasticities of Demand, Wheat Products and Rice, by Income Class, Juiz de Fora, MG, 1973.

Household Income Classes Cr$	Demand Elasitcities			
	Wheat Bread	Macaroni	Wheat Flour	Rice
Less than 4,591	- 0.199	- 0.119	0.284	- 0.153
4,591 - 7,143	- 0.427	- 0.144	- 0.472	- 0.150
7,144 - 10,053	- 0.486	- 0.127	- 0.512	- 0.126
10,054 - 13,158	- 0.484	- 0.107	- 0.528	- 0.105
13,159 - 18,645	- 0.407	- 0.082	- 0.553	- 0.078
18,646 - 32,978	- 0.220	- 0.058	- 0.566	- 0.058
32,979 - 44,991	0	- 0.041	- 0.559	- 0.040
44,992 - 74,876	0	- 0.028	- 0.575	- 0.026
74,877 - 166,835	0	- 0.014	- 0.589	- 0.014

SOURCE: Garcia (1978).

Table 11 Estimated Per Capita Distribution of Yearly Costs and Benefits, Wheat Consumption Policy, Metropolitan Area of Belo Horizonte, MG, Brazil, in Cr$, 1974[1].

Household Expenditure Classes Cr$	Per Capita Expenditure PCE	Per Capita Subsidy PCS	%	Change in Consumer Welfare CCW	% of PCS	Social Cost SC	% of PCS	$\frac{CCW}{PCE} \times 100$
Less than 4,500	1,604	35	100	28	82	6	18	1.77
4,500 - 8,999	1,749	35	100	24	66	12	34	1.35
9,000 - 11,299	2,549	42	100	27	63	16	37	1.05
11,300 - 15,799	2,692	44	100	27	62	17	38	1.01
15,800 - 22,599	3,793	46	100	30	66	15	34	0.80
22,600 - 31,500	4,453	52	100	41	78	11	22	0.92
31,600 - 45,199	5,919	60	100	57	96	2	4	0.96
45,200 - 67,799	10,869	59	100	57	96	2	4	0.52
Over 67,799	27,494	62	100	58	94	4	6	0.21

Source: Calculated by the author.

Note: [1]Wheat products include wheat bread, macaroni and wheat flour directly used by consumers.

(Table 10). the results presented in Table 11 were obtained from the summation of the individual results for wheat bread, macaroni and wheat flour[24].

The social cost is greater for the low and medium-income consumers than for the upper income groups. This is due primarily to the magnitude of the price elasticity of demand (Table 10).

The last column of Table 11 shows the relative impact of the consumption subsidy on the consumer's real expenditures. The two lower-expenditure classes have a greater relative gain than the medium and higher classes. The medium classes, from the third class up to the seventh, show approximately the same relative gain. the two highest expenditure classes gain on the average 73 percent less than the average of the two lowest expenditure classes. These results suggest that a cut in the concumption subsidy will hurt the low- and medium-income groups relatively more than the higher income groups.

In an attempt to evaluate the effects of transferring the consumption subsidy from wheat to rice, we estimated for rice, in Table 12, the same policy measures as are estimated for wheat in Table 11, considering the value of the subsidy to be the same[25]. Three main advantages appear to favor a rice subsidy compared to a wheat subsidy. First, the change in consumers' welfare is larger for the lower income classes up to the sixth income class. Second, the social costs are extremely low due to the lower price elasticity of demand. And finally, the increase in the real expenditure power is almost doubled for the first five income classes, with the exception of the first income class wich remains

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[24]The individual results are not presented, but can be obtained from the author.

[25]For details on the methodology and data set used to derive the results of Table 8, see Appendix C.

Table 12 Estimated Per Capita Distribution of Yearly Costs and Benefits, General Price Subsidy to Rice in the Metropolitan Area of Belo Horizonte, MG, Brazil, in Cr$, 1974.

Household Expenditure Classes Cr$	Per Capita Expenditure PCE	Per Capita Subsidy PCS	%	Change in Consumer Welfare CCW	% of PCS	Social Cost SC	% of PCS	$\frac{CCW}{PCE} \times 100$
Less than 4,500	1,604	32	100	31	97	0.99	3.15	1.90
4,500 - 8,999	1,749	50	100	48	97	1.55	3.09	2.77
9,000 - 11,299	2,549	53	100	52	97	1.38	2.61	2.02
11,300 - 15,799	2,692	53	100	52	98	1.16	2.18	1.93
15,800 - 22,599	3,793	53	100	52	98	0.86	1.62	1.38
22,600 - 31,599	4,453	50	100	50	99	0.61	1.21	1.11
31,600 - 45,199	5,919	45	100	45	99	0.38	0.84	0.76
45,200 - 67,799	10,869	42	100	42	99	0.23	0.54	0.39
Over 67,799	27,494	35	100	35	100	0.10	0.29	0.13

Source: Calculated by the author.

almost unchanged. All of these results are mainly due to the higher per capita consumption of rice by all income classes, and especially the first classes, and to the small and decreasing magnitudes of the price elasticities of demand for rice as income increases (see last column of Table 10).

Table 13 is derived from Tables 11 and 12, and Table B.3 of Appendix B. It presents the cumulative distributions of consumers, total expenditures, and change in consumers' welfare for the case of wheat and for the case of rice. Those cumulative distributions are used for drawing the concentration curves of Figure 9[26]. At the out-set, it can be seen that with the exception of the first income stratum, the distribution of the change in consumers' welfare when the consumption subsidy is for rice is slightly biased toward the low-income group. This is because the cumulative percentage of the change in consumers' welfare in the case of rice is almost always greater then in the case of wheat and is also greater than the cumulative percentage of the population.

Figure 9 shows five basic curves. Curve A is the change in the consumers' welfare distribution curve when the subsidy is given to rice. Curve B is the perfect equality curve. Curve C es the same as Curve A when the subsidy is given to wheat. Curve D is the expenditure distribution curve. And last, Curve E is the line of perfect inequality.

Some important conclusions can be drawn from Figure 9. First, since Curve A, except for the first income class, is above Curve B, the distribution of benefits of a rice consumption subsidy is biased toward low-income people. The reverse is true for Curve C. However,

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[26] These curves have interpretations analogues to the Lorenz curve for income distribution.

Table 13 Cumulative Percentages of Consumers' Expenditure and Change in Consumers' Welfare per Expenditure Class in Belo Horizonte, MG, Brazil, 1974-75.

Household Expenditure Classes Cr$	Cumulative % of Consumers[1]	Cumulative % of Total Expenditure[1]	Cumulative % of CCW with Wheat Subsidy[2]	Cumulative % of CCW with Rice Subsidy[3]
Less than 4,500	1.2	0.3	0.9	0.8
4,500 - 8,999	11.3	2.9	8.0	11.4
9,000 - 11,299	18.4	5.6	14.0	19.2
11,300 - 15,799	33.6	11.6	27.4	35.9
15,800 - 22,599	51.3	21.5	43.7	55.4
22,600 - 31,599	67.8	32.4	61.0	72.6
31,600 - 45,199	81.0	43.9	77.0	85.0
45,200 - 67,799	89.5	57.6	87.1	92.5
Over 67,799	100.0	100.0	100.0	100.0

Source: Calculated by the author.

Notes: [1]Columns 3 and 4 of Table B.3, Appendix B.

[2]Cumulative multiplication of Column 3 of Table 11 and Column 3 of Table B.3, Appendix B. And CCW = Change in Consumers' Welfare.

[3]Cumulative multiplication of Column 3 of Table 11 and Column 3 of Table B.3, Appendix B. And CCW = Change in Consumers' Welfare.

since Curve C is above Curve D, the wheat consumption subsidy--even though biased toward high-income groups--has some power to deconcentrate income.

The main problem with the subsidies for both wheat and rice is related to their low cost-effectiveness, caused by a large spill-over effect. This will be shown in the next section.

A final question is, "Which consumption subsidy would be better from a nutritional standpoint?" Since both wheat products and rice are rich calorie sources, we attempted to evaluate the per capita daily gain in calories due to the subsidy for each product (Table 14). In both cases, the increase in calorie consumption was relatively small (less than 1.5% of the per capita calorie consumption). This is because of the relatively low values of the price elasticities of demand for both products. In effect, the subsidies were working more as an income transfer than as an instrument to stimulate food consumption directly.

