TRADE LIBERALIZATION, INCOME DISTRIBUTION AND POVERTY: THE POULTRY PRODUCTION CASE STUDY IN BRAZIL.

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LIST OF ACRONYSMS

ALADI: The Latin American Integration Association

ABCS – Associação Brasileira dos Criadores de Suínos. www.abcs.com.br

ABEF – Associação Brasileira dos Produtores e Exportadores de Frango. www.abef.com.br

ABIEC - Associação Brasileira das Indústrias Exportadoras de Carne. www.abiec.com.br

ABIPECS – Associação Brasileira da Indústria Produtora e Exportadora de Carne Suína. www.abipecs.org.br

AMS: Aggregate Market Support

APEC: Asia Pacific Economic Cooperation

AVE: *Ad Valorem* Equivalent

CEPEA – Centro de Estudos Avançados em Economia Aplicada. www.cepea.esalq.usp.br

COMTRADE: The Commodity Trade Statistics Database of the United Nations

FAO – Food and Agriculture Organization.

JOX. **Jox Assessoria Agropecuária**. www.jox.com.br

MAPA. Ministério da Agricultura, Pecuária e Abastecimento. Serviço de Inspeção Federal (SIF).

MDIC – Ministério do Desenvolvimento, Indústria e Comércio.

SECEX – Secretaria de Comércio Exterior.

USDA – United States Department of Agriculture.

UBA – União Brasileira de Avicultura.

WITS -   World Integrated Trade Solution

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1 Introduction

This report analyses the poultry production and chicken meat markets in Brazil, and the importance of trade liberalization in these markets for poverty alleviation. The main objective is to address whether and to which extent trade liberalization in the sector could help to improve the poverty situation in Brazil. The report is organized in seven sections. The first one is this introduction, where general aspects of poverty in Brazil are presented. This section also brings a description of the poultry production sector in Brazil. The second section deals with the issue of price transmission from international markets to Brazilian markets, as well as a discussion of market concentration and market power by industries. The third section deals with the barriers in international trade, addressing separately the situation in developed and developing countries. The issues of technical and sanitary barriers are also analyzed in this section. The fourth section addresses the economic and social impacts of Doha trade liberalization scenarios, through the use of a computable general equilibrium micro-simulation model of Brazil. The fifth section addresses briefly some aspects of the sector's political economy and the trade negotiations. The sixth section offers

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lessons and policy recommendations derived from the study. Finally, the last section brings the references.

1.1 General aspects of poverty in Brazil

It has long been recognized that, although Brazil is a country with a large number of poor people, its population is not among the poorest in the world. Based on an analysis of the 1999 Report on Human Development, Barros et al (2001) show that around 64% of the countries in the world have per capita income less than in Brazil, a figure that mounts to 77% if we consider the number of persons in the same condition. The same authors show that, while in Brazil 30% of the total population is poor, on average only 10% are poor in other countries with similar per capita income. Indeed, based on the same report the authors define an international norm that, based on per capita income, would impute only 8% of poor for Brazil. That is, if the inequality of income in Brazil were to correspond to the world average inequality for countries in the same per capita income range just 8% of the Brazilian population would be expected to be poor.

Taking the concept of poverty in its particular dimension of income insufficiency, the same authors show that in 1999 about 14% of the Brazilian population lived in households with income below the line of extreme poverty (indigence line, about 22 million people), and 34% of the population lived in households with income below the poverty line (about 53 million people). Even though the percentage of poor in the population has declined from 40% in 1977 to 34% in 1999, this level is still very high and, it seems, stable. The size of poverty in Brazil, measured either as a percentage of the population or in terms of a poverty gap, stabilizes in the second half of the eighties, although at a lower level than was observed in the previous period.

Barros and Mendonça (1997) have analyzed the relations between economic growth and reductions in the level of inequality upon poverty in Brazil. Among their main conclusions, these authors point out that an improvement in the distribution of income would be more effective for poverty reduction than economic growth alone, if growth maintained the current pattern of inequality. According to these authors, due to the very high level of income inequality in Brazil, it is possible to dramatically reduce poverty in the country even without economic growth, just by turning the level of inequality in Brazil close to what can be observed in a typical Latin American country.

The poverty in Brazil has also an important inter-regional dimension. According to calculations due to Rocha (1998), in a study for the 1981/95 period, the South-East region of the country, while counting for 43.84% of total population in 1995 had only 33% of the poor. These figures were 15.37% for the South region (8.15% of poor), and 6.81% for the Center-West region (5.23% of poor). For the poorer regions, on the contrary, the share of population in each region is lower than the share of poor: 4.56% (9.32% of poor) for the North region, and 29.42% (44.31% of poor) for the North-East region, the poorest region in the country.

In terms of evolution of regional inequality, Rocha (1998) concludes that no regular trend could be observed in the period. Moreover, the author also concludes that the yearly observed variations in concentration are mainly related to what happens in the state of São Paulo (South-East region), and in the North-East region. This reinforces the position of these two regions in the extremes of the regional income distribution in Brazil. The author also points out that once the effects of income increase that followed the end of the hyper-inflation period in 1995 run out, the favorable evolution in the poverty indexes and its spatial incidence will depend mainly on the macroeconomic determinants related to investment. Also, the author concludes that even keeping unchanged the actual level of poverty, the reduction in the regional inequality will require the reallocation of industrial activity to the peripheral regions.

And, finally, the same author also concludes that the opening of the economy to the external market (mainly in relation to the formation of Mercosur) would help reduce regional inequality in Brazil. This would happen through reduced consumer prices in the poorest regions, which are fortunately lacking in the industries most threatened by new trade flows.

Green, Dickerson and Arbache (2001) analyzed the behavior of wages and the allocation of labor throughout the 1980-99 trade liberalization period in Brazil. Among the main findings the authors point out that wage inequality remained fairly constant for the 1980s and 1990s, with a small peak in the mid 80s. The main conclusion of the study is that the egalitarian consequences of trade liberalization were not important in Brazil for the period under analysis. As caveats, the authors note the low trade exposure of the Brazilian economy (around 13% in 1997), as well as the low share of workers that have completed college studies in total (1 in 12 workers at that time).

The year 2001 picture

The reference year for the poverty analysis (modeling) in this study is 2001. Some general aggregated information about poverty and income inequality in Brazil can be seen in Table 1. The rows of Table 1 correspond to income classes, grouped according to POF definitions[6], such that POF[1] is the lowest income class, and POF[10] the highest. A fair picture of income inequality in Brazil emerges from the table. We see that the first 5 income classes, while accounting for 52.6% of total population in Brazil, get only 17% of total income. The highest income class, on the other hand, accounts for 11% of population, and about 45% of total income. The Gini index associated with the income distribution in Brazil in 2001, calculated using an equivalent household[7] basis, is 0.58, placing Brazil's income distribution among the world's worst.

Table 1. Poverty and income inequality in Brazil, 2001.

Income group	PrPop	PrInc	AveHouInc	UnempRate	PrWhite	AveWage	PrChild
POF[1]	10.7	0.9	0.1	32.6	35.2	0.2	46.2
POF[2]	8.0	1.8	0.4	17.3	38.3	0.3	37.2
POF[3]	16.0	5.2	0.6	10.4	42.0	0.4	35.1
POF[4]	7.3	3.1	0.8	8.8	45.1	0.4	32.5
POF[5]	11.0	5.8	1.0	7.5	49.2	0.5	28.7
POF[6]	7.9	5.1	1.2	7.4	53.4	0.6	26.4
POF[7]	12.9	11.1	1.7	6.8	60.3	0.8	24.5
POF[8]	7.5	8.7	2.3	6.1	66.3	0.9	21.5
POF[9]	7.7	12.7	3.1	5.9	71.2	1.4	20.5
POF[10]	10.9	45.7	7.9	4.2	81.6	3.2	17.7
Total	100.0	100.0	---	---	---	---	---

PrPop = % in total population; PrInc = % in country total income; AveHouInc = average household income; UnempRate = unemployment rate; PrWhite = % of white population in total; AveWage = average normalized wage index[JB1]; PrChild = share of population under 15 by income class.

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[6] POF stands for Pesquisa de Orçamentos Familiares (Household Expenditure Survey). POF[1] ranges from 0 to 2 minimum wages, POF[2] from 2+ to 3, POF[3] from 3+ to 5, POF[4] from 5+ to 6, POF[5] from 6-8, POF[6] from 8-10, POF[7] from 10-15, POF[8] from 15-20, POF[9] from 20-30, and POF[10] above 30 minimum wages. The minimum wage in Brazil in 2001 was around US$76, or R$180.00 per month.
[7] The equivalent household concept measures the subsistence needs of a household by attributing weights to its members: 1 to the head, 0.75 to the other adults, and 0.5 to the children (eg, to feed 2 does not cost double).

Source: PNAD, 2001.

The unemployment rate is also relatively higher among the poorer classes. This is a very important point to be noted, due to its relevance for modeling. The opportunity to get a new job is probably the most important element driving people out of poverty: hence the importance for poverty modeling of allowing the model to capture the existence of a switching regime (from unemployment to employment), and not just changes in wages. As can be seen in Table 1 above, the unemployment rate reaches 36.5% among the lowest income group (persons above 15 years[JB2]), and just 7.7% among the richest.

For the purpose of further describing the state of income insufficiency in Brazil a poverty line was set and defined as one third of the average household income[8]. (Much lower figures than those presented in page 5. This may merit some explanation[JB3]) According to that criterion 30.8% of the Brazilian households in 2001 would be poor[9]. This would comprise 96.2%, 76.6% and 53.5% respectively of households in the first three income groups[10], or 34.5 million out of 112 million households in 2001. Table 2 below shows how each POF group contributes to three overall Foster, Greer and Thorbecke (1984) measures of poverty and inequality[11] [JB4](FGT):

- FGT0: the proportion of poor households (i.e., below the poverty line)
- FGT1:the average poverty gap (proportion by which household income falls below the line)
- FGT2: measures the extent of inequality among the poor.

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[8] This poverty line is equivalent to US$ 48.00 in 2001.

[9] Barros et all (2001), working with a poverty line that takes into account nutritional needs, find that 34% of the Brazilian households were poor in 1999.

[10] The proportion of households below the poverty line in the other income groups are 0.284% for the 4th, 0.14% for the 5th, 0.04% for the 6th, 0.008% for the 7th, and 0.001% for the 8th. There are no households below the poverty line for the two highest income classes.

[11] The poverty gap and poverty line values are constructed with "adult equivalent" per capita household income. The formula for the FGT indexes is $FGT(\alpha) = \frac{1}{n.z^{\alpha}} \cdot \sum_{i=1}^{p}(z - x_i)^{\alpha}$, where n is the number of people in the population, p is the number of poor people, z is the poverty line, and x is the income of the poor. The parameter α can take on values from 0 to 2. The poverty gap is obtained using $\alpha = 1$. See Foster et all (1984).

Table 2: POF group contributions to FGT poverty indices

POF group	% of all families	share below poverty line	average poverty gap	contributions to FGT0	contributions to FGT1	contributions to FGT2
POF[1] poorest	10.7	0.9617	0.7334	0.1122	0.0856	0.0715
POF[2]	8.0	0.7657	0.3047	0.0716	0.0285	0.0135
POF[3]	16.0	0.5355	0.1496	0.0877	0.0245	0.0092
POF[4]	7.3	0.2837	0.0539	0.0202	0.0038	0.0011
POF[5]	11.0	0.1143	0.0189	0.0122	0.0020	0.0005
POF[6]	7.9	0.0390	0.0054	0.0029	0.0004	0.0001
POF[7]	12.9	0.0082	0.0009	0.0010	0.0001	0.0000
POF[8]	7.5	0.0008	0.0001	0.0001	0.0000	0.0000
POF[9]	7.7	0.0000	0.0000	0.0000	0.0000	0.0000
POF[10] richest	10.9	0.0000	0.0000	0.0000	0.0000	0.0000
	sum=100	FGT0= ave=0.3079	FGT1= ave=0.1449	FGT0= sum=0.3079	FGT1= sum=0.1449	FGT2= sum=0.0960

Source: PNAD, 2001. ave = average.

As stated before, this general poverty and inequality picture also has an important regional dimension in Brazil. This is a consequence of the spatial concentration of economic activity, which is located mainly in the South-East region. This is particularly true of industrial activity; agriculture is more dispersed among regions. Table 3 shows more information about the regional dimension of poverty and income inequality in Brazil. **Error! Reference source not found.** shows where regions are located, and shades them according to proportion of households in poverty.

Figure 1. Brazil' states shaded according to proportion of population bellow the poverty line.
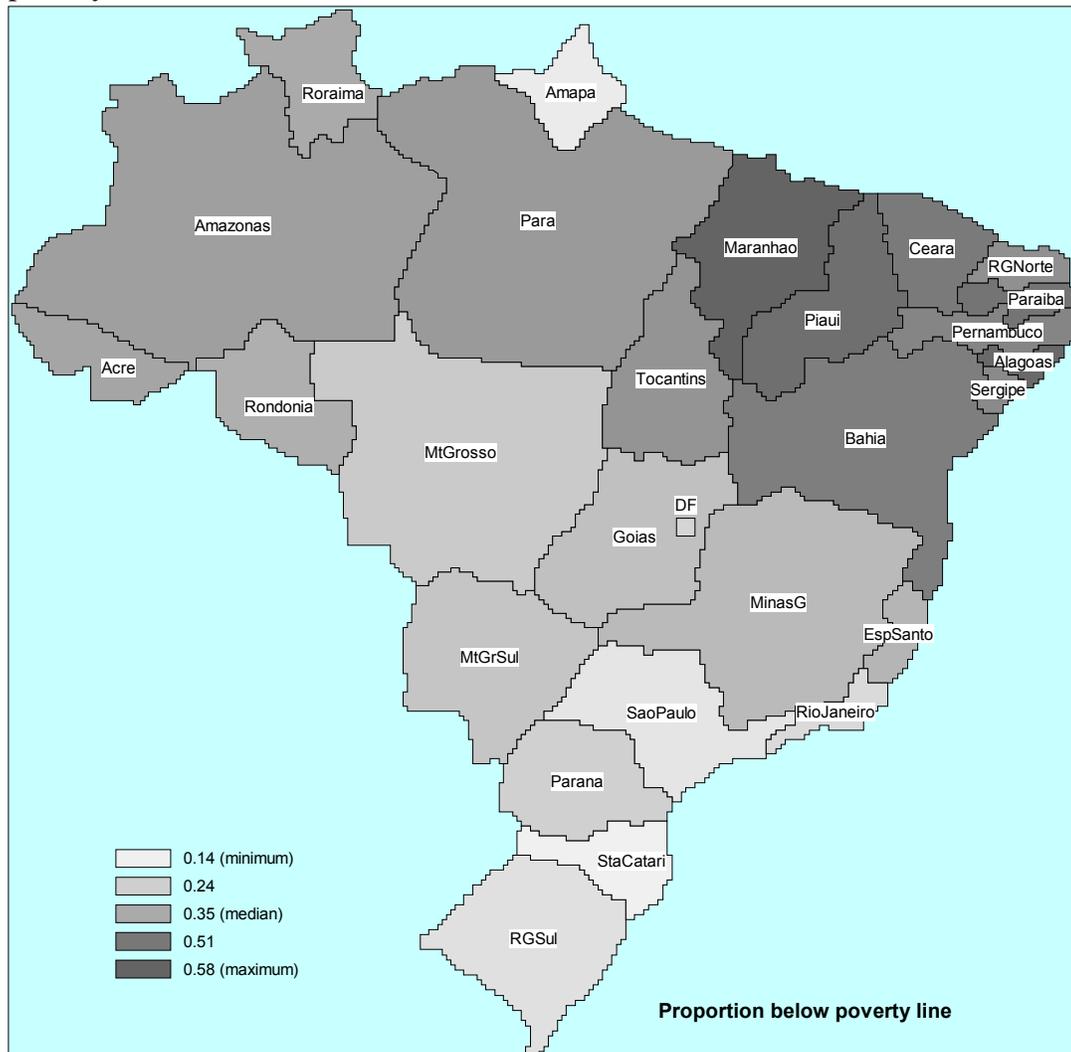
Source: PNAD, 2001.