The spillover effect of these policies for either wheat or rice is large because the nonterget group, consumers above the third income stratum, for example, consume the largest amount of the total wheat or rice consumed. Hence one can conclude that a general price subsidy for rice presents a lower social cost than a general price subsidy for wheat. Moreover, if the primary goals of subsidizing food consumption is to improve the income distribution and the nutritional status of the poor, then rice is slightly better them wheat. In the case of wheat, a general price subsidy is even more costly because the present wheat consumption policy directs the subsidy to the wheat grain that millers buy from the government. A study by Pereira Soares (1980) reported that during the period 1967 to 1977 millers appropriated approximately one-third of the

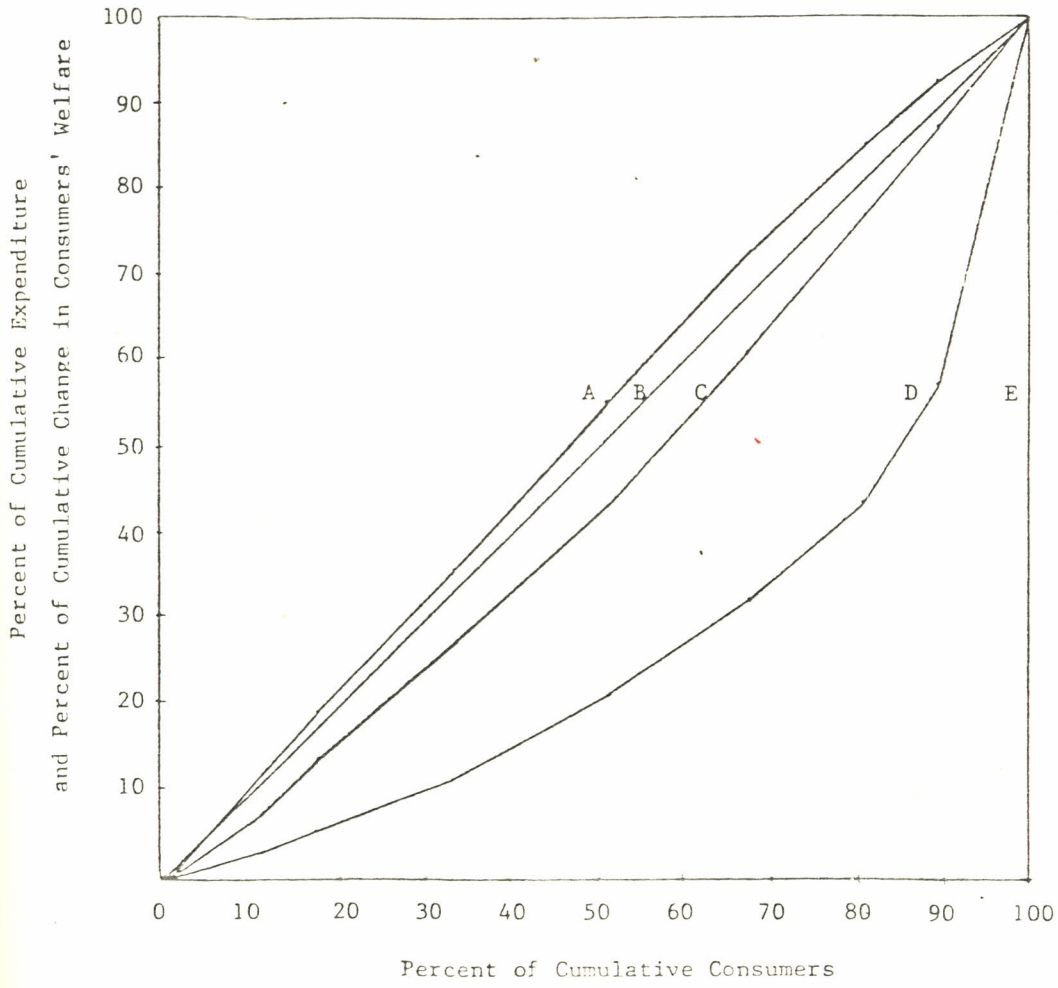

Figure 9 - Concentration Curves

Table 14 Estimated Daily Increase in Calorie Consumption Due to a General Price Consumption Subsidy, Wheat and Rice, Belo Horizonte, MG, Brazil, 1974.

Household Expenditure Class	Calorie Consumption[1] A	Increase in Calories: Wheat Subsidy[2] B	Increase in Calories: Rice Subsidy[2] C	$\frac{C}{B} \times 100$
Less than 4,500	1,446	11	17	154
4,500 - 8,999	1,804	20	27	135
9,000 - 11,299	1,826	26	24	92
11,300 - 15,799	1,875	28	20	71
15,800 - 22,599	1,907	26	15	58
22,600 - 31,599	2,007	20	10	50
31,600 - 45,199	2,132	6	7	116
45,200 - 67,799	2,163	7	4	57
Over 67,799	2,313	10	2	20

Source: Calculated by the author.

Notes: [1]This column is the actual per capita calorie consumption surveyed by FIBGE (2), less the increase in calories due to the wheat consumption subsidy, since the subsidy was in effect in 1974.

[2]These columns were obtained from the model developed in Chapter 2.

value of the subsidy through manipulations in the production of special wheat flour and in the marketing of the bran, which was not under strong government control.

In the case of rice, even if there were better distributional characteristics (see Figure 9), a general price subsidy would be very difficult to administer because of a lack of organizational structure (see Carvalho, 1981). The question remains, if the governments's real goals are a more equitable distribution of income and/or insuring the nutritional status of the poor, which kind of program should the government undertake? The next section will tackle this question.

Alternative Consumption Policies

In this section we present and discuss the results obtained from the application of the disaggregated model presented in Chapter 2. The model was applied to the case of wheat bread, rice, and edible beans, considering Brazil as a whole. The data set used in the analysis is found in Table A.6 of Appendix A. The policy objective was to increase the per capita daily consumption of calories by the target group by 64 calories--the increase achieved by the 1974 wheat subsidy (for details, see footnote 7 in Table A.6, Appendix A).

As shown by the results in Table 15, for the case of wheat bread the most cost-effective program--the best in terms of lowest fiscal cost and low per unit cost of additional wheat bread supplied to consumers--was a food stam program. The two worst programs were a target oriented price subsidy and a general price subsidy, which have high fiscal costs and a consequent high cost per unit of increment in wheat bread consumption.

Table 15 Estimated Fiscal Costs and the Costs of Each Additional Unit of Wheat Bread Consumed under Alternative Programs, and Alternative Parameters, Brazil, 1974 (Cr$ of 1977).[1]

Program		ε = 1.5		ε = 3.0		ε = ∞	
		η_p		η_p		η_p	
		-0.4	-0.6	-0.4	-0.6	-0.4	-0.6
Target Oriented							
Food Stamp	FC[2]	6.96	7.42	6.22	6.42	5.38	5.38
	UC[3]	15.56	16.59	13.91	14.36	12.02	12.02
	% TE[4]	3.75	4.00	3.35	3.46	2.90	2.90
Price Subsidy	FC	19.07	13.70	18.33	12.70	17.49	11.66
	UC	42.63	30.64	40.99	28.41	39.10	26.06
	% TE	10.28	7.38	9.88	6.84	9.43	6.28
General							
Price Subsidy	FC	35.22	23.48	30.94	20.63	33.75	20.97
	UC	78.75	52.50	69.19	46.13	75.48	46.90
	% TE	18.98	12.65	16.67	11.12	18.19	11.30

Source: Calculated by the author.

Notes: [1]Estimates of $\eta_p = -0.4$ and $\varepsilon = 1.5$ were obtained from Garcia (1978), and assumed by the author respectively. The estimate $\eta_p = 0.6$, is arbitrarily 50% larger, in absolute value, than the estimated original value, -0.4. The same procedure was applied to obtain $\varepsilon = 3.0$, and for sensitivity purposes, $\varepsilon = \infty$ was also arbitrarily assumed. η_r and η_p can be obtained through the use of the formulas in Section 2.3, knowing that the value of $\alpha = 0.5$ and $\eta_t = -0.34$, with this last value obtained from Ferreira e Silva (1981).

[2]FC = Fiscal Cost in billions of real Cr$ of 1977;

[3]UC = Unit Cost of additional wheat bread consumed. The price of one Kilogram of wheat bread in real terms of 1977 was Cr$12.02 in 1974 (FIBGE (1)).

[4]*% TE = percentage of the FC with respect to the treasure expenditure* during 1974 (Cr$185,567,430,000) in real Cr$ of 1977 (Banco Central, 1982, p. 68).

When the general price subsidy program is compared with a food stamp program for bread, it can be seen that the fiscal cost of the subsidy program could be three to five times that of a food stamp program. This is a very significant difference. If the present fiscal cost of the general price subsidy for wheat were shifted to a food stamp program for bread the per capita benefits could be substantially larger. Moreover, the fiscal cost of a food stamp program as a percentage of the treasury expenditure is one-third to one-fourth of that of a general price subsidy. This is important because Brazil has been pressed by the IMF to reduce the budget deficit. A shift from the general price subsidy for wheat to a food stamp program for wheat bread could contribute strongly to that objective without lowering the nutritional status of low income people.

The sensitivity analysis with the different values of the price elasticities of supply (ε) and demand (η_p) show that as the supply elasticity of wheat bread increases together with the elasticity of demand for wheat bread, with the target group held constant, the fiscal cost of all programs decreases. Given that Brazil is a net importer of wheat (facing a horizontal world supply of wheat grain and wheat flour), and if the bakery industry can be assumed to be a constant cost industry, then the more realistic fiscal costs would be those under the $\varepsilon = \infty$. This puts the food stamp program for bread in a favorable position when compared with the general price subsidy for wheat bread. The results of the sensivity analyses of the different price elasticities of demand with a fixed supply elasticity, in general, did not show great differences.

The results for the case of rice are presented in Table 16. Again, the best program is the food stamp program. It has the lowest fiscal cost and consequently the lowest cost per additional

Table 16 Estimated Fiscal Costs and the Costs of Each Additional Unit of Rice Consumed, Alternative Programs, Alternative Parameters, Brazil, 1974 (Cr$ of 1977)[1].

Program		$\varepsilon = 0.31$		$\varepsilon = 0.62$		$\varepsilon = \infty$	
		η_p		η_p		η_p	
		-0.15	-0.23	-0.15	-0.23	-0.15	-0.23
Target Oriented							
Food Stamp	FC[2]	5.82	8.36	4.76	5.76	3.03	3.03
	UC[3]	17.62	25.29	14.42	17.42	9.18	9.18
	% TE[4]	3.14	4.51	2.57	3.10	1.63	1.63
Price Subsidy	FC	26.21	20.60	25.15	18.00	23.42	15.27
	UC	79.30	62.32	76.10	54.45	70.86	46.21
	% TE	14.12	11.10	13.55	9.70	12.62	8.23
General							
Price Subsidy	FC	61.22	39.93	50.56	32.97	45.99	28.74
	UC	185.81	120.81	152.98	99.77	139.15	86.95
	% TE	32.99	21.52	27.25	17.77	24.78	15.49

Source: Calculated by the author.

Notes: [1]Estimates of $\eta_p = -0.15$ and $\varepsilon = 0.31$ were taken from Garcia (1978) and Pastore (1971), respectively. The estimate $\eta_p = -0.23$ was obtained by arbitrarily increasing η_p by 50 percent, in absolute value, than its original value, -0.15. The same procedure was used to obtain $\varepsilon = 0.62$. For function sensitivity purposes, it was arbitrarily assumed that $\varepsilon = \infty$. η_r and ε_p can be obtained through the use of the formulas in Section 2.3, knowing that the value of $\alpha = 0.5$ and $\eta_t = -0.13$ [average from Paniago (1969) and Mandell (1972) estimates for Brazil].

[2]FCm= Fiscal Cost in billions of real Cr$ of 1977.

[3]UC = Unit Cost of additional wheat bread consumed. The price of one Kilogram of rice in real Cr$ of 1977 was Cr$ 9.18, in 1974 (FIBGE(1)).

[4]%TE = percentage of the FC with respect to the treasury expenditure during 1974 (Cr$ 185,567,430,000) in real Cr$ of 1977 (Banco Central, 1982, p. 68).

unit of rice consumed by the target group. For the remaining programs in increasing order of magnitude of fiscal cost, we have a price subsidy for a targed group and a general price subsidy. The differences in cost effectiveness among all three programs are, in general, substantially large, indicating that any program other than a food stamp program would put a sizeable drain on the public budget. In a short-run situation, for a typical case for rice in Brazil with a price elasticity of supply of $\varepsilon = 0.31$, and a price elasticity of demand by the low-income group of $\eta_p = -0.15$, a food stamp program is four times cheaper than a target-oriented price subsidy, and more than ten times cheaper than a general price subsidy.

The sensitivity analysis indicated that as ε is increase with η_p fixed, the value of all policy measures (FC, UC and % TE) declines, although in general it declines slowly. the same can be said for the case of varying η_p with ε fixed.

The results for the case of edible beans are presented in Table 17. The rank in terms of cost-effectiveness is food stamp, target oriented price subsidy and general price subsidy. The sensitivity analysis and the differences among programs follow the same pattern as for rice. If the typical short-run situation for edible beans in Brazil is considered to be a price elasticity $\varepsilon = 0.26$ and a demand elasticity $\eta_p = -0.40$, then a food stamp program is more than six times cheaper than a general price subsidy.

Now let us compare typical cases for wheat bread ($\varepsilon = \infty$, $\eta_p = -0.40$), rice ($\varepsilon = 0.31$, $\eta_p = -0.15$), and edible beans ($\varepsilon = 0.26$, $\eta_p = -0.40$) in order to test the hypothesis defended by some policy makers and researchers in Brazil and elsewhere: that a shift in the general price subsidy from wheat to rice or beans would result in a

Table 17 Estimated Fiscal Costs and the Costs of Each Additional Unit of Edible Beans Consumed, Alternative Programs, and Alternative Parameters, Brazil, 1974 (Cr$ of 1977)[1].

Program		$\varepsilon = 0.26$		$\varepsilon = 0.52$		$\varepsilon = \infty$	
		η_p		η_p		η_p	
		-0.40	-0.60	-0.40	-0.60	-0.40	-0.60
Target Oriented							
Food Stamp	FC[2]	5.65	7.63	4.84	5.92	3.31	2.79
	UC[3]	18.75	25.33	16.07	19.65	9.26	9.26
	% TE[4]	3.04	4.11	2.61	3.19	1.50	1.50
Price Subsidy	FC	11.93	10.89	11.13	9.18	11.22	6.05
	UC	39.62	36.16	36.94	30.48	31.42	20.09
	% TE	6.43	5.87	6.00	4.95	4.89	3.26
General							
Price Subsidy	FC	42.66	28.44	26.71	17.81	21.25	10.79
	UC	141.62	94.41	88.68	59.12	59.53	35.83
	% TE	22.99	15.37	14.39	9.60	9.33	5.81

Source: Calculated by the author.

Notes: [1]Estimates of $\eta_p = -0.40$ and $\varepsilon = 0.26$ were assumed by the author [based on the value of $\eta_t = -0.32$ estimated by Paniago (1969) and the midpoint between the estimates made by Paniago (1969), 0.14, and by Pastore (1971), 0.37, respectively. In order to obtain the values $\eta_p = -0.60$ and $\varepsilon = 0.52$ and $\varepsilon = \infty$, the same procedure was used as in Table 15. The value of α was assumed $\alpha = 0.5$.

[2]FCm= Fiscal Cost in billion of real CR$ of 1977.

[3]UC = Unit Cost of additional wheat bread consumption. The price of one Kilogram of edible beans in real Cr$ of 1977 was Cr$ 9.26,in 1974 (FIBGE(1)).

[4]%TE = percentage of the TC with respect tot he treasury expenditure during 1974 (Cr$185, 567, 430,000) in real Cr$ of 1977 (Banco Central, 1982, p. 68).

lower cost alternative. The results in Tables 15, 16 and 17 reject the above hypothesis since the fiscal cost of a general price subsidy for wheat bread is shown to be almost half the cost of a similar program for rice or beans. However, in all of the cases, a general price subsidy puts a heavy burden on the treasury (see % TE). Because of this and the high spillover effect discussed earlier, even the cheapest subsidy program, the one for wheat bread, does not appear to be the best for the Brazilian situation.

Let us next consider and compare cases for a food stamp program. The cost of a food stamp program for wheat bread (5.38 billion cruzeiros or US$ 269 million, five times less than a general price subsidy for wheat bread), would not differ greatly from that for the rice or even for beans. If the choice is to be between a program for wheat bread and one for rice or beans, then a case might be made favoring rice or beans in order to save foreign exchange on wheat imports. This assumes that the fiscal cost difference of the two programs (Tables 15 and 16) are not significant, and that the additional rice or beans consumed will be produced economically domestically.

One should not forget that, even if the choice of rice in these circumstances could lead to savings in foreign exchange, on the other hand there is a social cost implicit in any program. It could be that, in a general equilibrium framework, the choice of a food stamp program for rice, as mentioned above, would lead to a decline in exports and, consequently, to a decline in foreign exchange revenue due to the high domestic resource costs of the import substitution policy of choosing rice over wheat bread as a product for the food stamp program.

CONCLUSIONS AND SUGGESTIONS FOR FUTURE RESEARCH

Conclusions

For the period considered in this study (1966-1982), the Brazilian government made a sustained effort to achieve self-sufficiency in wheat production through a production policy that consisted of a guaranteed producer price keyed to the cost of producing wheat. This producer price was generally above border prices evaluated at official exchange rates. In terms of increased wheat production compared with the levels of production if the free market had prevailed, this policy showed positive results in some ten years, and negative effect in seven others. The reason for this disparate result is that the value of the cruzeiro was persistently overvalued in this period. Hence, the producer subsidy in most cases was only offsetting the tax of a distorced exchange rate. In seven years of the period studied the producer subsidy did not cover the implicit tax of the overvalued currency.

The wheat consumption policy, like the production policy, had two main components, one caused by the overvalued currency working as an implicit subsidy for consumers, the other made up of an explicit general price subsidy, mainly after 1972. Throughout the period aggregated wheat consumption increased as a consequence of the policies, and with the exception of three years (1970-1972), this increase was greater than the increases in wheat production. As a whole, the explicit production subsidy was able to reduce imports in a net sense only during the three years referred to above. The gains in production were small, especially after discounting for the increase in seed demand the following year as a resul of increases in area planted[28].

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[28] The conclusions to this point are drawn from thr results of Tables D.2, Appendix D.

In total, the wheat production policies for the whole period represented a tax on producers of approximately 7 billion cruzeiros of 1977, which corresponds to 350 million dollars[29]. This was due in part to the rise in the price of wheat in the world market in the mid-and late 1970's, at which time the domestic price set by the government fell short of the border price. In addition, the overvaluation of the cruzeiro represented a tax on producers.

The social costs of the producer policies were around 2 billion cruzeiros, or 97 million dollars, and the estimated expenditure on foreign exchange induced by the policies was estimated to be more than 391 million dollars. This latter result was contrary to the stated objectives of the explicit producer policy. Because of these failures, the wheat production policy was unsatisfactory in terms of its stated objectives[30].

The total cost of the wheat consumption subsidy for the whole period was 122.5 billion cruzeiros, or 6.1 billion dollars. Of this total, by our estimates consumers captured 85 percent or 5.2 billion dollars. However, because of spillover effects (approximately one-third of the total subsidy[31]) manipulations by the millers (another one-third, estimated by Pereira Soares (1980)), and because the social costs amounted to 15 percent of the total cost of the subsidy, only 19 percent of this cost was captured by the true target group. An important conclusion thus is that the wheat consumption subsidy is a poor program in terms of cost-effectiveness. This conclusion is reinforced with the results obtained through the alternative consumption policies analysis in which a general price

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[29] Shadow price exchange rate for 1977 was equal to Cr$ 19.97/1 US$ (see Table A.3, Appendix A).