As can be seen in the Table 3, the states in the North region account for 8% of total population, compared to 23.5% for the North-East, 45% in the South-East, 16% for South, and 7.2% for the Center-West. In the SE region, the state of São Paulo alone accounts for 22.9% of total Brazilian population.

The next column in Table 3 shows the share of households below the poverty line in each region, as a proportion of total regional households. As can be seen, the states in the NE region (states numbered from 8 to 16 in the table) plus the states of Tocantins and Para in the N region present the highest figures for this indicator. If, however, regional population is taken into account, the third column shows that the populous regions of Ceará, Pernambuco, Bahia, Minas Gerais and São Paulo give higher contributions to the Foster-Greer-Thorbecke (Foster et al, 1984) poverty gap

index. These figures are the contribution of each state to the total poverty gap index in Brazil expressed as a proportion of the poverty line (see column total). We can see that the average poverty gap in Brazil in 2001 is a 14.5% insufficiency of income to reach the poverty line.

Table 3. Regional poverty and income inequality figures. Brazil, 2001.

Regions	Macro-regions*	Population share of each region	Proportion of poor households in regional population	Regional Contribution to the Poverty Gap	Regional Average Poverty Gap
1 Rondonia	N	0.005	0.338	0.001	0.147
2 Acre	N	0.002	0.356	0.000	0.176
3 Amazonas	N	0.011	0.396	0.002	**0.196**
4 Roraima	N	0.001	0.347	0.000	0.152
5 Para	N	0.023	**0.425**	0.005	**0.194**
6 Amapa	N	0.003	0.151	0.000	0.069
7 Tocantins	N	0.006	**0.429**	0.001	**0.180**
8 Maranhao	NE	0.029	**0.579**	0.008	**0.288**
9 Piaui	NE	0.015	**0.564**	0.005	**0.304**
10 Ceara	NE	0.042	**0.540**	**0.011**	**0.267**
11 RGNorte	NE	0.016	**0.471**	0.004	**0.218**
12 Paraiba	NE	0.019	**0.550**	0.005	**0.257**
13 Pernambuco	NE	0.045	**0.512**	**0.011**	**0.248**
14 Alagoas	NE	0.015	**0.577**	0.004	**0.289**
15 Sergipe	NE	0.010	**0.503**	0.002	**0.239**
16 Bahia	NE	**0.073**	0.520	**0.019**	**0.256**
17 MinasG	SE	**0.108**	0.301	**0.014**	0.133
18 EspSanto	SE	**0.019**	0.324	0.003	0.144
19 RioJaneiro	SE	**0.095**	0.202	0.009	0.095
20 SaoPaulo	SE	**0.229**	0.166	**0.019**	0.083
21 Parana	S	0.059	0.237	0.006	0.100
22 StaCatari	S	0.034	0.136	0.002	0.055
23 RGSul	S	0.067	0.179	0.005	0.073
24 MtGrSul	CW	0.013	0.289	0.002	0.120
25 MtGrosso	CW	0.015	0.251	0.002	0.106
26 Goias	CW	0.031	0.300	0.004	0.126
27 DF	CW	0.013	0.219	0.001	0.106
Total	Brazil	1.000	0.308	0.145	0.145

Source: Ferreira Filho and Horridge (2005). * - Macro-Regions: N = North; NE = North-East; SE = South-East; S = South; CW = Center-West

The last column in the table above shows the regional insufficiency gap. The picture is similar to what was seen for the number of households below the poverty line, with the states in the NE regions plus the states of Tocantins and Para showing the highest poverty gaps. Two states in the South region (Santa Catarina and Rio Grande do Sul) show the lowest poverty gaps in Brazil, followed closely by São Paulo. Interesting enough, Amapa state (in the North region) shows a poverty gap in line with the richer states of the S-SE. This result, however, should be viewed with caution, since that state has a very small share of total population, which could cause the result to be a sampling bias.

More information about the labor structure of the economy can be seen in Table 4 and Table 5. In these tables sectoral wage bills are split into the model's 10 occupational groups which are defined in terms of a unit wage ranking. More skilled workers, then, would be those in the highest income classes, and vice-versa. As can be seen in Table 4, Agriculture is the activity that uses more unskilled labor (40.5% of that sector's labor bill), while Petroleum and Gas Extraction and Petroleum Refinery are the most intensive skilled labor (10th labor class) using activities, with Financial Institutions coming next. If labor inputs were measured in hours (rather than in values) the concentration of low-skill labor in Agriculture would be even more pronounced.

Agriculture is also the sector that hires the highest share of unskilled labor in Brazil, around 41% of total workers in income class 1. The Trade sector is the second largest employer of this type of labor. As for the higher income classes, we see that the Financial Institutions and Public Administration sectors hire the largest numbers of well-paid workers.

Table 4. Share (%) of occupations in each activity's labor bill.

	OCCUPATIONS (WAGE CLASS)										
Sectors	1	2	3	4	5	6	7	8	9	10	Total
Agriculture	40.5	30.2	5.8	6.0	5.2	3.3	3.7	1.8	1.9	1.6	100
MineralExtr	12.0	19.4	6.8	6.9	8.4	6.1	12.8	9.9	10.8	6.9	100
PetrGasExtr	0.0	0.0	0.0	0.9	0.9	6.1	16.1	12.1	22.8	41.1	100
MinNonMet	7.1	18.8	7.4	8.9	11.5	11.8	14.1	7.6	7.4	5.3	100
IronProduc	1.9	6.8	4.0	6.3	10.2	9.7	22.7	14.0	15.4	9.1	100
MetalNonFerr	1.9	6.8	4.0	6.3	10.2	9.7	22.7	14.0	15.4	9.1	100
OtherMetal	1.9	6.8	4.0	6.3	10.2	9.7	22.7	14.0	15.4	9.1	100
MachTractor	0.5	4.6	1.9	4.8	6.8	9.0	19.6	17.2	16.8	18.8	100
EletricMat	0.4	3.8	2.6	3.3	10.3	11.6	20.4	15.5	17.0	15.1	100
EletronEquip	0.4	3.8	2.6	3.3	10.3	11.6	20.4	15.5	17.0	15.1	100
Automobiles	0.3	2.5	1.0	2.4	7.7	8.6	19.6	15.7	22.4	19.8	100
OthVeicSpare	0.3	2.5	1.0	2.4	7.7	8.6	19.6	15.7	22.4	19.8	100
WoodFurnit	8.2	11.7	6.6	8.8	12.4	11.9	16.6	9.3	9.6	5.0	100
PaperGraph	2.3	7.8	3.7	6.2	8.4	8.1	18.7	13.0	16.7	15.1	100
RubberInd	0.8	4.7	3.2	4.6	14.4	5.5	24.0	13.6	16.6	12.5	100
ChemicElem	2.1	7.8	3.0	4.2	9.1	11.8	14.2	15.6	16.4	15.8	100
PetrolRefin	0.5	1.5	2.7	0.3	9.0	5.7	13.1	7.2	10.5	49.5	100
VariousChem	0.0	6.8	9.6	13.4	25.3	0.0	14.5	2.8	7.9	19.7	100
PharmacPerf	1.7	5.7	3.1	6.8	4.1	7.5	13.5	11.3	18.7	27.4	100
Plastics	1.6	6.3	2.3	8.5	12.8	12.1	24.6	10.3	9.0	12.6	100
Textiles	14.7	9.0	4.9	7.2	12.5	11.0	17.6	11.3	6.2	5.5	100
Apparel	3.2	17.3	7.5	15.1	16.1	9.7	15.7	5.4	4.5	5.5	100
ShoesInd	4.1	16.2	6.5	13.5	18.2	13.0	14.4	5.7	4.8	3.6	100
CoffeeInd	8.6	14.3	6.1	9.6	13.2	11.3	15.1	8.3	7.4	6.0	100
VegetProcess	8.6	14.3	6.1	9.6	13.2	11.3	15.1	8.3	7.4	6.0	100
Slaughter	8.6	14.3	6.1	9.6	13.2	11.3	15.1	8.3	7.4	6.0	100
Dairy	8.6	14.3	6.1	9.6	13.2	11.3	15.1	8.3	7.4	6.0	100
SugarInd	8.6	14.3	6.1	9.6	13.2	11.3	15.1	8.3	7.4	6.0	100
VegetOils	8.6	14.3	6.1	9.6	13.2	11.3	15.1	8.3	7.4	6.0	100
OthFood	8.6	14.3	6.1	9.6	13.2	11.3	15.1	8.3	7.4	6.0	100
VariousInd	16.8	13.4	6.6	6.2	11.4	7.4	13.1	7.8	10.7	6.5	100
PubUtilServ	1.7	17.5	5.3	8.6	7.1	6.0	12.9	12.2	14.2	14.5	100
CivilConst	6.3	13.4	8.6	10.1	12.5	9.0	20.2	9.6	6.9	3.4	100
Trade	10.0	14.2	6.6	8.2	10.7	8.2	15.1	8.3	10.0	8.7	100
Transport	4.6	7.0	4.4	4.7	7.5	7.1	19.0	16.1	18.1	11.6	100
Comunic	1.4	4.6	2.4	5.1	7.9	9.4	18.6	13.9	17.2	19.4	100
FinancInst	0.9	3.5	1.3	3.5	6.6	4.2	10.0	11.8	23.3	34.9	100
FamServic	16.4	20.3	7.4	8.4	9.6	6.8	12.1	6.5	7.2	5.4	100
EnterpServ	2.9	8.1	4.3	5.7	8.1	6.4	13.0	8.6	15.7	27.2	100
BuildRentals	2.0	4.3	2.7	4.8	9.9	6.3	17.1	8.8	18.4	25.7	100
PublAdm	1.7	13.1	3.6	7.2	7.6	6.8	13.0	12.1	19.3	15.6	100
NMercPriSer	7.6	16.6	6.0	9.2	9.3	10.9	13.7	8.2	11.6	6.9	100

Source: PNAD, 2001.

Table 5. Share of each activity in total labor bill, by occupation.

Sectors	OCCUPATIONS (WAGE CLASS)									
	1	2	3	4	5	6	7	8	9	10
Agriculture	41.0	17.8	9.8	6.9	4.8	3.8	2.2	1.4	1.1	0.9
MineralExtr	0.5	0.4	0.4	0.3	0.3	0.3	0.3	0.3	0.2	0.1
PetrGasExtr	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.2	0.3	0.5
MinNonMet	0.5	0.8	0.9	0.8	0.8	1.0	0.6	0.5	0.3	0.2
IronProduc	0.1	0.1	0.2	0.2	0.3	0.3	0.4	0.3	0.3	0.2
MetalNonFerr	0.0	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.1	0.1
OtherMetal	0.3	0.7	1.2	1.3	1.7	1.9	2.4	2.0	1.5	0.9
MachTractor	0.1	0.5	0.5	0.9	1.1	1.7	2.0	2.3	1.6	1.8
EletricMat	0.0	0.1	0.2	0.2	0.5	0.7	0.7	0.7	0.5	0.5
EletronEquip	0.0	0.1	0.2	0.2	0.4	0.6	0.5	0.5	0.4	0.4
Automobiles	0.0	0.1	0.1	0.1	0.3	0.4	0.5	0.5	0.5	0.5
OthVeicSpare	0.0	0.2	0.2	0.3	0.8	1.1	1.3	1.3	1.4	1.2
WoodFurnit	0.9	0.7	1.1	1.0	1.2	1.4	1.0	0.8	0.6	0.3
PaperGraph	0.3	0.6	0.8	0.9	1.0	1.2	1.4	1.3	1.2	1.1
RubberInd	0.0	0.1	0.1	0.1	0.3	0.1	0.3	0.2	0.2	0.1
ChemicElem	0.1	0.1	0.2	0.1	0.3	0.4	0.3	0.4	0.3	0.3
PetrolRefin	0.0	0.1	0.3	0.0	0.5	0.4	0.5	0.3	0.4	1.7
VariousChem	0.0	0.3	1.1	1.0	1.6	0.0	0.6	0.2	0.3	0.8
PharmacPerf	0.1	0.2	0.3	0.4	0.2	0.5	0.5	0.5	0.6	0.9
Plastics	0.1	0.2	0.2	0.5	0.6	0.7	0.8	0.4	0.3	0.4
Textiles	0.7	0.2	0.4	0.4	0.5	0.6	0.5	0.4	0.2	0.1
Apparel	0.3	0.9	1.1	1.5	1.3	1.0	0.8	0.4	0.2	0.3
ShoesInd	0.2	0.4	0.4	0.6	0.7	0.6	0.3	0.2	0.1	0.1
CoffeeInd	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0
VegetProcess	0.5	0.4	0.5	0.6	0.6	0.7	0.5	0.3	0.2	0.2
Slaughter	0.4	0.3	0.4	0.5	0.5	0.5	0.4	0.3	0.2	0.1
Dairy	0.1	0.1	0.1	0.2	0.2	0.2	0.1	0.1	0.1	0.0
SugarInd	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1
VegetOils	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0
OthFood	1.0	1.0	1.2	1.2	1.4	1.5	1.0	0.7	0.5	0.4
VariousInd	0.7	0.3	0.5	0.3	0.5	0.4	0.3	0.3	0.3	0.2
PubUtilServ	0.5	3.2	2.8	3.0	2.0	2.1	2.4	3.0	2.5	2.6
CivilConst	2.7	3.3	6.1	4.8	4.9	4.3	5.0	3.2	1.6	0.8
Trade	13.5	11.2	14.8	12.6	13.3	12.5	12.0	8.7	7.5	6.6
Transport	2.6	2.3	4.1	3.0	3.8	4.4	6.2	7.0	5.6	3.6
Comunic	0.2	0.4	0.6	0.8	1.0	1.5	1.6	1.6	1.4	1.6
FinancInst	1.0	2.3	2.4	4.4	6.9	5.3	6.7	10.5	14.6	22.3
FamServic	21.0	15.1	15.8	12.1	11.2	9.8	9.0	6.5	5.1	3.9
EnterpServ	1.6	2.6	4.0	3.6	4.1	4.0	4.2	3.8	4.8	8.5
BuildRentals	0.1	0.2	0.3	0.3	0.6	0.4	0.6	0.4	0.6	0.9
PublAdm	6.4	29.4	23.3	31.2	26.7	29.3	29.2	36.3	40.8	33.7
NMercPriSer	2.2	2.8	2.9	3.0	2.4	3.5	2.3	1.8	1.8	1.1
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: PNAD, 2001.

And, finally, Table 6 shows the distribution of occupation wages (OCC) classes among the household income classes (POF classes).

Table 6. Wage bill distribution according to occupational wages and household income classes. 1996 million Reais.

Household Income Classes	OCCUPATIONAL WAGES CLASSES (personal)										
	OCC1	OCC2	OCC3	OCC4	OCC5	OCC6	OCC7	OCC8	OCC9	OCC10	Total
POF[1]	1531	1637	0	0	0	0	0	0	0	0	3168
POF[2]	538	2409	1632	783	0	0	0	0	0	0	5362
POF[3]	1804	3996	1201	2460	4327	3728	342	0	0	0	17859
POF[4]	766	1513	861	1380	1077	616	5020	0	0	0	11233
POF[5]	932	2787	1147	1649	2746	2254	5945	3526	0	0	20985
POF[6]	537	1811	795	1410	2133	2127	4305	5517	405	0	19039
POF[7]	576	2315	1178	2012	3038	3102	8717	7654	12773	0	41365
POF[8]	201	1137	524	1045	1819	1969	4896	5585	13211	1427	31814
POF[9]	123	695	401	762	1312	1449	4571	5218	15864	16994	47388
POF[10]	83	527	301	576	1135	1185	3939	5086	18480	134499	165811
Total	7091	18827	8040	12077	17586	16430	37734	32586	60732	152920	364024

Source: PNAD (2001).

In the table above the rows show household income classes, while the columns show the wages by occupation. It is evident from this table that the wage earnings of the higher wage occupations (OCC10, for example) are concentrated in the higher income households, and *vice-versa*. Most of the wages earned by workers in the first wage class (OCC1) accrue to the three poorest households, POF[1]-[3]. All the workers in the highest wage class, on the other hand, are located in households from the 8th income class and above.

The GINI index has fallen slightly in the more recent years, to a value of 0.56, according to Ferreira et al (2006). These authors show that the same happened to the headcount ratio, the poverty gap and the extension of poverty, and attribute this fact to two main causes: the effect of direct transfer policies targeted to the poor, and to the impacts of the long run investments in the educational system[12].

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[12] The important point to note here is the trend, since the authors use a different poverty line than what was used in this study.

1.1.1 The labor employment structure in poultry production in Brazil

According to the PNAD 2001 (IBGE, 2001), 1,415,904 persons were employed in poultry production in Brazil in 2001, out of a total of 14,160,122 workers (older than 15 years old) in primary (agriculture and livestock) sectors. The sector is also one of the primary activities that employ most of the lowest income wages workers in Brazil, as can be seen in Table 7 and Table 8. Table 7 shows the share of each activity in total number of workers employed, by wage class. It takes into account, then, the size of each activity. As it can be seen there, the poultry sector is one of the most important employers of workers on the lowest wage class, or the most unskilled workers, with 16% of total employment of OCC1. Only corn production employs proportionately more workers in this wage class than poultry, which is a sector where family production is also very important[13].

Table 7. Labor employment structure in poultry production. Shares of each activity in labor demand, by wage class (number of workers). Brazil, 2001.

Wage class	coffee	sugarcane	rice	wheat	Soybean	cotton	corn	livestock	poultry	other	Total
1 OCC1	0.03	0.01	0.08	0.00	0.00	0.01	0.18	0.07	0.16	0.47	1.00
2 OCC2	0.08	0.04	0.04	0.00	0.01	0.01	0.07	0.20	0.09	0.47	1.00
3 OCC3	0.09	0.06	0.02	0.00	0.03	0.00	0.06	0.28	0.04	0.42	1.00
4 OCC4	0.07	0.06	0.03	0.00	0.06	0.00	0.04	0.30	0.05	0.40	1.00
5 OCC5	0.06	0.06	0.03	0.00	0.08	0.00	0.05	0.32	0.04	0.36	1.00
6 OCC6	0.07	0.10	0.01	0.00	0.06	0.00	0.04	0.37	0.02	0.33	1.00
7 OCC7	0.08	0.09	0.04	0.01	0.08	0.01	0.05	0.32	0.02	0.32	1.00
8 OCC8	0.08	0.04	0.04	0.01	0.11	0.00	0.04	0.33	0.03	0.33	1.00
9 OCC9	0.06	0.03	0.05	0.00	0.10	0.00	0.04	0.35	0.04	0.34	1.00
10 OCC10	0.03	0.02	0.03	0.00	0.14	0.00	0.05	0.41	0.02	0.29	1.00
Total no of workers	808946	472321	715727	7065	343240	74089	1522906	2587894	1415905	6212029	14160122

Source: PNAD, 2001.

Table 8 shows the structure of labor demand inside each activity. It can be seen there that most of the poultry production workers belong to the first two wage classes, or about 91%. As seen before, the lowest wage workers dominate the composition of the poorest household's incomes. It is expected, then, that any expansion in this sector (and in agriculture in general) will generate poverty alleviation. This aspect will be further explored latter in this paper.

Table 8. Labor employment structure in poultry production. Shares of each wage class in each activity total employment (number of workers). Brazil, 2001.

Wage class	coffee	sugarcane	rice	wheat	Soybean	cotton	corn	livestock	poultry	other	Total
1 OCC1	0.23	0.11	0.62	0.00	0.05	0.58	0.67	0.16	0.63	0.43	0.41

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[13] This phenomenon has also a regional dimension, not discussed here.

2 OCC2	0.41	0.34	0.22	0.00	0.12	0.31	0.21	0.32	0.28	0.33	0.30
3 OCC3	0.09	0.10	0.03	0.00	0.06	0.04	0.04	0.09	0.02	0.06	0.06
4 OCC4	0.08	0.11	0.03	0.08	0.14	0.01	0.02	0.10	0.03	0.06	0.06
5 OCC5	0.06	0.10	0.03	0.08	0.17	0.01	0.02	0.09	0.02	0.04	0.05
6 OCC6	0.04	0.10	0.01	0.00	0.09	0.00	0.01	0.07	0.01	0.03	0.03
7 OCC7	0.05	0.10	0.03	0.42	0.13	0.04	0.02	0.06	0.01	0.03	0.04
8 OCC8	0.03	0.02	0.01	0.25	0.08	0.00	0.01	0.03	0.01	0.01	0.02
9 OCC9	0.02	0.01	0.02	0.08	0.08	0.02	0.01	0.04	0.01	0.02	0.02
10 OCC10	0.01	0.01	0.01	0.08	0.10	0.00	0.01	0.04	0.00	0.01	0.02
Total	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Source: PNAD, 2001.

1.2 Economic aspects of poultry production and consumption in Brazil

The Brazilian poultry production is growing presently faster than in the past, and closely linked to export growth. In the domestic market there is a strong substitution between chicken meat and bovine meat, mainly. According to the Brazilian Association of Poultry Producers and Exporters, the country exports annually 29% of its production.

The evolution of the Brazilian poultry production can be seen in Figure 2.

Figure 2. Chicken meat production in Brazil (tons). 1989 – 2005.
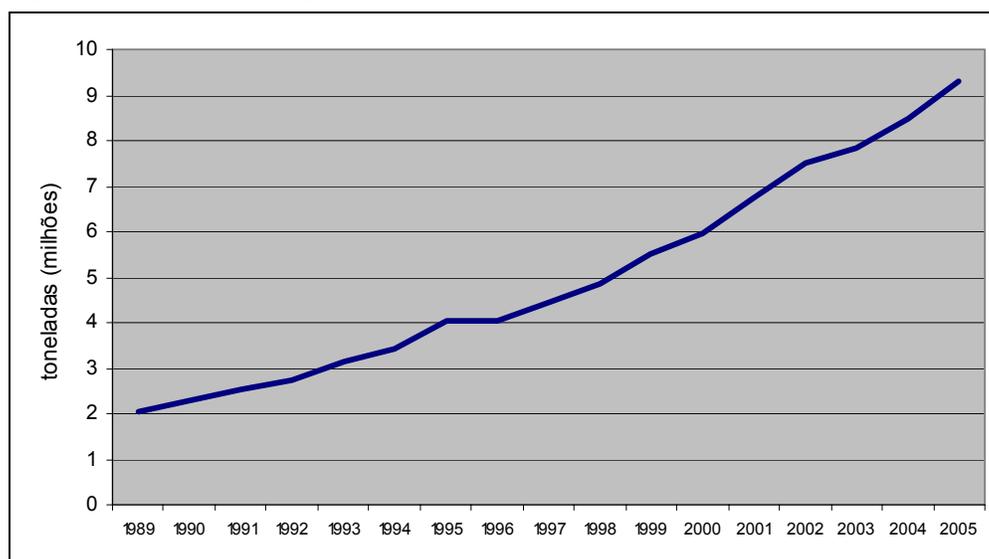
Source: PNAD, 2001

The Brazilian chicken meat production increased by 129.5% in the last ten years, and reached 9.3 millions tons in 2005. This expansion can be explained mainly

by the diffusion of technology in the fields of genetics, nutrition, management, sanity and equipments that have transformed poultry production in a well organized industrial activity. The good performance of poultry production sector comes from the fall in input prices and/or gains in efficiency in the production chain.

An example of the above statement can be seen in the extraordinary gains obtained in feed conversion ratio, one of the most common indicators of efficiency in production. While in 1930 3.5 kg of feed was necessary to produce 1 kg of live bird, this value fell to 1.96 kg nowadays, due to genetic gains in animal production.

Areas of production in Brazil

The Brazilian production of chicken meat is concentrated in southern Brazil, mainly in the states of Parana (PR), Santa Catarina (SC) and Rio Grande do Sul (RS). These states together concentrate 55.4% of total production of chicken meat in Brazil, which amounts to about 2.24 millions animals. The production by state can be seen in Table 9 .

Table 9. Production and states share in production of chicken meat. Brazil.

States	Number of animals	Share %
Paraná	918.483.512	22,7%
Santa Catarina	712.581.904	17,6%
Rio Grande do Sul	607.278.961	15,0%
São Paulo	539.134.821	13,3%
Minas Gerais	256.503.939	6,3%
Goías	154.740.689	3,8%
Mato Grosso Sul	116.875.377	2,9%
Mato Grosso	69.049.273	1,7%
Bahia	42.857.510	1,1%
Pernanbuco	40.568.863	1,0%
Distrito Federal	34.677.153	0,9%
Sub-Total	3.492.752.002	86,40%
outros c/ sif	32.972.377	0,816%
Total under supervision	**3.525.724.379**	**87,220%**
Without supervision	516.632.399	12,780%
Total	**4.042.356.778**	**100,0%**

Source: ABEF/SECEX. Supervision means sanitary inspection and supervision.

The states in the center-west regions (Goiás, Mato Grosso, and Mato Grosso do Sul) have started to gain importance in poultry production scenario, due to their proximity to the new grains production areas, which allows a reduction in production costs. The center-west region produces about 8.4% of the national total production.

Consumption

The share of chicken meat in the consumption bundle in Brazil has progressively gained importance, due mainly to the significant price falls in relation to other meats, mainly bovine meat. The per-capita evolution of chicken meat consumption in Brazil is around 35.5 kg/person/year, against 12 kg/person/year for pork, and 36.7 kg/person/year for beef. The share of chicken meat in total national meats consumption was around 41% in 2004.

Exports

The Brazilian exports of chicken meat started to grow fast in the late nineties, coming to lead world exports in 2004. Exports increased by 204% in the period 2000-2005, pushed by the strong Brazilian currency devaluation in 1999. The United States, the second larger exporter, have also a big share in world market, but showing greater variation in export values, as can be seen in Table 10.

Table 10. World exports of chicken meat. 1000 ton. 1999-2005.

ANO	1999	2000	2001	2002	2003	2004	2005
Brasil	771	907	1.249	1.600	1.922	2.470	2.762
EUA	2.080	2.231	2.520	2.180	2.232	2.170	2.464
UE	776	774	764	877	760	789	780
Tailândia	285	333	392	427	485	200	300
China	375	464	489	438	388	241	300
World	4.442	4.856	5.565	5.707	5.994	6.019	6.979

Source: ABEF/USDA.

The Middle East is the main market for the Brazilian chicken meat, and the region has preference for the whole carcass (not cut in parts). The Far East and Europe prefer parts, and are respectively the 2nd and 3rd most important Brazilian markets, in spite of the strong competition by the French product, which is subsidized. Table 11 shows the Brazilian chicken meat exports by region of destination.

Table 11. Brazilian exports (kg) by destination and type of product.

Destination	2005	Whole carcass (%)	Cuts (%)	Industrialized (%)
Middle East	848.570.022	83,5%	15,8%	0,7%
Asia	756.949.812	3,4%	96,2%	0,5%
European Union	387.036.522	4,3%	78,7%	17,0%
Russia	258.186.741	31,9%	66,4%	1,7%
Africa	191.782.179	21,8%	78,2%	0,1%
South America	114.861.374	89,9%	8,6%	1,4%
Others	288.559.309	23,0%	76,0%	1,0%
Total	**2.845.945.959**	**36,7%**	**60,4%**	**3,0%**

Source: ABEF

Saudi Arabia is the main destination for whole carcass chicken from Brazil, while in Europe, Germany is the main importer, and has preference for parts.

The main exporting states inside Brazil

The southern states in Brazil are the main exporter states, following the production trend. As seen in Table 12, in 2004 the three states in southern Brazil represented about 82% of total exports.

Table 12. Chicken meat exports, by state. 2004.

States	Exports (Ton.)	Share %
Paraná	681.597	27,60%
Santa Catarina	718.218	29,08%
Rio Grande do Sul	621.215	25,15%
São Paulo	187.004	7,57%
Minas Gerais	77.792	3,15%
Goías	82.083	3,32%
Others	101.612	3,32%
Mato Grosso Sul	39.514	1,60%
Mato Grosso	47.826	1,94%
Bahia	-	0,00%
Pernanbuco	-	0,00%
Distrito Federal	14.272	0,58%
Sub-Total	2.469.521	99,99%
Others with inspection	175	0,01%
Total under inspection		0,00%
Without inspection		0,00%
Total	**2.469.696**	**100,00%**

Source: ABEF/USDA. Inspection means official sanitary inspection.

2 Price transmission and concentration of gains

2.1 Price transmission in the poultry sector in Brazil

In this section the price transmission from the international market to the Brazilian domestic market is investigated. The analysis is divided in two steps. In the first step, the price transmission from the international market to the domestic chicken meat market is analyzed. In the second step the price transmission from the domestic chicken meat market to the poultry producers (farm gate level) is analyzed. The choice of this procedure is based on the fact that time series of poultry at farm gate level in Brazil are scarce, ranging from 2000 to 2005. The chicken meat price series, on the other hand is from 1995 to 2005.

2.1.1 Price transmission in the international chicken meat market

The transmission between the price of chicken meat in the international market and the domestic market was analyzed using time series procedures, with the aid of the RATS software.

The following models were adjusted to evaluate the impact of the international price variations on the domestic prices:

- Model 1 – the international price of chicken meat in US$ was transformed in R$ (Brazilian Real) and deflated by a domestic price index (the IGP-DI). The dependent variable is the domestic price, also deflated by the IGP-DI.
- Model 2 – The international prices in US$ and the exchange rate (R$/US$) deflated by the IGP-DI were included in the transfer function that had the domestic price as the dependent variable.