[30] For details, see Table D.5, Appendix D, and the discussion associated with that Table.

[31] This would be a lower bound if one considers that the non-target group would be more than 33% of the Brazilian population and this group, as was reported, consumed larger per capita quantities of wheat products.

subsidy for bread was ranked in third place and had a unit cost five times greater than that for a food stamp program.

In terms of foreign exchange expenditure, the wheat subsidy program cost Cr$ 44.3 billion or US$ 2.2 billion dollars, an expenditure not in accord with one of the objectives of the wheat production policy, which was to achieve a saving in foreign exchange. The effects of the production and consumption policies together are the sum of the individual effects of each policy.

From the disaggregated analysis one can conclude that, even though the gains in consumer welfare are slightly biased towards high-income groups, the wheat consumption subsidy contributed to the income redistribution objective by creating a more equal distribution of actual income. When the same subsidy costs for wheat were shifted to rice in a simulated general price subsidy, the result was that the distribution of the gains now were slightly biased toward the low-income groups. However, two main considerations should be made: the first is that even if a cut in the wheat consumption subsidy (or the simulated rice subsidy) harms the low- and medium-income group more, the drop in real expenditure is low (less than 2 percent). Second, the nutritional impact in terms of calories was very low--less than 1.5 percent of the total calorie intake *per capita*.

Some final conclusions, based on the cases studied, are that the wheat consumption subsidy is not a good policy for redistributing income, nor is it a good instrument for dealing with malnutrition problems. The alternative policy analysis showed that if consumption of any of the products considered (wheat bread, rice and edible beans) is to be subsidized, the subsidy should be through a target-oriented program such as a food stamp program. The food stamp program is shown to be four to ten times cheaper than a

general price subsidy, and two to six times cheaper than a target-oriented price subsidy.

Suggestions for Future Research

A large number of parameter used to produce the analysis of this study came from secondary sources. In some cases they were estimated for period of time other than that of the study, and under somewhat different conditions. The results could be improved with more updated estimates of parameters for aggregate supply and demand, disaggregate demand by income classes, shadow price of foreign exchange, and individual intake of wheat products by income classes.

Once estimates of the parameters of the aggregate demand and supply curves and of the disaggregated demand curves are obtained, it will be possible to develop a new set of formulas to calculate the policy measures derived in this study, thus relaxing the assumption of constant demand and supply parameters. Relaxing that assumption would bring more realism to the analysis.

The production policy analysis could also be extended to account for the net effect of all policies that effect wheat production in each year. Such an analysis could be performed by making use of the theory of effective protection.

In addition it would be interesting to extend the analysis of the alternative consumption policies to consider the set of products that would be more recommended to be subsidized in each typical macro-region in Brazil, considering the tastes and preferences of the target groups. Moreover it would be of interest to make estimates and comparisons of the administrative costs of target-oriented programs and country-wide programs.

Finally, it would be of interest to develop a plan to phase out both subsidies in order to minimize the negative effects on wheat growers and low-income consumers.

BIBLIOGRAPHY

BANCO DO BRASIL. "Trigo Nacional". Porto Alegre-RS. CTRIN, Dezembro 1979, 111 pages.

BANCO DO BRASIL. "Farm to Mill Expenses". CTRIN (Unpublished data). Porto Alegre-RS, 1984.

BANCO DO BRASIL. "Preços de Trigo para os Produtores e Volume de Produção". Porto Alegre-RS. CTRIN, 1983. (Unpublished data).

BANCO CENTRAL. Brasil Programma Econômico - Ajustamento Interno e Externo. 77 p. Outubro de 1982.

BALE, M.D. and E. LUTZ, "Price Distortions in Agriculture and Their Effects: An International Comparison" American Journal of Agricultural Economics, 63(1): 8-22, February 1981.

BARKER, R. and Y. HAYAMI, "Price Support Versus Input Subsidy for Food Self-Sufficiency in Developing Countries" American Journal of Agricultural Economics, 58(4): 617-28, February 1981.

BRAGA, H.C. and J.L. MASCOLO, "Comércio Exterior Setor Externo" Conjuntura Econômica, Março 1981, pp. 32-42.

CALEGAR, G.M. Brazilian Wheat Policy and Its Income Distribution and Trade Effects. Unpublished Ph.D. Dissertation, University of Minnesota 1984.

CARVALHO, L.E. "O Carácter Social da Política de Subsídio ao Trigo" Alimentação e Nutrição, Março 1981, pp. 32-42.

CFP. "Preços e Custos Domésticos e Internacionais: Distorções, Um Estudo Preliminar". Agosto 1983.

CONTADOR, C.R. "Trigo Nacional: O Custo Social da Auto - Suficiência" Estudos Econômicos, 4(3): 53-83, 1974.

CURRIE, J.M., J.A. MURPHY, and A. SCHMITZ, "The Concept of Economic Surplus and Its Use in Economic Analysis" Economic Journal, 81, (December 1971) 741-99.

FECOTRIGO. "Custo de Produção: Trigo Revisão Safra 1983, Soja-Estimativa 1983-84". Porto Alegre-RS, 32 p.

FERRREIRA E SILVA, T. Política Triticola - Efeitos de uma Redução no Subsídio. Universidade Federal de Viçosa, Viçosa-MG, 1981. 83 p. (Tese de M.S.).

FGV(1). Conjuntura Econômica. Rio de Janeiro (several issues).

FIBGE(1). Anuário Estatístico de Brasil, Rio de Janeiro (several issues).

FIBGE(2). "Special Runs of ENDEF: Consumption in Calories by Global Income Classes; Annex A: Number of Days Researched; Annex B: Average Number of Comensal Days". FIBGE, Rio de Janeiro (mimeographed).

FIBGE(3). Estudo Nacional da Despesa Familiar: Despesas das Famílias; Dados Preliminares. 6 Vol. Rio de Janeiro: FIBGE, 1978 and 1979.

FIBGE(4). Estudo Nacional da Despesa Familiar. Tabelas de Composição de Alimentos. 2ª edição, Rio de Janeiro, 1981.

GARCIA, J.C. Avaliação dos Impactos do Aumento no Oferta de Alimentos e Renda sobre a Nutrição Humana e suas Implicações para o Estabelecimento de Prioridades de Pesquisas Agrícolas no Brasil. Universidade Federal de Viçosa, Viçosa-MG, 160 p. 1978 (Tese de DS).

HALL, L.L. "Evaluating the Effects of P.L. 480: Wheat Imports in Brazil's Grain Sector" American Journal of Agricultural Economics, 62 (February 1980): 19-28.

IMF. International Financial Statisc, 1983.

JUST, R.E., D.L. HUETH, and A. SCHMITZ, Applied Welfare Economics and Public Policy. Prentice Hall, Englewood Cliffs, N.J., 1982.

KAKWANI, N.C. Income Inequality and Poverty - Methods of Estimation and Policy Application. Oxford University Press, 1980, p. 377.

KNIGHT, P. Brazilian Agricultural Technology and Trade - A Study of Five Commodities. Praeger Publishers, New York, 1971, p. 223.

LOPES, M.R. "The Mobilization of Resources from Agriculture: A Policy Analysis for Brazil". Unpublished Ph.D. Dissertation, Purdue University, 1977.

MANDELL, P.I. "A Expansão da Moderna Rizicultura: Crescimento de Oferta numa Economia Dinâmica" Revista Brasileira de Economia, 26(3): 169-236, Julho/Setembro 1972.

MARTIN, M.V. and R.F. BROKKEN, "The Scarcity Syndrome: A Comment" American Journal of Agricultural Economics, 63(1): 158-59, February 1983.

McCARTHY, F.D. and L. TAYLOR, "Macro Food Policy Planning: A General Equilibrium Model for Pakistan" The Review of Economics and Statistics, 62(1): 107-121, February 1980.

MENDONÇA DE BARROS, Exportações de Produtos Primários não Tradicionais. Série IPE - Monografias 4. Universidade de São Paulo, 1974, p. 97.

PANIAGO, E. "An Evaluation of Agricultural Price Policies for Selected Food Products: Brazil" Unpublished Ph.D. Thesis, Purdue University, 1969.

PORTELA DE LIMA FERNANDES, D. "Aspectos Econômicos e Estatísticos do Trigo no Brasil" Informe Agropecuário, Belo Horizonte, 9(97): 1-8, January 1983.

PEREIRA SOARES, A. Avaliação Econômica da Política Triticola de 1967 a 1977. Comissão de Financiamento da Produção, Coleção Análise e Pesquisa, Vol. 20, MA, Brasília, November 1980.

REUTLINGER, S. and M. SELOWSKY, Malnutrition and Poverty: Magnitude and Policy Options. The World Bank. The Johns Hopkins University Press, Baltimore, 1976.

ROJKO, A., D. REGIER, P. O'BRIEN, A. COFFING, and L. BAILEY. Alternative Futures for World Food in 1985. Washington, D.C.: United States Department of Agriculture, Foreign Agricultural Economic Report No. 146, 1978.

SUNAB. "Evolução do Preço do Trigo em Grão para Produtores e Moinhos e Consumo aparente de Farinha de Trigo". Departamento do Trigo, Rio de Janeiro, (mimeographed) 1983.

SCOBIE, G.M. Food in Egypt: Their Impact on Foreign Exchange and Trade. Research Report 40. Washington, D.C. International Food Policy Research Institute. 1983.

WILLIAMSON GRAY, C. Food Consumption Parameters for Brazil and Their Application to Food Policy. International Food Policy Research Institute. Research Report 32. September 1982.

WORLD BANK. Brazil: A Review of Agricultural Policies. 1982.

A P P E N D I C E S

APPENDIX A

DATA SET FOR THE AGGREGATED ANALYSIS

Table A.1 Observed Current Prices for Wheat Grain, Brazil, 1965-1982.

Year	Producer Price[1] Cr$/MT	Miller Price[2] Cr$/MT	CIF Import Price[3] Cr$/MT
1965	210	157	138
1966	265	180	158
1967	317	218	197
1968	383	273	235
1969	450	311	281
1970	490	402	300
1971	547	456	385
1972	600	511	466
1973	750	573	784
1974	1,400	713	1,478
1975	1,670	734	1,380
1976	2,130	766	1,702
1977	3,170	1,202	1,574
1978	4,150	1,432	2,506
1979	5,400	1,563	4,644
1980	11,840	2,206	11,654
1981	28,500	9,918	20,550
1982	58,823	23,921	36,051

Sources: [1]Banco do Brasil (1979, 1983).
[2]SUNAB (1983).
[3]FIBGE (1), the CIF price was obtained by dividing the total CIF value of wheat grain imports by the quantity imported.

APPENDIX A

Table A.2 Production, Seed Consumption, Consumption by Millers, and Total Imports: Wheat, Brazil, 1965-1982.

Year	Production[1] MT	Seeds[1] MT	Consumption[2] MT	Imports[3] MT
1965	221,576	17,602	-	2,380,659
1966	298,523	29,076	2,488,062	2,394,408
1967	364,870	47,661	2,404,039	2,446,017
1968	693,598	71,911	2,884,158	2,621,013
1969	1,146,319	117,155	2,907,855	2,355,599
1970	1,734,972	166,159	3,033,611	1,969,300
1971	2,038,632	224,831	3,209,356	1,710,521
1972	693,399	152,467	3,377,669	1,796,877
1973	1,934,439	219,351	3,797,636	2,945,548
1974	2,848,040	279,257	4,116,482	2,399,175
1975	1,582,587	344,575	4,437,274	2,082,376
1976	3,037,864	328,237	5,064,250	3,425,999
1977	2,012,842	382,699	5,252,116	2,608,068
1978	2,700,707	483,403	5,656,178	4,334,432
1979	2,881,186	402,889	6,096,512	3,650,741
1980	2,702,130	315,177	6,802,036	4,755,116
1981	2,223,632	388,272	6,097,950	4,360,034
1982	1,802,337	403,365	6,101,072	4,144,000

Sources: [1]Banco do Brasil (1979, 1983).
[2]SUNAB (1983).
[3]FIBGE (1).

APPENDIX A

Table A.3 Miscellaneous Data for the Aggregate Analysis of Brazilian Wheat Policy, Brazil, 1965-1983[1].

Year	General Price Index 1977=100 Annual Average[2]	General Price Index 1977=100 June 1977[2]	General Price Index 1977=100 November 1977[2]	Nominal Exchange Rate[3] cr$/US$	Shadow Price Exchange Rate[4] cr$/US$	Port to Mill Expenses as % of C.I.F. Prices[5]	Farm to Mill Expenses as % of Farm gate Prices[6]
1965	5.8	5.8	6.4	1.90	2.28	0.15	0.09
1966	8.1	8.0	8.9	2.22	2.66	0.15	0.09
1967	10.4	10.3	11.1	2.67	3.20	0.15	0.11
1968	12.9	12.9	13.9	3.38	4.06	0.15	0.14
1969	15.5	15.2	16.8	4.08	4.90	0.15	0.16
1970	18.6	18.4	19.9	4.59	5.51	0.15	0.20
1971	22.4	22.4	23.8	5.29	6.35	0.15	0.20
1972	26.2	26.1	27.6	5.93	7.12	0.15	0.19
1973	30.2	30.0	31.8	6.13	7.36	0.15	0.16
1974	38.8	39.3	42.3	6.79	8.15	0.15	0.16
1975	49.6	48.7	54.7	8.19	9.83	0.15	0.11
1976	70.1	68.5	79.9	10.67	12.80	0.15	0.13
1977	100.0	100.1	111.0	14.14	19.97	0.18	0.19
1978	138.7	137.4	157.3	18.07	21.68	0.16	0.20
1979	213.5	199.6	263.7	26.85	32.37[4]	0.14	0.22
1980	427.5	397.5	561.8	52.71	59.19[4]	0.13	0.15
1981	897.3	864.0	1,118.8	93.12	118.08[4]	0.13	0.15
1982	1,753.7	1,707.4	2,185.2	179.51	221.87[4]	0.14	0.16
1983	--	3,880.1	6,706.3	--	--	--	--

Notes: [1]The price elasticities of demand and supply of wheat grain for the whole period were, respectively, -0.25 and 0.75 obtained from Rojko et.al. (1978). [2]FGV(1). [3]IMF (1983). [4]Braga and Mascolo (1983), we use their percentage overvaluation and correct the nominal exchange rate column above for the years 1979-1982 and for the other years we assumed as justified in the Chapter 3, 20% of overvaluation of the cruzeiro. [5]See Table 4 Appendix A, a simple average from 1976-1982 was used for the years 1965-1975. [6]Calculated from Table 5 Appendix A.

APPENDIX A

Table A.4 Estimated Port to Mill Expenses for Imported Wheat, Brazil, 1976-82 (Nominal Cr $/MT).

Item		1976/77 SA[3]	ES[3]
1.	C.I.F. cost	1,847.48	1,526.20
2.	Port to mill expenses (2.1-2.12)	277.89	277.07
2.1.	TMP[1] (3% of CIF)	54.42	45.79
2.2.	AFRMM[2]	66.24	78.43
2.3.	Quality sample at the origin	0.70	0.83
2.4.	Loading	0.93	1.10
2.5.	Unloading	0.70	0.83
2.6.	Port expenses	31.15	36.88
2.7.	"Desestiva"	10.89	12.89
2.8.	Freight (Port to mill)	22.82	27.01
2.9.	Opening of credit (1% of FOB)	17.02	13.69
2.10.	Bank of Brazil-CACEX-fee (0.9% of FOB)	15.32	12.32
2.11.	Commission on freight	1.28	1.51
2.12.	Bank of Brazil commission (3% of CIF)	55.42	45.79
3.	(2) as % of (1)	15.04	18.15

Source: CFP (1983)

Notes: [1]TMP = fee to improve the ports.

[2]AFRMM = fee to improve the Merchant Marine.

[3]SA = average for September, October, and November for year t.
ES = average for April, May, and June for year t + 1.

Table A.4 (continued)

1977/78		1978/79		1979/80	
SA	ES	SA	ES	SA	ES
1,682.05	2,411.65	2,713.97	4,176.80	5,221.00	11,001.94
305.38	388.23	436.91	601.37	751.70	1,415.78
50.46	72.35	81.42	125.30	156.63	330.06
86.43	99.47	111.94	138.66	173.32	284.63
0.91	1.05	1.18	1.46	1.82	2.99
1.21	1.40	1.57	1.94	2.43	3.98
0.91	1.05	1.18	1.46	1.82	2.99
40.65	46.78	52.65	65.21	81.51	133.86
14.21	16.35	18.40	22.79	28.49	46.78
29.77	34.26	38.56	47.76	59.70	98.03
15.09	21.71	24.44	36.22	45.27	93.12
13.58	19.54	21.99	32.60	40.74	83.80
1.67	1.92	2.16	2.67	3.34	5.48
50.46	72.35	81.42	125.30	156.63	330.06
18.16	16.10	16.10	14.40	14.40	12.87

Table A.4 (continued)

1980/81		1981/82		1982/83	
SA	ES	SA	ES	SA	ES
13,022.79	18,511.48	24,589.28	32,265.54	43,533.06	87,189.57
1,675.82	2,390.53	3,175.13	4,344.60	5,862.73	12,245.82
390.68	555.34	737.68	967.97	1,305.99	2,615.69
336.91	479.80	637.33	914.98	1,234.49	2,720.66
3.54	5.04	6.69	9.60	12.95	28.54
4.72	6.71	8.92	12.80	17.27	38.06
3.54	5.04	6.69	9.60	12.95	28.54
158.45	225.64	299.72	430.30	580.56	1,279.48
55.37	78.85	104.74	150.37	202.87	447.11
116.04	165.25	219.50	315.13	425.17	937.01
110.21	160.04	212.59	288.57	389.34	780.43
99.20	144.04	191.33	259.71	350.41	702.39
6.48	9.23	12.26	17.60	23.74	52.32
390.68	555.34	737.68	967.97	1,305.99	2,615.59
12.90	12.90	12.91	13.47	13.47	14.04

APPENDIX A

Table A.5

Total Farm to Mill Expenses for Domestically Produced Wheat in Brazil, 1966-1982 (nominal Cr $/MT).