The data

The price of chicken meat in the Brazilian domestic market is from JOX Consulting (www.jox.com.br), for the Brazilian wholesale market level. As a proxy for the poultry price in the international markets the wholesale price in the United States [Broilers - 12- city composite wholesale price – Agriculture Market Service, USDA (www.ers.usda.gov)] was used. The time series ranges from January, 1995 to August, 2005, and was transformed into logarithms.

A possible alternative series for international prices could be unit prices of exports. This, however, was not used, because almost always there are lags between the moment of the sale and the time of effective exports, when the sale is considered in the statistics. Thus, the product can be exported in a determined month, but the sale was made previously. Therefore, it has been found in empirical analysis that the dispersion of the data that composes the averages can be very high, making it misleading for econometric studies of this type.

Results

The integration tests showed that the domestic price was stationary with trend, and that the international price time series and exchange rate series were integrated of order –I(1) which requires the transformation of the series to first differences. Since

the results pointed to different order of integration for the variables, alternative models were specified.

(This para is too technical) [JB5]Considering that the unit root tests often do not allow to distinguish series that are not stationary due to deterministic trends from series that are not stationary due to unit roots, two alternative models were adjusted, one for the case where the international price was expressed in R$ (Model 1a) and the other for the case where it was expressed in US$ (including the exchange rate) (Model 2a).

In the first version, all the variables were expressed in the levels and the model includes a constant and a trend term. In the second version, the models were adjusted considering all the variables in the first difference (not including in the model the variable trend and the constant), the Error Correction Model.

The cross-correlation function estimation suggested that the international prices have influence on the domestic prices with one month lag. Thus, all the models were adjusted considering that the international price has impact on the domestic price with one month lag.

Results of model 1

The results with model 1, in which the international price of broilers in US$ was transformed into R$ point to the influence of that price on the domestic prices with one month lag. The coefficient of the variable is significant at 0.7% level. The estimated elasticity of transmission is of the order of 0.2, as can be seen in Table 13. Lags of the dependent variable were included in the equation to eliminate residual autocorrelation.

Table 13. Econometric results for Model 1.

Dependent Variable : domestic price - Estimation by Least Squares
Monthly Data From 1995:04 To 2005:08
Usable Observations   125   Degrees of Freedom   119
Centered R**2   0.821647   R Bar **2 0.814153
Standard Error of Estimate   0.0661014039
Sum of Squared Residuals   0.5199580766
Regression F(5,119)   109.6434
Significance Level of F   0.00000000
Durbin-Watson Statistic   1.934267
Q(31-0)   29.109741
Significance Level of Q   0.56351782

Variable	Coeff	T-Stat	Signif
Constant	0.408	5.65	0.00
TREND	-0.001	-4.39	0.00
International price (t-1) - R$	0.203	1.86	0.07

Variable	Coeff	T-Stat	Signif
Domestic price (t-1)	0.821	9.26	0.00
Domestic price (t-2)	-0.021	-0.18	0.85
Domestic price (t-3)	-0.194	-2.37	0.02

Model 2 results

In model 2 the coefficient of the variable international price of broiler in US$ with one period lag is significant at 10% level of probability. The estimated transmission elasticity is 0.27. The exchange rate coefficient is non-significant at 10% level. The estimates results can be seen in Table 14.

Table 14. Econometric results for Model 2.

Dependent Variable: domestic price - Estimation by Least Squares
Monthly Data From 1995:04 To 2005:08
Usable Observations   125   Degrees of Freedom   118
Centered R**2   0.822068   R Bar **2   0.813020
Sum of Squared Residuals   0.5187327932
Regression F(6,118)   90.8622
Significance Level of F   0.00000000
Durbin-Watson Statistic   1.930914
Q(31-0)   31.195420
Significance Level of Q   0.45639641

Variable	Coeff	T-Stat	Signif
Constant	0.410	5.65	0.00
Trend	-0.001	-4.40	0.00
International price (t-1) - US$	0.268	1.63	0.10
Exchange rate (t-1)	0.148	0.99	0.32
Domestic price (t-1)	0.819	9.22	0.00
Domestic price (t-2)	-0.024	-0.21	0.84
Domestic price (t-3)	-0.195	-2.37	0.02

The results for models 1a and 2a (error correction models) (Tables 13a and 14a) show elasticities close to 0.32 for international price in both cases. These values, as well as those obtained with models 1 and 2 can be considered quite significant, if one takes into account the Brazilian exported share of the chicken meat industry. It is worth to note that the bulk of the Brazilian chicken meat production is consumed internally, which implies that the price formation process is highly influenced by domestic variables, like income, price of substitutes, and costs.

The results then suggest a significant degree of transmission of international prices to the domestic markets: about 32% of price variation in the international prices of poultry would be transmitted to the Brazilian domestic market with a one month lag. Results also point to the end of price transmission process in this period, since no effect arises after that. Many studies have shown that for agricultural commodities with contracts traded in future markets, the effects of international price variations on

domestic prices can be even faster. Contemporaneous significant correlations have been reported, and, in cases where exports are a large share of domestic production, the value of the elasticity can be large[14].

Table 13a. Econometric results for Model 1a (error correction model).

Dependent Variable DPI - Estimation by Least Squares
Monthly Data From 1995:04 To 2005:08
Usable Observations   125   Degrees of Freedom   121
Uncentered R**2 0.187563   T x R**2   23.445
Standard Error of Estimate   0.068950741
Sum of Squared Residuals   0.5752587590
Durbin-Watson Statistic   1.952227
Q(31-0)   33.125176
Significance Level of Q   0.36381142

Variable	Coeff	Std Error	T-Stat	Signif
1. Dif. International price (t-1) – R$	0.325	0.11	2.87	0.01
2. Dif. Domestic price (t-1)	0.186	0.08	2.25	0.03
3 Dif. Domestic price (t-2)	0.152	0.08	1.82	0.07
4. Error correction term (t-1)	-0.247	0.05	-4.63	0.00

Table 14a. Econometric results for Model 2a (error correction model).

Dependent Variable DPI - Estimation by Least Squares
Monthly Data From 1995:04 To 2005:08
Usable Observations   125   Degrees of Freedom   120
Uncentered R**2 0.215675   T x R**2   26.959
Standard Error of Estimate   0.068029017
Sum of Squared Residuals   0.5553536550
Durbin-Watson Statistic   1.954692
Q(31-0)   37.823543
Significance Level of Q   0.18580867

Variable	Coeff	Std Error	T-Stat	Signif
1. Dif. International price (t-1) - US	0.321	0.17	1.90	0.06
2 Dif. Exchange rate (t-1)	-0.060	0.14	-0.43	0.66
3 Dif. Domestic price (t-1)	0.220	0.08	2.67	0.01
4. Dif. Domestic price (t-2)	0.188	0.08	2.24	0.03
5. Error correction term (t-1)	-0.344	0.06	-5.40	0.00

It is interesting to note that this result contrasts somewhat with those found by Quiroz and Soto (1995), and Baffes and Gardner (2003), quoted by Nogués (2005). These authors reported reduced price transmission (five out of eight cases studied) as general findings in their study. Here, it's worth to remember that Brazil is a major chicken meat exporter, instead of importer, and has almost no policy aiming to insulate the domestic market from international price variations for this product.

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[14] See, for example, Bacchi et al (2003) and Silveira and Bacchi (2005).

2.1.2 Price transmission from the Brazilian chicken meat market to farm gate poultry production

The price transmission from the chicken meat market to the farm gate level was performed with a time series from the year 2000 to 2005, with monthly data from Jox Consulting.

The relation between the international price and the Brazilian producer price was established by indirect form. Since there is no producer price data available for the period before 2000 in the domestic market, the methodological option was to proceed in two steps: in the first step the relation between the international price and the domestic price in the wholesale level was estimated, considering time series from the period 1995-2005. In the second step the relation between the wholesale price and producer price in the domestic market was estimated with data from the period 2000-2005.

Even with enough degrees of freedom to estimate the relation in a direct way, the above procedure was chosen because the available producer price data quality is considered somewhat poor, which suggests that the second stage estimation should be regarded with greater care.

The relation between the chicken meat price at wholesale level and the producer price was estimated through an error correction model. The price relation is contemporaneous, and statistically significant. The results indicate that a chicken meat price variation at wholesale level is transmitted more than proportionately to the producer level, with an elasticity of 1.22, statistically different from 1. The estimation results can be seen in Table 15.

Table 15. Regression results. Price transmission from the Brazilian chicken market to producers.

Dependent Variable producer price (difference) - Estimation by Least Squares
Monthly Data From 2000:02 To 2005:08
Usable Observations   67   Degrees of Freedom   65
Uncentered R**2   0.803943   T x R**2   53.864
Mean of Dependent Variable   -0.001313276
Std Error of Dependent Variable 0.104011548
Standard Error of Estimate   0.046411258
Sum of Squared Residuals   0.1400103191
Durbin-Watson Statistic   1.722696
Q(16-0)   13.984085
Significance Level of Q   0.59989951

Variable	Coeff	Std Error	T-Stat	Signif
1. dif. wholesale price	1.222	0.075	16.305	0.000
2. error correction term (t-1)	-0.423	0.095	-4.435	0.000

In an alternative version (not shown here), all the variables were expressed in levels, and the model including a constant and a trend. The results of this model and the results of the error correction model are similar.

The elasticity higher than one occurs because the price level in the two segments (producer and wholesale level) is different. The commercialization margin between them makes the price at wholesale level higher than the producer prices. Cost items inside that margin that are independent from the product's prices (poultry prices) make the elasticity of transmission of prices from the producer level to the wholesale level to be less than one.

An example will help clarify this point. Let us suppose that producer price is $1,00 and that wholesale price is $2,00. If chicken accounts for 50% of the final wholesale price of chicken meat, an R$0.10 (10%) increase in the producer prices would translate to a 5% increase in wholesale prices.

Thus, the value of the parameter b must be less than one in the following relation adjusted with the data in the logarithms:

$P_{wholesale} = a + b\, P_{producer}$

If b will be is less than one in above equation, the parameter d must be higher than one in the equation below, which is what was observed.

$P_{producer} = c + d\, P_{wholesale}$

The size of the estimated elasticity indicates a high degree of transmission from the chicken meat market to producers, and is in range to what could be expected by theory, since poultry is just part of the total production cost of the meat at wholesale level. The high correlation of the two series is also shown in Figure 3, where the calculated correlation coefficient is 0.896.

Figure 3. Evolution of poultry price at producer level and chicken meat price at wholesale level .

- producer price (pp) e - wholesale level price (wp)
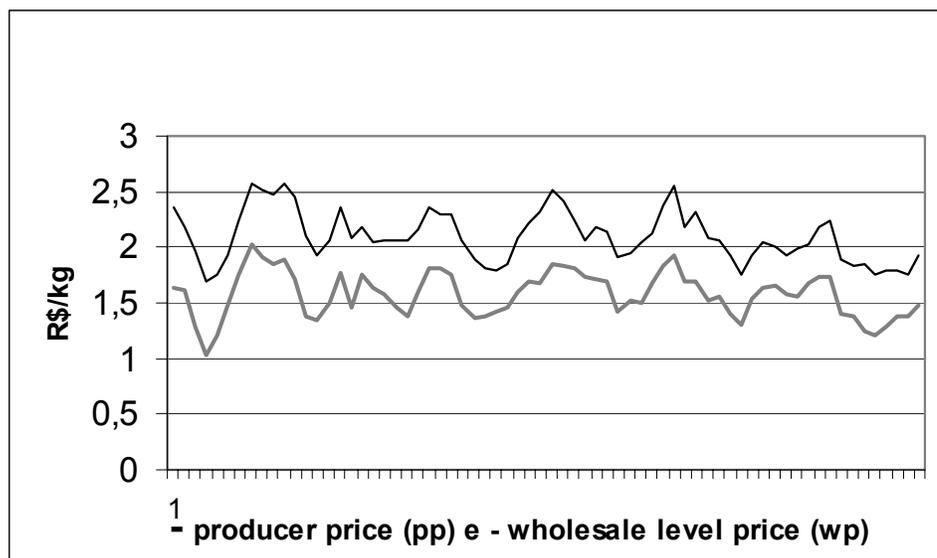
2.2 Market concentration, distribution of benefits and public policies

The modern poultry production is actually a large industrial complex, and cannot be analyzed only from the point of view of production and distribution. According to Zirlis et al (1990) the poultry production complex also comprises the feeding industry, veterinarian products, equipments, packing and industrial processing, and can be regarded as one of the best examples of economic integration and interdependency in a market economy. In this sense the poultry production complex is highly vertically integrated, and does extensive use of contracts in the production chain. In this chapter the issue of the structure and market power in the industry is explored in more detail. In what follows, a detailed exposition of market structure is done, in order to search for evidence of oligopolistic behavior.

Poultry production in Brazil can be divided into three main different production arrangements: independent producers; cooperative production; and the integrated system through contracts. In the first case, the independent producers do not have any contract linking either their inputs acquisition or selling of production to any particular processing firm. These producers buy or produce themselves their own feed, buy the chicks and services in the spot markets, and sell their production independently.

In the cooperative production case, the producers are organized around a cooperative venture for buying inputs, processing the production and trading the final product. Here, the producers buy their inputs, as well as sell their production, from and to the cooperative.

The integration system can be vertical or horizontal, being the first case the most common in Brazil. According to Roy (1972) the integration system is vertical when there is a combination of two or more successive stages of production or distribution under the control of the same firm. In Brazil the processing industry actually has control to every stage in the production process, including the primary production. From the industry's point of view, the following arguments for preferring this strategy are (Marques, 1991):

- Cost reductions associated to scale economies;
- Avoid costs associated with market price mechanism;
- To allow the firm to internalize gains that otherwise would be absorbed by other intermediaries.

From the point of view of the producers, the main arguments to explain the integration system are:

- The system reduces the price uncertainty;
- The processing industry supplies better technical support, usually much better than the public system, due to its interest in quality and homogeneity of the final product, which in turn, strengthens productivity.

In the case of the integrated production system in Brazil the producers receive the chicks, the feed and the veterinarian products, and are responsible for delivering the production in a date established by the contract. Besides, the producers must also supply the constructions, equipment and labor needed for the operation, and all other materials that may be required. The production will always be sold to the contracting industry.

According to Araujo (1996) the integrated system of production under contracts arose in parallel to the poultry production modernization, as a process of change in the organizational strategies. This system has spread rapidly in the state of Santa Catarina, where there used to be no modern poultry production in commercial basis, like in the state of São Paulo and Minas Gerais. Presently, the production under contracts is the main form of organization in poultry production in Brazil: around 75% of all

producers are in the integrating system, concentrated in the most important states in terms of production.

2.2.1 The chicken meat Industry concentration in Brazil

The Brazilian chicken meat industry settled in Brazil in the seventies, and the market is leaded by a few big companies. There are, however, a large number of small and medium companies, including many in the informal sector. The large companies are mainly located in the southern region of Brazil, and are expanding in direction to the southeast region, through mergers and new acquisitions.