Year	Freight	Storage	Conser-vation	Port Expenses	Personal Expenses	Bank of Brazil Commission	General Expenses	Insurance	ICM tax
1966	15.37	7.92	0.00	0.00	0.02	0.59	1.50	2.69	0.00
1967	21.05	14.72	0.00	0.53	0.22	0.47	1.37	3.18	0.00
1968	36.03	14.01	0.00	1.77	0.21	1.13	1.49	3.88	0.04
1969	50.82	17.73	0.00	2.12	0.15	2.24	1.37	4.60	0.00
1970	69.03	27.86	0.00	2.24	0.09	3.29	1.68	5.06	0.12
1971	75.47	31.78	0.00	3.03	0.14	2.38	3.34	5.67	0.09
1972	74.84	28.33	2.11	4.29	0.27	3.00	3.97	5.69	0.01
1973	99.50	28.09	1.87	4.17	0.32	3.27	3.81	7.61	0.07
1974	181.16	38.62	2.89	6.06	0.30	4.66	4.61	16.04	0.24
1975	133.94	52.00	3.12	4.42	0.58	3.49	9.60	15.88	0.08
1976	157.59	74.58	4.12	11.69	0.20	4.18	7.52	20.68	56.47
1977	319.35	92.71	6.01	7.85	0.65	5.01	23.96	31.19	212.52
1978	422.81	139.66	8.26	24.28	0.53	5.72	28.80	41.02	295.57
1979	770.03	205.42	13.03	32.90	0.77	8.58	28.94	52.69	419.21
1980	1,591.01	545.99	44.71	70.98	1.39	43.70	79.95	116.46	54.35
1981	3,030.46	1,723.51	0.00	85.33	3.17	99.42	246.50	286.10	700.01
1982	6,942.70	2,597.97	0.00	315.61	7.38	149.33	686.24	577.87	2,534.03

Source: Banco do Brasil (1984).

APPENDIX A

Table A.6 Data for the Alternative Policy Analysis Section, Brazil, 1974.

Parameter	Units	Product		
		Wheat Bread	Rice	Edible Beans
P_o [1]	Cr/Kg	12.02	9.18	9.26
Q_o [2]	Kg	2.97×10^9	4.2×10^9	2.0×10^9
α [3]	-	0.50	0.50	0.50
λ [4]	-	0.3011	0.1577	0.3573
ε [5]	-	∞	0.31	0.26
η_t [5]	-	-0.34	-0.13	-0.32
η_P [5]	-	-0.40	-0.15	-0.40
Δ_q [6]	Kg	447,226,770	330,505,490	356,985,160

Notes: [1] All these prices were obtained from FIBGE (1) and made real prices for 1977 through the use of the GPI of Table 3, Appendix A, column 2. In order to obtain the price of wheat bread without the wheat consumption subsidy, the same procedure was used as explained in section 2.2, with the difference that here we are using national prices. In other words, price of wheat bread $P_o^{WB} = 8.38$, price of wheat flour, $P_o^{WF} = 3.61$ and price of wheat grain, $P_o^{G} = 1.84$.

[2] All these quantities are approximate annual consumption in Kg by the Brazilian population in 1974 (103 million people), and were calculated departing from the per capita consumption of Table 2. For purposes of this study it was assumed that 1 Kg of wheat bread requires 0.8 Kg of wheat flour, and 1 Kg of wheat grain produces 0.75 Kg of wheat flour. The quantity of wheat bread above was obtained assuming that all wheat grain would be used for wheat bread and after subtracting the increase in consumption of wheat grain due to the wheat consumption subsidy of 1974 (951,574 MT, in 1974, see Table D.3 column 3).

[3] It was assumed to be $\alpha = 0.50$.

Table A.6 (continued)

[4]It was calculated as $\lambda = \Delta q/\alpha Q_o$. Recall that for the case of wheat bread $\lambda = \Delta q/\alpha(Q_o - q_{total})$ because there was at that time a wheat consumption subsidy.

[5]For explanation see footnotes of Tables 24, 25, and 26.

[6]Δq was calculated assuming that the objective of the policy would be to increase the daily calorie consumption of the target group ($\alpha = 0.50$) by 64 calories. The increase in wheat consumption due to the wheat consumption subsidy in 1974 produced this effect, when the increased wheat grain consumed refered to above (footnote 2) was converted to bread and divided by the population x 365 and multiplied by 2690 Cal. = 1 Kg of wheat bread. For rice 1 Kg = 3640 Cal. and for edible beans 1 Kg = 3370 Cal. For the information on calorie contents see FIBGE (4).

APPENDIX B

Table B.1 Annual Expenditure on Wheat Bread and Crackers, Macaroni, and Wheat Flour, Per Capita by Expenditure Class, Metropolitan Area of Belo Horizonte and Rural Area of Minas Gerais and Espirito Santo, Brazil, 1974-75 (cruzeiros).

Products	Expenditure Classes								
	less than 4500	4500 to 8999	9000 to 11299	11300 to 15799	15800 to 22599	32600 to 31599	31600 to 45199	45200 to 67799	over 67799
	Metropolitan Area								
Wheat Bread & Crackers	30	37	57	62	82	137	170	150	189
Macaroni	25	20	28	23	27	33	30	28	30
Wheat flour	2	1	2	2	2	5	5	5	10
	less than 2300	2300 to 3399	3400 to 4499	4500 to 6799	6800 to 8999	9000 to 25,799	15,800 to 22,599	22,600 to 31,599	over 31,599
	Rural Areas								
Wheat Bread & Crackers	2	6	6	9	15	18	25	35	61
Macaroni	6	12	11	16	20	18	25	22	29
Wheat Flour	0	1	2	2	3	7	10	12	14
Rice	39	77	93	112	159	163	190	221	265

Source: FIBGE (3)

APPENDIX B

Table B.2 Calorie Consumption of Wheat Bread, Macaroni, and Wheat Flour, Per Consumer Per Day, Metropolitan Area of Belo Horizonte and Rural Areas of Minas Gerais and Espirito Santo, Brazil, 1974-75 (calories).

Products	Expenditure Classes Cr$								
	less than 4500	4500 to 8999	9000 to 11299	11300 to 15799	15800 to 22599	32600 to 31599	31600 to 45199	45200 to 67799	over 67799
	Metropolitan Area								
Wheat Bread & Crackers	73	107	132	152	166	199	252	265	274
Macaroni	109	83	94	84	79	79	69	53	48
Wheat flour	7	6	10	11	12	19	18	20	34
Rice	274	435	465	470	475	453	412	386	321
	less than 2300	2300 to 3399	3400 to 4499	4500 to 6799	6800 to 8999	3000 to 15,799	15,800 to 22,599	22,600 to 31,599	over 31,599
	Rural Areas								
Wheat Bread & Crackers	4	13	13	17	25	32	37	58	71
Macaroni	28	42	52	60	65	61	79	69	70
Wheat Flour	1	2	10	11	14	30	45	42	50
Rice	186	272	337	410	465	551	557	660	663

Source: FIBGE (2)

APPENDIX B

Table B.3 Data for Derivation of the Expenditure and Change in Consumer Welfare Curves, Belo Horizonte, MG, Brazil, 1974-75.

Household Expenditure Classes Cr$	Per Capita Expenditure Cr$ A	Number of Consumers in 1000 B	Total Expenditure in Cr$1000 A x B
Less than 4,500	1,604	22	37,102
4,500 - 8,999	1,749	184	321,816
9,000 - 11,299	2,549	128	326,272
11,300 - 15,799	2,692	275	740,300
16,000 - 22,599	3,793	320	1,213,760
22,600 - 31,599	4,453	300	1,335,900
31,600 - 45,199	5,919	240	1,420,560
45,200 - 67,799	10,869	155	1,684,695
Over 67,799	27,494	190	5,223,860
TOTAL	--	1,814	12,304,265

Source: FIBGE (3)

APPENDIX C

A SIMPLE MODEL FOR ANALYZING THE EFFECT OF SHIFTING THE SUBSIDY FROM WHEAT TO RICE

The market for rice in Belo Horizonte, MG, Brazil, viewed as an undistorted market (i.e., without government intervention), can be depicted in equilibrium at price P_o and quantity Q_o according to Figure C.1 in which DD is the demand for rice and SS is the supply of rice, assumed infinitely elastic since the Belo Horizonte market is a relatively small fraction of the Brazilian market. If one wants to know the effect on the price of rice of transferring the consumption subsidy from wheat to rice, in order to use the methodology in the Disaggregated Analysis section to evaluate the distributional impacts of that transfer, then one must solve the following system of equations related to Figure C.1:

$$(P_o - P_1)\, Q_1 = TCS \tag{1}$$

$$Q_o = a\, P_o^{-\eta} \tag{2}$$

$$Q_1 = a\, P_1^{-\eta} \tag{3}$$

where:

P_o and Q_o are the equilibrium free market price and quantity

P_1 and Q_1 are the postsubsidy equilibrium price and quantity

TCS is the total cost of the subsidy of wheat transferred to rice, i.e, area $P_o ABP_1$, Figure C.1

a and η are, respectively, demand shifters and the price elasticity of demand for rice in Belo Horizonte.