In the eighties the sector faced a reorganization funded by public credit, and the 5 larger companies doubled in size (from 17% in 1980 to 35% in 1985). In the nineties the sector faced a new reorganization, with new mergers and fusions, and ownership transfers. The evolution of the market shares of the main companies in the Brazilian markets between 1998 and 2004 can be seen in Figure 4. As seen, the leader SADIA, which has plants in Santa Catarina, Paraná, Minas Gerais and Mato Grosso states, lost share in the period under consideration. PERDIGÃO, on the other hand, with units in Rio Grande do Sul, Santa Catarina, Paraná, Goiás and Mato Grosso states, was the company that grew the most in the period.

Figure 4. Evolution of market share in the Brazilian chicken meat market. 1998 and 2004

1998

2004
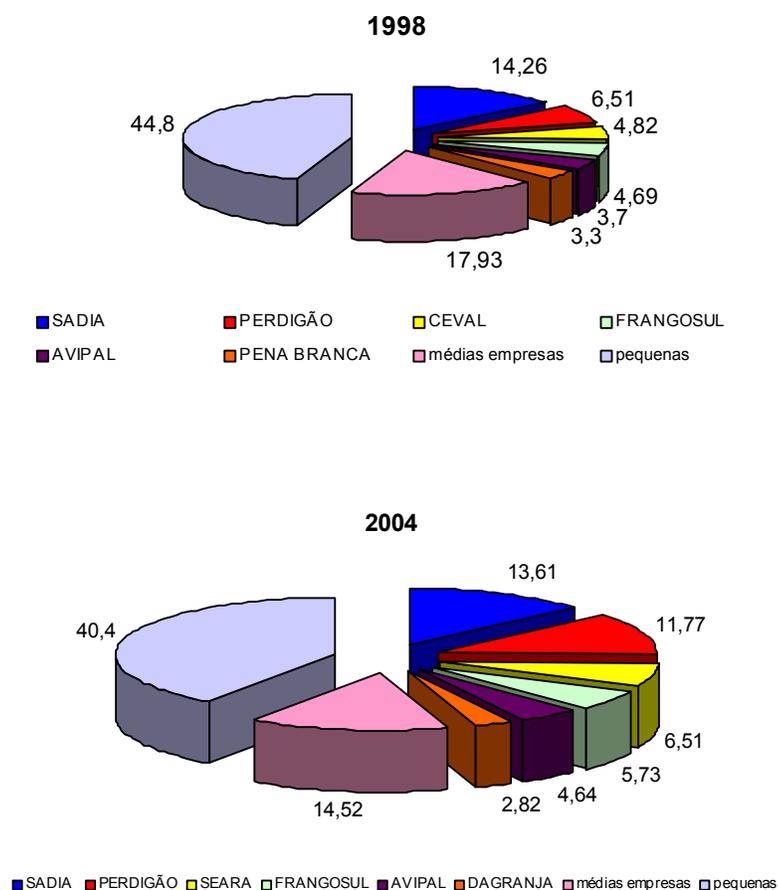
It can also be seen from Figure 4 that the share of medium and small companies is significant in the market. Table 16 brings more information about the evolution of the concentration ratio in the chicken meat market in Brazil. In this table, only companies affiliated to the Brazilian Association of Chicken Meat Exporters – ABEF are accounted for. As seen, from Table 16, the share of the main companies increased in the eighties.

Table 16. Share of production (quantity) of the main companies affiliated to ABEF in the Brazilian chicken meat market.

Companies group	1980	1985	1990	1993	1999	2004
5 largest	17,60%	34,30%	35,60%	35,00%	36,50%	42,26%
15 largest	24,80%	45,90%	50,50%	51,90%	54,75%	56,93%

Source: Rizzi (1993), Spolador (2001) and Abef.

It is important to notice that there are few barriers to entry in this market. According to Spolador (2001) the integration technology is well known, the breeds are readily available in the market, and the distribution system does not represent a barrier.

More information about the concentration ratio (in volume) can be seen in Table 17, bellow, where all the companies, including those not affiliated to ABEF, are accounted for.

Table 17. Concentration ratio (production) in the chicken meat market in Brazil.

	year	
CR	1998	2004
4	0,3028	0,3762
8	0,4294	0,4906
16	0,5289	0,568
20	0,5521	0,596

Source: Spolador (2001).

The above analysis suggests that the chicken meat market in Brazil is rather competitive, with the 4 largest companies accounting for just 37.6% of the total market in volume. Indeed, there is a strong competition in this market, with local small companies supplying local supermarkets efficiently.

The capital structure in the industry is basically owned by Brazilian firms. In 1998 the French Doux bought Frangosul. Now denominated Doux/Frangosul this company has 4 plants in Rio Grande do Sul and Mato Grosso do Sul. Another foreign capital firm in this sector is Cargill, which in 2004 bought Seara. The company kept the name Seara, and presently has 5 industrial units in Santa Catarina, Paraná, São Paulo and Mato Grosso do Sul. Together, the share of these foreign companies is about 12.24% of the market (6.51% Seara and 5.73% Doux/Frangosul). The remaining market share (about 87%) is accounted by Brazilian firms[15].

In the Brazilian market, then, chicken meat can be regarded as a commodity, an important conclusion for further analysis, especially if one takes into account the considerable price transmission found in the previous section. Together the two characteristics of the chicken meat market in Brazil suggest that changes in external prices would be transmitted to producers. The next section covers other aspects of this problem.

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[15] Sadia and Perdigão are open capital companies, with shares traded in the Brazilian Stock Market. A recent bid by Sadia do take over Perdigão was refused.

3 Barriers to international trade and economic impacts of its reduction

The reduction of the barriers agreed in multilateral negotiations should be designed to ensure that all countries, and particularly developing countries, reap the benefits of more liberalized trade. However, many trade policies adopted by the some countries hinder increases in prosperity and social progress in developing countries. In this regard, the discussion about economic impacts of lower agricultural trade barriers has received large attention by governments, trade institutions and policymakers around the world.

The importance of chicken meat among the main Brazilian agricultural products exports can be seen in Table 18. Brazil became the main world exporter of this product in 2004, with 2.4 million metric tons exported. Presently Brazil is the third largest chicken meat producer in the world, with 8.6 million metric tons in 2005, according FAO data[16].

Table 18. Brazilian exports by products (4 digits HS). 2005.

Product	Billion US$	%
Iron Ores (2601)	7.3	6.2%
Soybean (1201)	5.3	4.5%
Motor Vehicles (8703)	4.4	3.7%
Petroleum Oils (2709)	4.1	3.5%
Sugar (1701)	3.9	3.3%
Chicken Meat (0207)	3.5	3.0%
Aircrafts (8802)	3.1	2.6%
Soybean Meal (2304)	2.8	2.4%
Parts of Motor Vehicles (8708)	2.4	2.0%
Iron and Steel (7207)	1.8	1.5%
Other	79.2	67.2%

Source: Brazilian Ministry of Development, Industry and Trade. (SECEX/MDIC)

The main Brazilian trade partners in chicken meats in the last 5 years were Japan, Saudi Arabia, European Union (EU-25), the Russian Federation, Hong Kong, South Africa, Kuwait, United Arab Emirates, China and Venezuela. These countries

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[16] FAO (Food and Agriculture Organization of the United Nations).

were responsible for approximately 76% of the Brazilian chicken meat exports between 2000 and 2005 (Table 19).

Table 19. Chicken meat Brazilian exports. 2000-2005. (1.000 metric tons).

Country	2000	2001	2002	2003	2004	2005
Japan	109.3	130.6	164.2	184.9	323.1	402.2
Saudi Arabia	207.6	255.7	251.0	288.1	332.6	379.8
EU-25	138.9	247.1	284.8	308.4	277.9	321.3
Russian Federation	20.8	96.9	295.7	201.6	191.5	253.9
Hong Kong	112.6	115.2	143.2	199.3	178.7	156.0
South Africa	15.3	31.7	47.8	76.4	130.7	148.8
Kuwait	39.0	49.8	46.4	59.8	100.7	139.6
United Arab Emirates	30.1	53.0	78.2	99.9	120.5	130.6
China	18.9	16.4	9.9	11.6	60.2	116.6
Venezuela	0.0	0.0	0.0	16.2	68.5	102.9
Others	214.3	252.7	278.7	475.7	640.1	610.3
TOTAL	906.7	1249.3	1599.9	1922.0	2424.5	2762.0

Source: Brazilian Ministry of Development, Industry and Trade (SECEX/MDIC)
Note: Chicken meat includes the position 020711, 020712, 020713 and 020714 of the Harmonized System (HS).

The analysis of trade policies in this section will be done for these countries, and will contemplate the tariff schedule, the tariff-rate quotas (TRQs), the special safeguards (SSG), the level of amber box domestic support, export subsidies, anti-dumping measures, and the dispute settlement cases.

Data availability allows analysis of trade policies for the following countries: Japan, European Union, Hong Kong, South Africa, Kuwait, United Arab Emirates, China, Venezuela and Mexico will be covered. Moreover, the trade policies of United States of America (USA), Canada, India, Argentina, Indonesia and Thailand will also be covered.

The main assumption followed in this text is that the trade barriers adopted by developed countries are very high and result in agricultural production protected. Nevertheless, some developing countries also have high agricultural barriers and their reduction carry problems and opportunities.

3.1 Trade barriers in developed countries

Developed countries are represented in the study by United States, European Union, Japan and Canada. Two distinct groups can be divided: the first composed by

high importers (European Union and Japan) and, other composed by high producers and exporters (USA and Canada).

According to Table 20, there is a specific tariff of the US$ 0.176 per kg in USA. The resulting associated "*ad valorem* equivalent" (AVE)[17] is 12.2%. EU-25 applies a specific tariff of € 1024 per metric tons, or 91.4% as AVE. Japan imposes a tariff rate of the 11.9%, the smaller tariff among the developed countries studied. Furthermore, Japan does not apply a specific tariff. And finally, Canada has the highest and most complex tariff rate system to this product as it charges a specific tariff of not less than CAN$ 6.74 per Kg", which means an AVE of 249%.

Table 20. Market Access. Chicken Meat: cuts and offal, frozen. Developed countries. 2005.

Country	Applied Tariff		WTO Bound Tariff		TRQ	SSG
	Duty	AVE (%)	Final Duty	AVE (%)		
United States	US$ 0.176 / kg	12.2%	US$ 0.176 / kg	12.2%		
EU-25	€ 1024 / MT	91.4%	€ 1024 / MT	91.4%	•	•
Japan	11.9%	11.9%	11.9%	11.9%		
Canada	249% but not less than CAN$ 6.74/kg	249%	249% but not less than CAN$ 6.735/kg	249%	•	•

Source: USITC, TARIC, APEC Tariff and Canada Border Services Agency.
Notes: 1. MT = metric tons; 2. Specific tariffs were transformed into '*ad valorem*' equivalents – AVE(%) in accordance with AVE formula agreed in April 2005, within Doha Round Negotiations. The reference price used were US$ 1.44/Kg (USA); US$ 1.17/Kg (EU-25); US$ 2.59/Kg (Canada), and; US$D 0.69/kg (Mexico); 3. TRQ means 'tariff-rate quotas'; 4. SSG means 'special safeguards'.

Considering others trade policies, only EU-25 and Canada have registered tariff-rate quotas (TRQs) and Special Safeguards (SSGs) and presently, both apply these restrictions. The European Union has offered 26400 metric tons as in-quota volume, but has hardly filled it (the administration method adopted is license on demand). Canada has offered 39843.7 metric tons as chicken meat quota, administrated by a mixed method. Nevertheless, recently this country has imported more than the quota limit. It is important to notice that in the EU-25, there are four chicken meat

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[17] The calculus of *ad valorem* equivalent (AVE) follows Doha Round agricultural negotiations statements. Thus, the AVE is an average of the world imports values (COMTRADE value) and the country specific unit imports values (IDB value) weighted as follow: 82.5% by COMTRADE value and 17.5% by IDB value. To elucidate, COMTRADE is a trade flows database organized by UNCTAD/UN and IDB, is other trade flows database organized by WTO.

tariff-rate quotas covering 30 tariff lines, while in Canada, there is only one TRQ comprising 13 tariff lines.

The EU-25 has used price-based special safeguards (trigger price) on chicken meat imports, while Canada did not use this trade restriction, although it has reserved this right in the Uruguay Round.

An important note must be done regarding chicken meat price and trade distorting domestic support and export subsidies. Only Canada has offered amber box domestic support, but this amount has been allocated within the "*de minimis*" limit[18], meaning it is not accounted in Aggregate Market Support (AMS) calculus. That amount is therefore exempted from reduction obligations. The export subsidies have been given by United States and EU-25[19]. The EU-25, nevertheless, has offered export subsidies of €90.5 millions to its chicken meat producers and exporters.

3.2 Trade barriers in developing countries

Developing countries are represented in this study by Brazil, China[20], India, South Africa, Argentina, Mexico, Hong Kong, Venezuela, Indonesia, Thailand, Kuwait and United Arab Emirates. To facilitate the analysis, these countries will be divided according to their geographical regions: Asia, Latin America, Africa and Middle East.

• Asian Countries

The Asian countries do not have a common behavior regarding poultry trade policy. As it can be seen in Table 21, Hong Kong did not apply import tariffs on chicken meat. China charges a tariff rate of the 10%, and Indonesia imposes a duty of 5%. India and Thailand charge the larger tariff rates, at the level of 100% and 40%, respectively. As well as in the developed countries case, the applied tariff equals the WTO bound rate, except for Indonesia. This country registered a chicken meat bound tariff of 50%, but applies import a tariff of 5%.

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[18] "*De minimis*" limit: if the aggregate value of the product-specific support does not exceed 5 per cent of the total value of production of the agricultural product in question, no requirement to reduce trade-distorting domestic support is required.

[19] USA has only reserved this right.

[20] Contrary to the other countries, whose tariffs are from 2005, the information for China refers to 2003.

The Asian countries studied have not imposed other trade restrictions measures. According WTO notifications and other documents, these countries do not impose TRQs or SSGs to chicken meat imports.

Table 21. Market access. Chicken meat: cuts and offal, frozen. Asian developing countries.

Country	Applied Tariff		WTO Bound Tariff		TRQ	SSG
	Duty	AVE (%)	Final Duty	AVE (%)		
China	10%	10%	10%	10%		
India	100%	100%	100%	100%		
Hong Kong	Free	Free	Free	Free		
Indonesia	5%	5%	50%	50%		
Thailand	40%	40%	40%	40%		

Source: APEC Tariff, MERCOSUR, WTO, Government of India, South Africa Revenue Service, ALADI and WITS/UNCTAD.
Notes: 1. TRQ means 'tariff-rate quotas'; 2. SSG means 'special safeguards'.

None of the Asian countries studied offer domestic support of the amber box type to their poultry producers. Regarding export subsidies, India reserves the right to offer this kind of support for eggs exports, and Thailand, according to WTO notifications, reserves the right to offer export subsidies to chicken meat, but hasn't used it.

• *Latin America Countries*

Figures in Table 22 show that the chicken meat applied tariff rate in Brazil and Argentina are to the Mercosur's common external tariff. Venezuela imposes a duty of 20%, while Mexico charges a tariff rate of 234%. In Latin America, there is a difference between applied tariffs and WTO bound tariffs. Note that the Mercosur's countries bound tariffs are lower than in other countries. Brazil registered a bound tariff of 35%, and Argentina of 26.6%. The major tariff overhang[21] can be viewed in Venezuela where the difference between applied and bound tariffs is 115%, while in Mercosur countries it does not exceed 25%.

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[21] Tariff overhang is the difference between applied and bound tariffs.

Table 22. Market Access. Chicken Meat: cuts and offal, frozen. Latin American developing countries.

Country	Applied Tariff		WTO Bound Tariff		TRQ	SSG
	Duty	AVE (%)	Final Duty	AVE (%)		
Brazil	10%	10%	35%	35%		
Argentina	10%	10%	26.6%	26.6%		
México	234%	234%	US$ 1.512 / kg but not less than 234 %	234%	•	•
Venezuela	20%	20%	135%	135%	•	•

Source: APEC Tariff, MERCOSUR, WTO, Government of India, South Africa Revenue Service, ALADI and WITS/UNCTAD.
Notes: 1. Specific tariffs were transformed into '*ad valorem*' equivalents – AVE(%) in accordance with AVE formula agreed in April 2005, within Doha Round Negotiations; 2. TRQ means 'tariff-rate quotas'; 3. SSG means 'special safeguards'.

In Mexico the chicken meat tariff rate level is considerably higher than in other Latin American countries studied and there is no tariff overhang. Only Mexico and Venezuela have reserved the right to impose TRQs and SSGs on chicken meat imports into their territories. However, Mexico includes in its WTO notifications the message "better access conditions have been given beyond bound TRQ", i.e., there have been imports beyond the stipulated quota volume. On the other hand, Venezuela has offered a small quota volume of 3426 tons, covering 13 tariff lines within a unique TRQ. Regarding SSGs, both countries have reserved this right, but have not used it.

Note that the Latin American countries studied have not offered price or trade distorting domestic support, neither export subsidies to chicken meat producers and exporters. Another important topic is the price band ("*franja de precios*") system imposed by Venezuela, as well as by all Andean Community countries. Such instrument consists in a mechanism to stabilize import costs of some agricultural products, whose international prices fluctuate quite significantly. Such stabilization can be achieved rising the *ad valorem* tariff when the international price declines to a stipulated minimum level, and decreasing it when this price rises above a determined maximum level.

• *Middle East and African Countries*

Unlike South Africa that in this continent is the most important importer of chicken meat, it is difficult to get reliable information on Arab countries. Hence, the information on these countries presented in Table 23 should be regarded with caution.

Table 23. Market access. Chicken meat: cuts and offal, frozen. Middle East and African developing countries.

Country	Applied Tariff		WTO Bound Tariff		TRQ	SSG
	Duty	AVE (%)	Final Duty	AVE (%)		
South Africa	5%	5%	82%	82%	•	•
Kuwait	Free	Free	100%	100%		
United Arab Emirates	5%	5%	15%	15%		

Source: APEC Tariff, MERCOSUR, WTO, Government of India, South Africa Revenue Service, ALADI and WITS/UNCTAD.
Notes: 1. TRQ means 'tariff-rate quotas'; 2. SSG means 'special safeguards'.

South Africa imposes a 5% *ad valorem* tariff but has a bound rate of 82% implying a tariff overhang of 77%. It also imposes TRQ and SSG systems. The Kuwait has registered a 100% WTO bound tariff, but does not apply any to chicken meat imports. The United Arab Emirates adopted a 5% applied tariff and a 15% bound tariff, which results in a tariff overhang of 10%. South Africa has also offered 29033 tons of chicken meat quota volume, covering 16 tariff lines into a unique TRQ, and reserved the right to impose a chicken meat SSG, but has not used it.

And, finally, South Africa has reserved the right to offer export subsidies to chicken meat exporters, but has not used it. The United Arab Emirates notified WTO about its domestic support amount, which shows that the country does not offer amber box domestic support. Kuwait, however, has made no notification to the WTO on this matter.

Anti Dumping Measures and Dispute Settlement Body

Based on WTO available documents, the imposition of anti dumping measures in the chicken meat market has been restricted to South Africa and Argentina. The first country has imposed a restriction on chicken meat imported from USA in 2000. Argentina, also in 2000, levied anti dumping measures on Brazilian eviscerated chicken. USA also imposed measures against Canadian 'ready-to-cook kosher chicken', but this case wouldn't be framed as a chicken meat, but a prepared food.

Among the studied countries, there has been a concentrated debate about the dispute settlement body to chicken meat. Only 4 countries could be accounted as complainants, and 3 as respondents. In the first case, the USA had complained 2 times

against the Philippines, Brazil complained 3 times (against EU-25 in 2 occasions and 1 case against Argentina). The European Union complained against the USA in one case and Thailand complained against the EU-25, also in one occasion.

As respondents, the USA responded once to EU-25; the EU-25 responded 3 times (to Brazil in 2 occasions and once to Thailand). And, finally, Argentina responded once to Brazil.

General findings and conclusions[22]

In the chicken meat trade, the applied trade policies are distinctive among studied countries. Developed countries usually show high applied tariffs together with other trade restrictive measures, like tariff rate level near or greater than 100% (representing tariff peaks) jointly with TRQs and SSGs. However, USA and Japan, respectively a large exporter and a large importer, have applied tariffs relatively lower than the other countries studied.

The developing countries have, in general, applied agricultural tariffs at levels lower than developed countries. China, due to its WTO accession commitments, has applied agricultural tariffs in a low level in general. Thailand has chicken meat import tariff relatively high[23].

The Latin American countries have imposed low agricultural import tariffs. Nevertheless, specifically in the case of chicken meat, Mexico has charged an import tariff rate extremely high, 234%, which is rather prohibitive in practice. However, there are Mexican chicken meat imports due to preferential agreements in NAFTA itself, and in NAFTA with other partners. There are some preferential agreements among Mexico and Mercosur countries, but, for those including Brazil, chicken meat is not contemplated with preferences.

The Middle East countries studied and South Africa have charged low chicken meat import tariffs. South Africa, however, has imposed other trade restrictive policies, an uncommon trade policy feature for a developing country.

The Russian Federation and Ukraine, important chicken meat importing countries, have imposed trade policies less transparent and diverse of WTO

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[22] The technical appendix offers greater clarification on barriers to chicken meat imports apllied by different countries.

[23] The recent surge of the "Avian influenza" has potential to cause unpredictable effects on this market.

statements. Information about Saudi Arabia is expected to improve in the near future, due to its recent WTO accession.

Finally, as a general observation, the developed countries studied adopt a complex trade policy with a wide number of trade restrictions, while developing countries have used simple border trade measures. Contrary to what can be observed in other markets, domestic support policies in the developed world seem to be far less important in the poultry case. Complex trade policies in the developed countries, with tariff peaks and tariff quota systems, then, seem to be the main problem in the chicken meat market. And the lack of transparency in the applications of the WTO rules seems to be the main problem in some developing countries.

3.3 Technical and sanitary barriers in the chicken meat international trade

Technical and sanitary barriers to trade became important new issues in international trade, and this is especially true for trade in animal products. In this section this issue is examined in the context of the chicken meat trade in the international market.

The issues involving technical and sanitary regulations are treated in WTO respectively under the Technical Barriers to Trade Agreement (TBT), and the Sanitary and Phytosanitary Agreement (SPS). The first has the objective of avoiding countries to adopt technical measures with the sole objective to restrict trade, while the second focus on measures to allow countries to adopt measures for human health protection, food security, and also animal, and vegetal health security. The principles established under the two agreements compound the multilateral scope for discussion on technical and sanitary barriers to trade.

There is no effective list of technical and sanitary barriers (TSB) that affect trade of each product. Besides the dynamism inherent in the nature of these measures, there is the issue of legitimacy of these measures, which would define in practice if they would configure barriers or not. Trade in meats is one of the most affected by sanitary and technical regulations and, more recently, by environmental regulations. This is illustrated in a study by Kassum and Morgan (2002) analyzing notifications to the SPS Agreement. Those authors verified 2785 notifications to SPS between 1995 and 2001, of which 875 related to herds and meats (including feeds and excluding

dairy products). Of these, 240 measures resulted in closing borders, and 60 clearly restricted trade, allegedly on the basis of protecting human health and reducing risks of animal diseases. Regarding measures related to food safety, whose impact is harder to evaluate, about 10% resulted in closing borders, most of them related to the chicken market dioxin problem in 1997 and 1999. Another 20% of the measures had relatively clear effects on market access, particularly measures of quarantine, inspections and other requirements for imports (like certifications).

In the case of international trade in chicken meat, sanitary regulations apply with particular force to risks associated with Newcastle disease (ND), dioxin and labeling and, more recently, with the Avian Influenza (AI). Traditionally, the Newcastle disease is responsible for most restrictions that have been applied on Brazilian chicken meat.

The ND and AI are the bird diseases present in the A list of the International Office of Epizooties – OIE (2004), i.e, diseases that have a serious potential of fast dissemination independently of national frontiers, and with socio-economic and public health serious consequences. Countries are obliged to notify these diseases to the OIE. Another important bird disease is Salmonelosys, in list B, which comprises transmissible diseases of socio-economic and/or public health importance inside the countries and that are relevant for trade.

An illustrative example of a sanitary barrier that had negative positive effects on Brazil's exports can be seen in the case of Canada. Until this Canada did not import chicken meat from Brazil. In January 2003 there was a surge of ND in USA, and Canada banned imports from this origin and allowed imports from Brazil. In January of 2004 exports of chicken meat from this country to Canada reached US$2.5 millions. Its worth noting the last episode of ND in Brazil occurred in 2001 while in 2003, the OIE declared this country to be free of this illness.

More recently, a clearly arbitrary decision that can be considered an illegitimate trade barrier was adopted by Russia, causing a halt in imports of chicken meat from Brazil due to the appearance of cases of Foot and Mouth Disease in Amazon state, a restriction with no scientific basis.

Another relevant case for Brazilian chicken meat exporting sector was the change in status of the product imported by the EU, causing the incidence of higher tariffs on the Brazilian chicken meat exported to the region, and harming sales. Brazil established a dispute in WTO arguing against this measure, because it damaged its

poultry trade. The dispute was won by Brazil in 2004. A description of the main sanitary and technical barriers to chicken meat trade, based mainly in "grey documents[24]" is presented in Table 24.

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[24] Many different information sources, like interviews, newspapers and magazines, not necessarily scientific papers.

Table 24. Sanitary measures on chicken meat and selected related products. 1995 - 2005

Imposing country	Nature of the measure	Description
Germany	Sanitary and phytosanitary, and animal health regulations	October, 2003: exigency of analysis for Nitrofuran in chicken meat sold to Germany. The antibiotic was banned in the Brazilian Market in 2001, and was used in poultry production.
Argentina	Non-tariff barriers	Requirement of Mercosur Certificate of Origin. Previous import licensing (1999).
Canada	Sanitary regulations	1999: the Brazilian chicken meats "in natura" and its derivatives are prohibited to enter the country, under the argument of infestation by ND (1999). 2002: only Canadian Food Inspection Agency accredited companies are authorized to export for the country. In July 2002 an agreement was made of sanitary equivalence for chicken and turkey between Brazil and Canada, allowing exports from August on. The agreement recognizes as free of the disease the southern states plus SP, MG, MT, MS, GO and DF.
Chine	Sanitary and animal health regulations	2002: for codes NMC: 02071200 and 02071400 (frozen salted meat) the exigency of Animal Quarantine Certificate and Food Hygiene Certificate.
USA	Sanitary phytosanitary regulations and animal health regulations	Exigency that the Sanitary Inspection Brazilian System be certificated by the Food Safety Inspection Service (FSIS), of USDA, and declared equivalent to the north American system. The animal health Brazilian authority must certificate that Brazil is free of the ND, with the submission of the standardized form to the Animal Plant and Health Service (APHIS).
Italy	Sanitary and animal health regulations	2002: requires habilitation of the Brazilian exporter by the Ministry of Agriculture (MAPA,) and authorization of the Heath Ministry of Italy.
Japan	Sanitary and animal health regulations	1999: restrictions to the entry of Brazilian chicken meat in Japan under the allegation of contamination by nicarbazyn residuals.
Russia	Sanitary and animal health regulations	2004: halt imposed to imports of beef, pork and chicken meat from Brazil, due to the occurrence of Foot and Mouth disease in Amazon state.
European Union	Sanitary, phytosanitary and animal health regulations	Exigency of chemical and biological residuals control plans in animal products exported to the EU, like hormones, veterinarian's medicines and contaminants (Brasil, 2000). In 2003 there was an accusation of nitrofuran in Brazilian chicken meat, which is not allowed in Europe. In 2003 the EU determined the increase in salt content, from 1.2% to 1.8%

Source: notifications to the SPS Agreement.

Some relevant themes for chicken meat and related products also in the TBT agreement are included in the standardization scheme by ISO, although the voluntary standardization is not under control of this Agreement. A great part of the voluntary norms for feeds, microbiology of food and feeds deal with methods of analysis of contents, humidity, residuals determinations, among others. The interest in standardization on feeds shows the growing importance of traceability for this sector.

USA developed a regulatory norm for chicken denominated *United States Classes, Standards and Grades for Poultry*, from the American Marketing Service - USDA (70.200), in 2002. This established the denomination of products and classification standards, and the quality norms for them. The program is voluntary and supplies to the interested parties a service of categorization that is official for USA, and paid by the service user.

The main countries in chicken meat trade in the world have been involved in the Specific Trade Concerns (STC) of the SPS. Some themes are recurrent, and reflect the threats that Brazil and other developing countries have been facing. For example, there demands directly linked to the lack of transparency of countries to communicate their legislation to the WTO. Other disputes reflect the difficulty in harmonization and equivalence granting between countries. The non-discrimination and the need of scientific basis are also principles that should ideally be observed.

Eleven Specific Trade Concerns about chicken meat in the WTO have been raised until 2004. Some of the most relevant cases of interest for this study can be seen in Table 25.

Table 25. Specific Trade Concerns raised in the Committee of SPS Agreement. 1995-2004. Chicken, birds meats and related products.