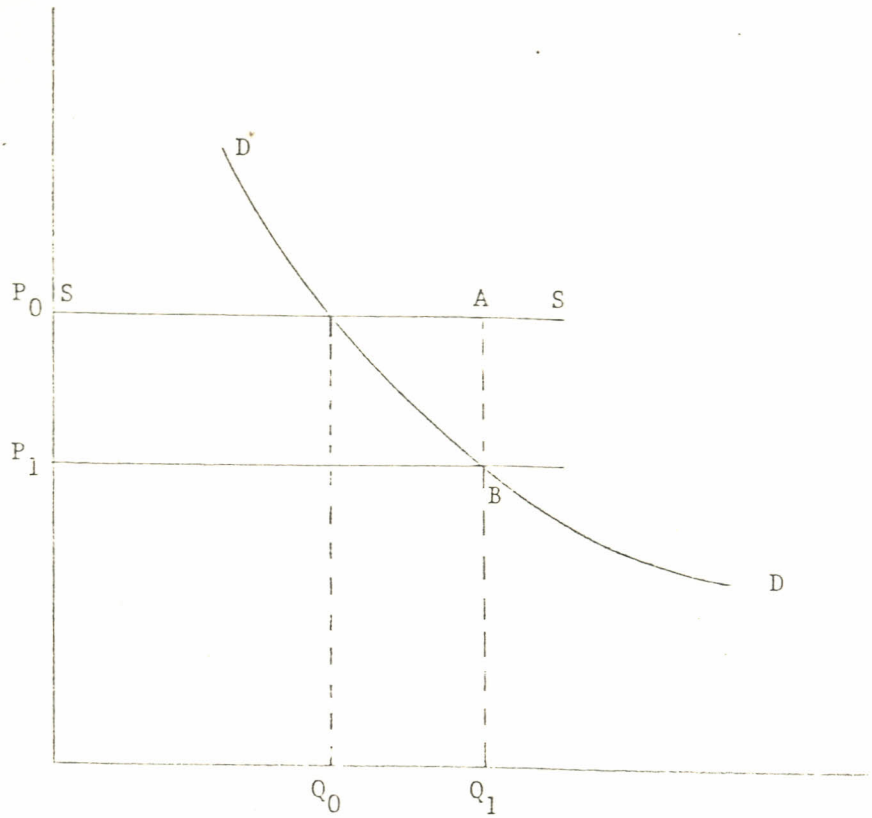

Figure C.1 Retail Market for Rice in Belo Horizonte, MG, Brazil.

As can be seen, the demand function was assumed to be of constant elasticity.

In the system above, we have estimates of the values for P_o, Q_o, TCS and η from secondary sources, as shown in the table below.

P_o[1] Cr$/Kg.	Q_o[2] Kg./year	η[3]	TCS[4] Cr$/year	P_1[5] Cr$/Kg
3.25	387	- 0.13	434	2.19

Notes: [1]This P_o is an average price per Kilogram paid by consumers in the metropolitan area of Belo Horizonte in Cr$ of August 1974, calculated by dividing the annual per capita expenditures on rice [FIBGE (3), Region IV, page 65, first column] by the annual per capita consumption of rice [FIBGE (2), Region IV, page 29, first column] after converting to Kilogram, considering that one Kilogram = 3570 calories according to [FIBGE (4), page 22].

[2]This Q_o is the average quantity used in footnote 1 above (43 Kg. per year) multiplied by nine, since we are working with an average and we have nine income strata as a whole.

[3]Average from estimates made by Paniago (1969) and Mandell (1972) for Brazil.

[4]Total cost of the subsidy obtained from Table 20, as to referred above.

[5]Obtained from next page FORTRAN program.

After substituting the known variables above in the system defined earlier and solving for P_1, one gets the following equation:

$$3.87 \times (3.25)^{1.13} \times (P_1)^{-0.13} - 387 \times (3.25)^{0.13} \times (P_1)^{0.87} - 434 = 0 \quad (4)$$

In order to solve this equation, the following iterative FORTRAN program was developed. After obtaining the value of P_1 above, the same procedure and source of data was used to generate the results of Table 21 in the main text of the thesis.

```
LIST

 84/07/31. 18.58.19.
M77TS      PROGRAM   CAL

00010       PROGRAM FINDP1(OUTPUT,TAPE10=OUTPUT)
00020       P1=2.2
00030       Q=-.01
00040       I=1
00050  7    P1=P1+Q
00060       Y=(3.25)**1.13*387.*P1**(-.13)-387.*(3.25)**.13*P1**.87-434
00070       IF(Y.GT.-6.5. AND .
00080+       Y.LT.6.5) THEN
00090       WRITE(10,100) Y,P1
00100       STOP
00110       ELSE
00120       WRITE(10,100) Y,P1
00130       I=I+1
00140       IF (I.EQ.10) STOP
00150        GO TO 7
00160       END IF
00170 100   FORMAT(2X,'Y=',F10.2,2X,'P1=',F10.2)
00180       STOP
00190       END
READY.
M77TS
READY.
RUN

 84/07/31. 18.59.08.
M77TS      PROGRAM   CAL

  Y=      -2.18  P1=       2.19

SRU       0.332 UNTS.

RUN COMPLETE.
```

APPENDIX D

Table D.1 Estimated Prices at the Producer, Miller, and Border Level[1] for Wheat Grain, in Cr$/MT of 1977, Brazil, 1966-82.

Year	Producer Price Cr$/MT	Producer Price Index (1965=100)	Miller Price Cr$/MT	Miller Price Index (1965=100)	Border Price Cr$/MT	Border Price Index (1965=100)
1965	3,577	100	2,707	100	3,283	100
1966	3,254	91	2,222	82	2,600	82
1967	3,182	89	2,096	77	2,615	80
1968	3,143	88	2,116	78	2,522	77
1969	3,110	87	2,006	74	2,500	76
1970	2,953	83	2,161	80	2,226	68
1971	2,767	77	2,036	75	2,372	72
1972	2,584	72	1,950	72	2,456	75
1973	2,741	77	1,897	70	3,586	109
1974	3,837	107	1,838	68	5,254	160
1975	3,385	95	1,480	55	3,830	117
1976	3,022	84	1,093	40	3,350	102
1977	3,407	95	1,202	44	2,623	80
1978	3,168	89	1,032	38	2,514	77
1979	2,493	70	732	27	2,978	91
1980	2,413	67	516	19	3,459	105
1981	2,939	82	1,105	41	3,282	100
1982	3,110	87	1,364	50	2,897	88

Source: Calculated by the author.

Notes: [1]Producer price is the farm gate price adjusted to the mill level. The miller price is the price set by the government, including the consumer subsidy. The border price is the CIF price adjusted to the mill level, without the consumption subsidy, considering the shadow exchange rate.

Table D.2 Estimated Production and Consumption Subsidies, Evaluated at Official and Shadow Price of Foreign Exchange, Brazil, 1965-1982.

YEAR	Production Subsidy (%)[1] OER[3]	SER[3]	Consumption Subsidy (%)[2] OER	SER
1965	55.0	9.0	-17.3	17.5
1966	45.5	21.4	0.6	17.1
1967	45.8	21.7	3.9	19.8
1968	49.7	24.6	-0.8	16.1
1969	49.4	24.4	3.6	19.8
1970	59.3	32.7	-16.6	2.9
1971	40.0	16.7	-3.0	14.2
1972	26.4	5.2	4.6	20.6
1973	-8.2	-23.6	36.5	47.1
1974	-12.4	-27.0	58.1	65.0
1975	5.8	-11.8	53.7	61.4
1976	8.2	-9.8	60.9	67.4
1977	83.5	29.9	35.3	54.2
1978	51.1	26.0	50.8	58.9
1979	0.5	-16.3	70.5	75.4
1980	-21.7	-30.2	83.2	85.1
1981	13.6	-10.5	57.3	66.3
1982	32.7	7.4	41.8	52.9

Source: Calculated by the author.

Notes: [1]Nominal rate of protection for producers.

[2]Nominal rate of protec tion for consumers.

[3]OER = official exchange rate; SER = shadow exchange rate.

Table D.3 Estimated Effects of the Production and Consumption Policies on Quantities Produced, Consumed and Imported, Taking into Account the Distortion in Exchange Rate Brazil, 1966-1982.

Year	Change in Production in Year t-1 [1]		Change in Consumption in Year t		Partial Change in Imports in Year t [2]		Total Change in Imports in Year t [3]	
	1,000 MT_A [4]	% [5]	1,000 MT_B	% [5]	1,000 MT_C	% [5]	$MT_D = MT_B + MT_C$	% [5]
1966	14	6.6	112	4.8	-7	-0.3	105	4.6
1967	40	15.7	129	5.7	-29	-1.2	101	4.3
1968	50	15.9	124	4.5	-31	-1.2	93	3.7
1969	106	18.0	155	5.6	-75	-3.3	80	3.5
1970	173	17.8	22	0.7	-124	-6.0	-102	-4.9
1971	331	23.6	120	3.9	-281	-15.0	-161	-8.6
1972	222	12.2	189	5.9	-198	-11.0	-9	-0.5
1973	26	3.9	559	17.2	-40	-1.7	518	21.4
1974	-432	-18.3	952	30.1	403	38.5	1,354	129.6
1975	-757	-21.0	941	26.9	772	208.6	1,712	463.0
1976	-157	-9.0	1,237	32.3	176	8.7	1,413	70.2
1977	-244	-7.4	931	21.5	384	29.7	1,315	101.7
1978	358	21.7	1,128	24.9	-230	-5.8	898	26.2
1979	430	18.9	1,804	42.0	-429	-18.8	1,375	60.4
1980	-411	-12.5	2,575	60.9	370	20.4	2,945	162.7
1981	-838	-23.7	1,452	31.3	873	42.9	2,325	114.3
1982	-192	-7.9	1,047	20.7	-269	-9.5	1,316	46.5

Source: Calculated by the author.