Complaining country	Denounced country	Measure	Observations
USA(1996)	Chile, Czech Republic, El Salvador, Slovak and Honduras.	Accusation that the denounced countries discriminated the standards for Salmonella control between domestic and imported from USA products. Those countries applied a "zero tolerance" standard and were charged the accusation of not presenting themselves a system of vigilance or eradication to support the non-existence of Salmonella in the domestic products.	Appeal to non-discrimination
Thailand (1997)	Korea	Korea was charged the accusation of prohibiting imports of fresh chicken meat due to Listeria, even though Korean experts were satisfied after visiting the Thailand industry.	
USA(1997)	Venezuela	USA informed that the non-pathogenic Avian Influenza was detected in some northeast	Allegations of lack of scientific basis

		states. As a consequence Venezuela banished the imports of birds and products from USA. The USA noted that although international standards existed for Avian Influenza, differences in comprehension and interpretation resulted in unfair barriers to trade. The low pathogenicity influenza found in Virginia has no support to justify the ban. The OIE backed the USA position.	and lack of ban notification. According to OIE the low pathogenicity influenza are not significant both in terms of animal security or socio-economic impacts.
Thailand (EU participating as a 3rd party). 1998	Australia	Successive Australians requirements for chicken meat imports. According to the EU, requirements regarding temperature and timing created an international barrier to trade.	The measure was notified by Australia (transparency). There was scientific divergence.
USA(1998), supported by Brazil, Australia, Canada, Chile, Hungary, India, Israel and New Zealand.	Switzerland	The USA manifested regarding the Swiss norms about animal meats treated with hormones, antibiotics and similar products imported over Tariff Quotes (TRQ) not being based on science of risk evaluation. In 2001 Switzerland announced the referred measures, to which the USA just declared resolved in 2004.	Non-quota products have different treatment.
Thailand (1998)	Czech Republic	Imports of chicken meat from Thailand was prohibited by the Czech Republic which was criticized by the lack of scientific justification and discrimination, since the oriental product was accepted even though containing arsenic acid levels above the Czech Republic acceptable level.	Lack of scientific justification and discrimination.
Costa Rica (2002), supported also by Argentina, Chile and Thailand.	Honduras	Honduras limited the imports of chicken meat from Costa Rica, allowing imports only from countries free from the Avian Influenza and other diseases. Costa Rica questioned the scientific justification of the measure, since the birds health status in the country was in accordance of the OIE standards.	The scientific base used by Honduras was questioned.
USA(2003)	China	USA questioned China for the ban imposed by imports from USA due to the low pathogenicity influenza in Delaware state, in February 2004. The ban affected the whole American territory.	The Chinese measure is based on article 6 of the SPS Agreement and OIE norms.
UE(2004) supported by USA.	India	India prohibited chicken meat and related products from USA due to the Avian Influenza, but the measure was not notified to the WTO.	India just notified the measure three months later (lack of transparency).

Source: WTO documents (STC)

The trade in chicken meats and other chicken products has caused disputes between Brazil and the EU since 1997. In this year Brazil demanded consultations to EU due to the rules adopted for some imports, as well as in the tariffs charged. Other disputes took place, mainly due to measures that caused a reduction of 80% of exports of chicken meat to the EU, corresponding to a loss of US$300 millions/year, according to ABEF. This dispute was caused by the change in the status of the Brazilian exported chicken meat, from salted and frozen (15.4% tariff) to frozen ("in

natura", with an equivalent tariff of 75%). To Brazil this was regarded as a measure to restrict trade.

The justification was that just meats where the level of salt was enough for preservation, without the need of freezing, could be included in the "salted" category. Brazil raised the argument that has got a less favorable treatment to what was specified in the EU lists to the GATT (1994), according to which the meat is considered "salted" if it has more than 1.2% of salt by kilogram. Thailand and the USA also consulted on this matter.

Presently, the Avian Influenza is the most worrying disease, due to its devastating potential and the implications for exports. Brazil, as the main world exporter, has adopted a series of monitoring measures. Recently, the USDA recognized the strong growth of the Brazilian chicken meat exports in 2004, crediting the success in a great deal to commercial promotion, sanity conditions, and the good quality of cuts sold by the country.

The capacity of developing countries to comply with the technical and sanitary requirements and role of the government and the private companies

The SPS and TBT agreements have not been too successful in avoiding its rules to be used as a protective mechanism, in particular against the developing countries (Henson et al, 1999; Henson and Loader, 2001). Considering that the participation in the notifications to the International Agreements can be an indicator of the effective influence of countries in the definition of technical reference parameters for the world, the notification processes since 1995 reveal that developed countries have been considerably more active. This indicates a greater influence of their technical standards on international regulations, an influence that will grow in the next years.

Barros et al (2002) analyzing the notifications of countries from the Western hemisphere to SPS concluded that the high income countries (USA and Canada) had an evident higher performance in the process. The most revealing indicator, however, is the nature of the notified measures to the WTO. In particular the USA had great regulatory action over pesticides and additives (chemicals in general), in special in what refers to residuals in products. Developing countries, on the other hand, had more initiatives about regulations for animal and plant health.

To the moment there are no estimates of the cost of compliance with the sanitary and technical legislation in the chicken meat market in Brazil. An important conclusion derived from field observations in studies conducted by the Centre of Advanced Studies in Applied Economics - CEPEA[25] is that the exporting companies have been under pressure for adjustment much more due to the certification process (voluntary rules) than to other country's regulations. In some cases the interviewed mention that this adjustment is part of the process to keep themselves competitive in the markets, complying with demands of the many different export markets. It is an evidence of the trend that the technical and sanitary requirements will be fulfilled by the establishment of voluntary, rather than mandatory, processes.

Section summary and conclusions

It seems clear from what was exposed above that the sustainability of chicken exports depends presently on the ability to comply with sanitary and technical requirements imposed by consumers. These standards are increasingly being imposed by the large industrial corporations and retailers (through voluntary norms and lobbies to influence the regulatory process) in developed countries. It is important, then, that the SPS and TBT principles be incorporated and absorbed by developed countries, in order to get the benefit of this transformation in commercial standards.

Many of the threats faced in the sanitary and technical fronts for chicken meats exports are related to the participation and knowledge by the country and companies in the international forum that determines the system's rules. It is quite evident that developing countries in general and Brazil in particular have bottlenecks to be solved in order to strengthen its participation in the process.

4 Economic and social impacts of reduction in agricultural protectionism

This section analyzes the economic and social impacts of a reduction in agricultural protectionism, with the aid of a general equilibrium micro-simulation

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[25] The International Economics team of CEPEA is conducting the study "Development of a Process for Systematic Identification and Analysis of Technical Barriers to the Brazilian Exports' (FINEP-CEPEA-ESALQ/FEALQ), in which in the first semester of 2006 the exporting firms are being researched about the threats in terms of technical barriers, including the costs of compliance.

model of Brazil based in Ferreira Filho and Horridge (2005). Simulations of Doha scenarios are implemented, with and without the inclusion in the liberalization scenario of chicken meats, to try to address the differential economic and social impacts on Brazil. A more detailed description of the models used can be seen in the Technical Appendix to this report. In what follows, the simulation scenarios are described, and the results analyzed.

Model's closure

The model's closure aims to mimic the GTAP model (Hertel, 1997) that generated the foreign price scenario. On the supply side, total national employment was kept fixed by occupation, with labor moving freely across sectors. The model allows substitution between occupations, driven by relative wages. Similarly capital is fixed nationally but is mobile between sectors and regions. Land stocks (used just in the Agriculture activity) are fixed in each sector.

On the demand side, government and investment spending are fixed[26], and a fixed trade balance enforces the national budget balance, which is accommodated by changes in real consumption. The trade balance, then, drives the level of absorption. The Consumer Price Index (CPI) is the model's numeraire.

Finally, lost revenues from tariff cuts are replaced: real aggregate revenue from all indirect taxes is kept fixed, via a uniform endogenous change in the power of indirect taxes on sales to households. This mechanism is equivalent to a lump sum tax, of value proportional to each household's spending[27]. It also resembles the traditional method of raising tax revenues in Brazil, through indirect tax collection.

The scenarios to be simulated

The scenarios to be simulated here are provided by a previous run of the GTAP model, which generates the global scenario to be implemented by Brazil. This scenario is presented in detail in Anderson and Martin (2006), and a brief description is provided here, since it is a multi-country scenario. Due to important tariff overhangs, the authors recognize that unless the Doha Round is considerably more

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[26] In real terms, since the CPI is the model's numeraire.

[27] That is, neither the distribution of spending nor relative prices facing households are altered. With fixed labour supplies, distortion of any labour-leisure choice does not arise.

ambitious than the Uruguay Round, it will achieve little development stimulus. As an example, the authors show that in agriculture, bound tariffs in developed countries average 48%, but applied tariffs average only 27%. In the case of least developed countries (LDC), the figures are respectively 78% and 13%. So, for many countries and products the tariffs can be cut deeply, with no impacts on trade (Hertel and Winters, 2006).

In the Doha scenario used in this study, agricultural tariffs are reduced using a tiered formula, with marginal cuts changing at 15 and 90 percent bound tariff rates. The marginal cuts are 45% for the lowest agricultural tariffs, 70% for tariffs in the middle range, and 75% marginal cuts for the highest tariffs. For developing countries the inflexion point are placed at 20, 60 and 120 percent bound tariff levels in agriculture, with marginal cuts of 35, 40, 50 and 60 percent, respectively (Hertel and Winters, 2006). The LDCs are not required to cut tariffs in the simulated scenario. These and other features of the simulated scenario are summarized bellow:

- Agriculture, market access - simulated through the use of a nonlinear (tiered) formula, described above.

- Agriculture, AMS – applied tiered formula. For developed countries marginal rates of 60 (AMS less than 20%) and 75 percent. For developing countries, marginal rate of 40 percent. For LDCs no cuts to domestic subsidies.

- Agriculture, export subsidies – abolished.

- Non-agriculture market access – 50% cuts in tariffs (33% developing countries, zero percent for LDCs).

Table 26 brings more information about this and the shocks applied to the Brazilian CGE model.

Table 26. Shocks to the model. Doha scenario. Percent variation.

	Import Tariffs	*Import CIF Prices*	*Implied Export Price Shift**
Product	*Doha Scenario*	*Doha Scenario*	*Doha Scenario*
Coffee	-0.04	0.74	-0.74
SugarCane	0	1.02	7.73
PaddyRice	0	2.8	7.58
Wheat	0	1.95	0.94
Soybean	0	2.54	3.90
Cotton	0	2.45	5.37
Corn	0	2.41	6.32
Livestock	0	1.05	0.24
NaturMilk	0	0.73	-1.11
Poultry	0	0.45	0.47
OtherAgric	-0.04	0.74	-0.74
MineralExtr	0	0.16	0.48

PetrGasExtr	0	0.14	0.20
MinNonMet	-0.01	0.13	0.78
IronProduc	-0.07	0.04	0.25
MetalNonFerr	-0.23	0.03	0.80
OtherMetal	-0.04	-0.01	0.45
MachTractor	-0.02	-0.17	-0.09
EletricMat	-0.1	-0.02	0.19
EletronEquip	-0.01	0	0.28
Automobiles	-2.14	0.24	0.53
OthVeicSpare	-0.02	-0.17	-0.09
WoodFurnit	-0.84	0.06	0.49
PaperGraph	0	0	0.21
RubberInd	-0.28	0	0.35
ChemicElem	-0.28	0	0.35
PetrolRefin	0	0.14	0.45
VariousChem	-0.28	0	0.35
PharmacPerf	-0.28	0	0.35
Plastics	-0.28	0	0.35
Textiles	0	0.65	1.34
Apparel	0	1.00	1.46
ShoesInd	-0.14	0.43	0.26
CoffeeInd	-0.05	0.25	1.50
VegetProcess	-0.21	0.74	2.20
Slaughter	0	2.17	18.02
Dairy	-0.02	4.43	7.56
SugarInd	0	5.22	4.30
VegetOils	0	0.88	3.50
OthFood	-0.21	0.74	2.20
VariousInd	-0.05	0.05	0.11
PubUtilServ	0	-0.05	-0.08
CivilConst	0	0.03	-0.03
Trade	0	0.05	0.01
Transport	0	-0.01	0.03
Comunic	0	-0.03	-0.06
FinancInst	0	-0.07	-0.10
FamServic	0	-0.10	-0.11
EnterpServ	0	-0.06	-0.04
BuildRentals	0	2.53	2.69
PublAdm	0	-0.05	-0.08
NMercPriSer	0	-0.10	-0.11

* - Vertical shift in export demand schedule calculated from GTAP results.
Source: Ferreira Filho and Horridge (2005)

It is important to notice that, in the model, chicken meat is aggregated with other meats in the product of the slaughter industry (slaughter in the above table). This is necessary since the Brazilian PNAD does not bring disaggregated information about the food industry, what makes it impossible to carry the micro-simulation on chicken meat individually. On the contrary, all the food industry activities are aggregated under just one sector. The agricultural activities, on the other hand, are disaggregated as shown in the table.

But live animals (poultry) are not externally traded. The link between the domestic poultry production and the international market, then, comes indirectly from

the meat industry. Considering that chicken meat and beef are the bulk of Brazilian meats exports, approximately with the same share, the differences in the results for both scenarios (with and without chicken meat) must be considered an upper limit for the chicken meat effect alone. But the link from the slaughter sector to poultry is accurate, since this input demand relation is modeled through a Leontief function.

For the sake of simplicity, in what follows the two simulated scenarios will be identified by CM (liberalization with chicken meat), and NCM (without chicken meat).

General results

As stated before, the shocks applied to the model were generated by a previous run of the GTAP model, where the Doha scenarios were implemented. The GTAP effects on the Brazilian economy were then transmitted to the Brazil CGE model through tariffs and import prices changes, and shifts in the demand schedules for the Brazilian exports[28]. In what follows, some selected macroeconomic results are presented in Table 27 that help to establish a benchmark for poverty analysis.

Table 27. Doha liberalization scenarios. Selected macroeconomic results. Percent variation.

Macros (percentage changes)	Doha Liberalization Scenarios	
	With Chicken Meat (CM)	Without Chicken Meat (NCM)
Real Household Consumption	0.22	0.11
Real Investment	0.00	0.00
Real Government Expenditure	0.00	0.00
Exports Volume	0.91	0.64
Imports Volume	1.98	1.05
Real GDP	0.04	0.03
Aggregated Employment	0.00	0.00
Real wage	0.02	0.02
Aggregated Capital Stock	0.00	0.00
Average Rate of Return	0.24	0.10
Consumer Price Index - CPI - Numeraire	0	0.00
GDP Price Index	0.05	0.01
Export Price Index	0.11	0.22

[28] The shifts in the demand schedules for Brazilian exports were calculated using export price and quantity results from GTAP, together with export demand elasticities drawn from GTAP data.

Imports (CIF) Price Index	-1.10	-0.33
Imports (Domestic Prices) Price Index	-1.23	-0.46
Real Devaluation	-1.15	-0.34
Terms of Trade	1.22	0.54
Nominal Exchange Rate	-1.26	-0.48
Balance of Trade as a GDP Share	0.00	0.00
Price of agricultural land	7.70	1.92

Since the model's closure fixes total supply of all primary factors (land, labor and capital), GDP shows only a slight increase in all simulations. The real exchange rate rises (revaluation) as a result of the shocks, with corresponding gains in the external terms of trade. The exchange rate devaluation is higher in the CM case, illustrating the importance of meats in the Brazilian external trade.

For factor market results, recall that land is fixed by sector, while capital and labor are fixed nationally, but mobile between sectors. As it can be seen, the average (aggregated) capital rental increases in all scenarios. With total capital stocks and labor fixed, the expanding industries would attract capital and labor from the contracting ones. In these industries those with falling capital/labor ratios increase the marginal productivity of capital, and hence capital returns, determining an increase in aggregated results. The price of land shows a strong increase in CM scenario, reflecting the increase in production of activities using this factor (Agriculture).

In the simulations, the balance of trade as a share of GDP is kept fixed. Brazilian real (volume) exports and imports would increase more in scenario CM than in NCM, reflecting the greater trade liberalization in the first scenario.

The impact of this Doha scenario on domestic production and sales can be seen in Table 28[29]. As it can be seen, the CM scenario generates, a strong increase in poultry production (4.43%), when compared to the NCM scenario (0.02%). This increase is driven mainly by an increase in intermediate demand, which is caused by the increase in chicken meat exports (7.05% increase) in CM scenario.

Table 28. Model results. Percent variation in production and sales, by destination.

		Doha Scenarios						
		CM				NCM		
Sales	Prod	Intermed	Househ	Exports	Prod	Intermed	Househ	Exports

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[29] Although the model has 52 commodities, only the commodities of direct interest for this study are presented here. The complete tables can be seen in the Appendix.

Poultry	4.43	4.6	-0.13	-0.04	0.02	0.02	0.01	0
Slaughter	6.94	0.53	-0.63	7.05	-0.08	-0.01	0.06	-0.13

DOMESTIC PRICES		
	CM	NCM
Poultry	9.08	-0.39
Slaughter	5.11	-0.27

LABOR MARKET		
Agriculture	**CM**	**NCM**
Employment	1.38	0.37
Wages	0.99	0.34

Notes: Prod: production; Intermed: intermediate consumption; Househ: household consumption.

Note that the household demands actually falls in the scenario with trade liberalization in chicken meat. This happens due to the increase in prices: 5.11% for chicken meat, and 9.08% for poultry in CM scenario. In the NCM scenario, on the other hand, there is a fall in chicken meat prices, induced by the currency revaluation caused by the liberalization on the other markets.

In the model, the sector Agriculture produces eleven commodities, including poultry. The variation in employment and wages observed in the model then is due to the inclusion of chicken meat in the liberalization scenario. As it can be seen from Table 28 the CM scenario generates larger effects both in employment and wages in agriculture, compared to the NCM scenario.

In summary, model results show that chicken meat has an effect strong enough to generate significant impacts on aggregate in the economy. The next section analyzes how these impacts affect income distribution and poverty in Brazil.

4.1 Poverty and employment impacts of a multilateral liberalization in the chicken meat international trade

Although in the previous section the specific results for poultry and chicken meats were presented, the policy change under analysis generates changes in most sectors and markets in the economy. The net result on income and the consumer price index, calculated for the models' household income classes, can be seen in Table 29 .

Table 29. Model results. Percent variation in the Consumer Price Index, Nominal Income and Real Income. Doha Scenarios.

Doha Scenarios						
	CM			NCM		
Household income class	Nominal income	CPI	Real income	Nominal income	CPI	Real income
POF[1](lower)	1.32	0.14	1.18	0.41	0.05	0.36

POF[2]	0.62	0.13	0.49	0.21	0.04	0.17
POF[3]	0.51	0.10	0.41	0.18	0.04	0.14
POF[4]	0.32	0.07	0.25	0.12	0.03	0.09
POF[5]	0.20	0.07	0.13	0.08	0.03	0.05
POF[6]	0.11	0.05	0.06	0.05	0.02	0.03
POF[7]	-0.05	0.03	-0.08	0.01	0.01	0.00
POF[8]	-0.12	0.00	-0.12	-0.02	0.00	-0.02
POF[9]	-0.21	-0.01	-0.20	-0.06	0.00	-0.06
POF[10](higher)	-0.25	-0.08	-0.17	-0.08	-0.03	-0.05
Gini index		-0.15			-0.06	

In Table 29 the specific CPI are calculated over the specific consumption bundles for the ten income classes in the model. The poorest households are those in income class POF[1]. As can be seen, the CPI actually increases for almost every income class, except for the richer. As discussed in Ferreira Filho and Horridge (2005) this last effect is due to the exchange rate revaluation, that reduces the price of imported products, whose share is higher in the richer household's consumption bundle.

Another general point to call the attention is the fall in income of the richest households. These household's income composition is made out mainly of the higher wages, as was seen in Table 6, which are paid mainly in the manufacturing activities. Manufacturing is more protected in the base year than agriculture in Brazil. The proposed Doha scenario generates as a general result, a fall in industrial wages, and an increase in agriculture and agriculture related activities, like the food industry. The consequence is a fall in wages and employment in manufacturing in relation to agriculture. The higher increase in nominal income of the poorest families then, is explained by the fact that agriculture pays the bulk of the lowest wages in the economy[30].

The net result of this CPI and income increases is a positive real income variation. As it can be seen, the real income increase is higher for the poorest families, and tends to decrease for the richest. These changes in income distribution would entail changes in GINI index of -0.15% and -0.06% respectively in scenarios CM and NCM. Therefore, the scenario with liberalization in chicken meat would improve income distribution in Brazil, relative to the scenario with no liberalization for that market.

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[30] Actually, agriculture pays more than 40% of the national wage bill of the lowest wage class, which is considered the most unskilled of the workers.

For the purpose of further describing the state of income insufficiency in Brazil the model uses a poverty line defined as one third of the average household income[31]. As mentioned above, according to that criterion 30.8% of the Brazilian households in 2001 would be poor[32]. This would comprise 96.2%, 76.6% and 53.5% respectively of households in the first three income groups[33], or 34.5 million out of 112 million households in 2001. The simulation results upon the poverty indexes can be see in Table 30.

The headcount ratio index (FGT0) captures only the extension of poverty, but is insensitive to its intensity (Hoffmann, 1998). The change in the intensity of poverty can be seen through the FGT1 index, the insufficiency of income ratio. A reduction in FGT1 means a reduction in the severity of poverty inside each household income class. As it can be seen, the FGT1 index decreases more than the headcount ratio in scenario CM. This means that although income distribution improves, it is not sufficient to drive a large number of persons (or households) out of poverty. Nevertheless, the reduction is higher when chicken meat is included in the liberalization scenario.

Table 30. Percentage changes in the proportion of poor households (FGT0) and of the poverty gap ratio (FGT1) by household income groups. Change in poverty (number of persons).

	Doha Scenarios			
	CM		NCM	
PRPF	Share bellow poverty line (FGT0)	Poverty gap (FGT1)	Share bellow poverty line (FGT0)	Poverty gap (FGT1)
1 POF[1]	-0.09	-0.41	0	-0.13
2 POF[2]	-0.01	-0.96	0	-0.33
3 POF[3]	-0.4	-1.7	-0.14	-0.58
4 POF[4]	-2.29	-2.35	-0.78	-0.78
5 POF[5]	-2.57	-3.09	-1.44	-1.05
6 POF[6]	-1.17	-3.60	-0.85	-1.27
7 POF[7]	-3.61	-5.78	-2.49	-2.18
8 POF[8]	0	-7.37	0	-3.33
9 POF[9]	0	0	0	0

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[31] This poverty line is equivalent to US$ 48.0 in 2001.

[32] Barros et all (2001), working with a poverty line that takes into account nutritional needs, find that 34% of the Brazilian households were poor in 1999.

[33] The proportion of households below the poverty line in the other income groups are 0.284% for the 4th, 0.14% for the 5th, 0.04% for the 6th, 0.008% for the 7th, and 0.001% for the 8th. There are no households below the poverty line for the two highest income classes.

10 POF[10]	0	0	0	0
National index	-0.42	-0.84	-0.16	-0.28

CHANGE IN POVERTY		
	CM	**NCM**
Number of households	-74,697	-27,345
Number of persons	-283,771	-105,300

The net results on the number of households and persons moving along the poverty line can be seen in the last rows of Table 30. In the scenario including chicken meat liberalization (CM) an estimated 74,697 households leave poverty. This number falls to 27,345 in the NCM scenario. The corresponding number of persons is 283,771 persons leaving poverty in the CM scenario, and 105,300 in the scenario without chicken meat, a difference of 178,471 persons.

And, finally, the model allows a closer look into income changes inside agriculture with more details. Table 30 shows the income variation of workers in the model, classified according to the occupational status in the labor market: non-agricultural workers, permanently employed workers, temporary workers, self-employed and employers. As it can be seen, the non-agricultural workers (workers outside agriculture) actually show a fall in income as a consequence of the policy, as discussed before. But in the case of agricultural workers, model results show that employers, more than the other categories, would be the most benefited in scenario CM. In any case, however, the income growth would be smaller when chicken meat does not participate in the liberalization scenario.

Table 31. Model results. Percent variation in workers average income, by occupational status.

	Doha Scenarios	
Worker occupational status	CM	NCM
1 Non-Agricultural workers	-0.31	-0.09
2 Permanent	0.03	0.04
3 Temporary	0.53	0.21
4 Self Employed	0.32	0.12
5 Employer	6.97	1.69

Another way of analyzing the distributive results is to look according to the structure of land ownership. These results can be seen in Table 32. As shown, the inclusion of chicken meat in the liberalization scenario causes strong income effects on income of land owners, almost regardless their farm income. This is due to the

structure of land distribution in the activity, with a large number of small and medium producers. These gains are strongly associated with land returns: while workers earn wages as income, landowners also get the returns to land, which shows strong increases in scenario CM.

Table 32. Model results. Percent variation in average income, by farm size.

	Doha Scenarios	
Land class	CM	NCM
1 noland	-0.11	-0.02
2 up to 25 ha	3.78	1.05
3 up to 50 ha	5.88	1.24
4 up to100 ha	6.16	1.61
5 up to250 ha	6.61	1.62
6 above 250 ha	7.19	1.67

5 The chicken meat sector political economy and the trade negotiations

In Brazil the chicken meat exporters are represented by ABEF – Associação Brasileira de Exportadores de Frango; and the Institute for the Study of Trade and International Negotiations – ICONE, an institution funded by 7 associations linked to the Brazilian agribusiness, including the poultry and chicken meat industry. This institute develops research applied to international trade, and supports the associations and the government in international negotiations. Moreover, the Brazilian minister of Development, Industry and Commerce is a former director of SADIA, one of the largest companies in the sector, and an ABEF associated. In short, it's possible to say that this sector is well represented in the trade negotiations.

6 Lessons and policy recommendations

Brazil is one of the most important players in the chicken meat world market. The rapid increase in the sector's production in last years conferred it a prominent role in the Brazilian economy.

The issue of if trade liberalization in the chicken meat market would reduce poverty and improve income distribution in the country is a complex one, and many aspects were addressed in this study. First of all, it is important to recognize that Brazil is a major exporter or chicken meats, even though the exported share is smaller than the domestically consumed share. This means that liberalization in WTO for this

sector can almost automatically be regarded as bringing benefits in aggregate terms, since there is no import side factor counterbalancing the export push effect. The extent by which extent this effect translates in poverty alleviation and improved income distribution, however, depends on many different factors.

The first one is related to the price transmission, and refers to how much of international price variations (expected to happen in a trade liberalization scenario in WTO) are transmitted to domestic producers. In this study this effect was found to be high for Brazil. The transmission elasticity from the international to the domestic chicken meat markets is estimated at 32% in the first month. This value is considered high if one takes into account that the bulk of the sector's production (about 70%) is consumed in the domestic market. Local influences, then, must be important in price formation. In a second step, the transmission from the Brazilian chicken meat market to producers was also found to be very high, indicating the absence of significant market power from the part of the meat companies.

These results disagree partially with others found by Quiroz and Soto (1995), and Baffes and Gardner (2003), quoted by Nogués (2005), and the main reason seem to be that Brazil is an exporter, as noted before.

This fact is in accordance with what was found for the chicken meat industry market structure, where the share of small and medium companies is significant. The concentration ratio for the 4 largest companies (CR8) was found to be around 0.38, while the CR8 is around 0.49 and the CR16 around 0.56. This indicates that the sector is rather competitive, although its organization is almost completely vertically integrated with contracts, with the food companies leading the process. The dominance of this form of market structure regardless the size of the integrating companies, however, indicates that the gains in efficiency and quality dominate the process. Additionally, the industry's capital structure is basically composed of Brazilian firms.

In what refers to the barriers to international trade in the chicken meat market, the applied trade policies are distinct among studied countries. Developed countries usually charge high applied tariffs together with other restrictive measures. However, USA and Japan, respectively a large exporter and a large importer, have applied tariffs that are relatively lower than those applied by other countries.

Developing countries, on the other hand, have tariff rates that are generally lower than developed countries. China, due to its WTO accession commitments,

applies a relatively low tariff. Thailand has chicken meat import tariff relatively high, while the Latin American countries impose relatively low tariffs. Nevertheless, specifically in the case of chicken meat, Mexico applies an extremely high tariff, which is rather prohibitive in practice.

The Middle East countries studied and South Africa charge low chicken meat import tariffs. South Africa, however, imposes other trade restrictive policies, an uncommon trade policy feature for a developing country. The Russian Federation and Ukraine, important chicken meat importing countries, impose trade policies less transparent and diverse of WTO statements, and the same applies to Saudi Arabia.

In summary, the developed countries studied adopt a complex trade policy with a wide number of trade restrictions, while developing countries have used simple border trade measures. Contrary to what can be observed in other markets, domestic support policies in the developed world seem to be far less important in the poultry case. Complex trade policies in the developed countries, with tariff peaks and tariff quota systems, then, seem to be the main problem in the chicken meat market, while the lack of transparency in the applications of the WTO rules seem to be the main problem in some developing countries.

Technical and sanitary barriers to trade are growing, and will probably become more and more important with the surge of new and old diseases, like the Avian Influenza. It seems clear that the sustainability of chicken exports will depend on the ability to comply with sanitary and technical requirements, increasingly being imposed by the large industrial corporations and retailers (through voluntary norms and lobbies to influence the regulatory process) in developed countries. It is important, then, that the SPS and TBT principles be incorporated and absorbed by developed countries, in order to get the benefit of this transformation in commercial standards.

Many of the threats faced in the sanitary and technical fronts for chicken meats exports are related to the participation and knowledge by the country and companies in the international forum that determines the system's rules. It is quite evident that developing countries in general and Brazil in particular, have bottlenecks to be solved to increase its participation in the process.

Here again a clear area for public action arises. Agricultural policy in Brazil almost doesn't exist, except for some recent actions of federal government more directed to small production. Indeed, the traditional agricultural policy instruments

used in Brazil in the seventies and eighties have long been abandoned, either due to the fiscal crisis, or to the lack of efficiency of those instruments in the open economy[34]. The maintenance of an efficient structure of sanitary regulations and sanitary enforcement rules can by no means be regarded anymore just from a food safety perspective. These actions must be regarded also as trade policy instruments, public goods to be supplied to the productive sector to assist the country's producers in external trade. The failure to communicate to trade partners that the country has a safe and reliable system of food security may be disastrous for the country in terms of loss of market share.

And, finally, model results presented suggest that the liberalization in the chicken meat industry would help reduce poverty and improve income distribution in Brazil. Although no isolated sector liberalization can be expected to be able to produce dramatic changes in the economy, it was found that the chicken meat market is important enough in Brazil for significant impacts in the economy, both in aggregated distributional terms. Both the primary production sector and the transforming industry are expected to gain more in the process, but other industries also gain, mainly those closely related to the formers by input-output linkages.

This increase in activity level of agriculture would lead, mainly due to the structure of labor demand in the poultry sector, to an increase both in food prices and in incomes, especially of the poorest families of the economy. The real income effect would benefit mainly the poorest, and the number of households and persons leaving poverty was estimated to be significant, with 47,352 households and 178,471 persons leaving poverty due to the Doha type liberalization in chicken meat only.

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[34] A clear example is the policy of government stocks acquisitions to regulate market prices.

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