Notes: 1/ The production of year t-1 is consumed in year t.
2/ The partial change in imports in year t is due only to the production subsidy in year t-1 and is given by $(QP_{t-1} - (SP_t - SW_t$, for meaning of the variables see Chapter 2.
3/ The total change in imports includes the effects of both producer and consumer subsidies.
4/ MT_i = metric tons of column i(i = A, B, C, D).
5/ Percent in relation to the production, consumption and imports that would have been observed if world prices had prevailed.

Table D.4 Estimated Effects of the Wheat Production and Consumption Policies on Quantities Produced, Consumed and Imported, Excluding Distortions in Exchange Rate, Brazil, 1966-1982.[1]

Year	Change in Production in Year t-1 1,000 MT_A	%	Change in Consumption in Year t 1,000 MT_B	%	Partial Change in Imports in Year t 1,000 MT_C	%	Total Change in Imports in Year t $MT_D=MT_B+MT_C$	%
1966	62	39	4	0.2	-55	2.2	-51	2.1
1967	73	32	24	1.0	-61	2.5	-38	1.5
1968	90	33	-6	0.2	-71	2.6	-77	2.9
1969	181	35	27	0.9	-151	6.1	-124	5.0
1970	298	35	-119	3.8	-249	10.7	-368	15.7
1971	511	42	-24	0.7	-461	21.0	-485	22.1
1972	455	29	40	1.2	-431	19.7	-391	17.9
1973	112	19	407	12.0	-126	4.7	281	10.5
1974	-128	8	804	24.3	99	6.6	903	60.3
1975	-298	9	778	21.3	313	31.5	1,090	109.9
1976	66	4	1,059	26.4	-47	1.6	1,012	17.4
1977	174	6	541	11.5	-35	1.5	507	13.5
1978	736	58	918	19.4	-607	17.6	310	25.6
1979	719	36	1,598	35.7	-718	57.4	880	191.5
1980	20	0	2,450	56.3	61	1.7	2,389	58.0
1981	-543	17	1,168	23.7	578	5.6	1,746	17.4
1982	202	10	772	14.5	-125	4.4	647	46.5

Source: Calculated by the author.

Note: [1]For details on the headings of each column of this table see footnotes on Table 9.

Table D.5 Estimated Effects of the Production Policy, Taking Into Account Distortions in the Exchange Rate, in Cr$10^6 of 1977, Brazil, 1966-1982.

Year	Total Subsidy (Tax) Cost = TC		Change in Producers Welfare		Social Cost = SC		Effect on Foreign Exchange = EF		
	cr$10^6	%	cr$10^6	% of TC	cr$10^6	% of TC	cr$10^6	%[1]	SC/EF
1966	171	100	160	93	12	7	18	0	0.64
1967	207	100	193	93	14	7	75	1	0.19
1968	431	100	398	92	33	8	79	1	0.41
1969	700	100	647	93	52	7	188	3	0.28
1970	1,262	100	1,143	91	119	9	276	6	0.43
1971	806	100	762	95	44	5	667	16	0.07
1972	89	100	87	98	2	2	486	11	0.00
1973	-1,634	100	-1,818	111	184	11	145	1	1.27
1974	-4,050	100	-4,598	114	547	14	-2,118	17	-0.26
1975	-719	100	-754	105	36	5	-2,962	37	-0.01
1976	-996	100	-1,037	104	40	4	-588	5	-0.07
1977	1,578	100	1,439	91	139	9	-1,007	15	-0.14
1978	1,765	100	1,626	92	139	8	578	5	0.24
1979	-1,398	100	-1,498	107	100	7	1,278	12	0.08
1980	-2,827	100	-3,272	116	445	16	-1,280	-	-0.35
1981	-762	100	-795	104	33	4	-2,865	20	-0.01
1982	385	100	375	97	10	3	-779	6	-0.01
TOTAL	-4,992	100	-6,942	139	1,949	39	-7,809	-	-0.25

Source: Calculated by the author.

Notes: 1/ % = FE x 100/(Total value of wheat imports + FE).

Table D.6 Estimated Effects of the Production Policy, Excluding Distortion in Exchange Rate, in Cr$10^{6} of 1977, Brazil, 1966-1982.

Year	Total Subsidy Cost = TC		Change in Producers Welfare		Social Cost=SC		Effect on Foreign Exchange = EF		
	cr$10^{6}	%	cr$10^{6}	% of TC	cr$10^{6}	% of TC	cr$10^{6}	%[1]	SC/EF
1966	304	100	267	88	37	12	123	2	0.30
1967	365	100	321	88	44	12	134	3	0.33
1968	724	100	631	87	93	13	149	3	0.62
1969	1,179	100	1,028	87	151	13	314	6	0.48
1970	1,907	100	1,631	86	275	14	462	13	0.60
1971	1,613	100	1,435	89	177	11	911	27	0.19
1972	374	100	344	92	30	8	880	24	0.03
1973	-475	100	-491	103	16	3	377	4	0.04
1974	-1,551	100	-1,633	105	82	5	-434	4	0.19
1975	295	100	289	98	6	2	-1,000	15	0.01
1976	697	100	677	97	20	3	131	1	0.15
1977	3,119	100	2,563	82	556	18	64	1	8.67
1978	2,896	100	2,517	87	379	13	1,273	14	0.30
1979	39	100	39	100	0	0	1,782	20	0.00
1980	-1,803	100	-1,986	110	183	10	161	1	1.14
1981	781	100	745	95	35	5	1,495	13	0.02
1982	1,381	100	1,251	91	131	9	293	3	0.44
TOTAL	11,845	100	9,628	81	2,215	19	4,125	--	0.54

Source: Calculated by the author.

Note: [1] % = EF x 100/(total value wheat imports + EF).

Table D.7 Estimated Effects of the Consumption Policy, with Distortion in Exchange Rate Taken into Account, Cr$10^6 of 1977, Brazil, 1966-1982.

Year	Total Subsidy (tax)tCost=TC		Change in Consumers Welfare		Social Cost = SC		Effect on Foreign Exchange = EF		
	cr$10^6	%	cr$10^6	% of TC	cr$10^6	% of TC	cr$10^6	%[1]	SC/EF
1966	1,120	100	1,093	98	27	2	-300	5	-0.09
1967	1,247	100	1,212	97	35	3	-338	5	-0.10
1968	1,169	100	1,143	98	26	2	-312	5	-0.08
1969	1,434	100	1,394	97	40	3	-389	7	-0.10
1970	195	100	195	100	1	0	-49	1	-0.01
1971	1,079	100	1,058	98	21	2	-285	7	-0.07
1972	1,706	100	1,656	97	50	3	-464	11	-0.11
1973	6,412	100	5,878	92	534	8	-2,003	19	-0.27
1974	14,085	100	12,107	86	1,978	14	-5,005	40	-0.40
1975	10,469	100	9,142	87	1,327	13	-3,612	45	-0.37
1976	11,431	100	9,716	85	1,715	15	-4,144	36	-0.41
1977	7,464	100	6,696	90	768	10	-2,442	36	-0.31
1978	8,382	100	7,393	88	989	12	-2,837	26	-0.35
1979	13,694	100	11,095	81	2,598	19	-5,372	49	-0.48
1980	20,019	100	14,817	74	5,202	26	-8,906	54	-0.58
1981	13,271	100	11,340	85	1,932	15	-4,766	33	-0.41
1982	9,350	100	8,423	90	927	10	-3,033	25	-0.31
TOTAL	122,527	100	104,358	85	18,170	15	-44,257	-	-0.41

Source: Calculated by the author.

Note: 1/ % = EF x 100/(Total value wheat imports - EF).

Table D.8 Estimated Effects of the Consumption Policy, Excluding Distortion in Exchange Rate, in Cr10^6 of 1977, Brazil, 1966-1982.

Year	Total Subsidy (Tax) Cost=TC		Change in Consumers Welfare		Social Cost = SC		Effect on Foreign Exchange = EF		
	cr10^6	%	cr10^6	% of TC	cr10^6	% of TC	cr10^6	%[1/]	SC/EF
1966	35	100	35	100	0	0	-9	0	-0.00
1967	206	100	205	99	1	1	-52	1	-0.02
1968	-49	100	-49	100	0	0	12	0	0.00
1969	218	100	217	100	1	0	-55	1	-0.02
1970	-932	100	-950	102	18	2	220	6	0.08
1971	-192	100	-193	100	1	0	47	1	0.02
1972	320	100	318	99	2	1	-81	2	-0.02
1973	4,136	100	3,893	94	243	6	-1,216	14	-0.20
1974	10,472	100	9,267	88	1,205	12	-3,522	34	-0.34
1975	7,627	100	6,852	90	775	10	-2,488	37	-0.31
1976	8,608	100	7,535	88	1,073	12	-2,957	31	-0.36
1977	3,442	100	3,248	94	193	6	-1,006	21	-0.19
1978	6,014	100	5,455	91	559	9	-1,923	21	-0.29
1979	10,653	100	8,906	84	1,747	16	-3,974	44	-0.44
1980	17,443	100	13,193	76	4,250	24	-7,548	52	-0.56
1981	9,041	100	8,023	89	1,018	11	-3,024	27	-0.34
1982	5,976	100	5,555	93	421	7	-1,809	19	-0.23
TOTAL	83,017	100	71,510	85	11,507	15	-29,385	--	-0.39

Source: Calculated by the author.

Note: 1/ % = EF x 100/(Total value wheat imports - EF).