RECENT PERFORMANCE OF BRAZILIAN SUGAR EXPORTS: A CONSTANT MARKET SHARE APPROACH

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ABSTRACT

This article presents an evaluation of changes in Brazilian sugar exports from 1991 to 1997, using a constant market-share model. The results indicate that the "competitive effect," an indicator of the country's ability to compete effectively with other important sugar supply sources, explains a significant portion of the observed export changes. However, other factors, such as the world market size and the import market structure, also affect the performance of Brazilian sugar exports over the period under analysis.

Key words: sugar, exports, Brazil, market share.

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1. Introduction

The international sugar market has changed substantially over the last decade. On the supply side, Brazil's market share increased and the country became the world's largest sugar producer and exporter (ISO, 1997). In 1998/99, Brazilian exports exceeded 8.35 million tons, approximately 23% of total world sugar exports (UNICA, 1998). Brazilian sugar exports have increased rapidly over the decade, from 1.6 million tons in 1990/91, to slightly more than 6.2 million tones in 1995/96.

This article presents a descriptive analysis of factors that can explain the performance of the Brazilian sugar export market in the 1990s. These factors are considered complementary to relative price changes in their potential to explain the evolution of Brazilian sugar exports. More specifically, this paper identifies the amount of export volume expansion that can be explained by each of the following factors: (i) the size of the world sugar market; (ii) the market composition of importers of Brazilian sugar; and (iii) the competitive-effect, an expression of the country's competitive strength relative to other important exporters in this market.

This analysis was in part motivated by new international multilateral rules for the sugar market, to be determined at the forthcoming World Trade Organization (WTO) Millennium Round. Despite its label, the international "free" sugar market is a market that most countries protect by establishing commercial trade barriers; this should soon change. Negotiations to be conducted at the coming WTO round are expected to result in norms that will minimize the strong protection system which has been distorting agroindustrial commodity trade. These distortions have been associated with general commodity oversupply.

Research on market protection mechanisms has been restricted mostly to governmental intervention on domestic market prices. Our

focus is on factors other than pricing that interfere with market flows. This focus is considered particularly appropriate for studying the sugar market.

2. Background for the methodological procedure

Several export analyses have used competitive indicators, such as production costs, prices, productivity, and other factors usually based on theoretical supply relations, to measure performance.[3] Other export market investigations have been based on demand relations and use the elasticity of substitution model as a theoretical background.[4] These analytical contexts presume that the commodity being evaluated is homogenous, such that international market flows are essentially determined by price differences between trading countries competing in the same market. In this sense, importers - which represent the demand side – would tend to transfer product acquisition to the lowest price supplier.

Several authors have indicated, however, that studies which try to explain international market flows as a function only of changes in relative prices linked with demand and supply may provide an incomplete explanation of the phenomenon.[5] This is particularly true when the analysis focuses on homogeneous product markets that are not considered to be perfect substitutes if different suppliers provide the product. When this is the case, one cannot conclude that market flows are strictly determined by price differences between the several suppliers.

Factors other than price, such as tradition in market relations, political and institutional factors, language, and complex customs systems, can lead to an imperfect market and determine the market flow.

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3 Gasques et al. 1998; Pinheiro & Horta, 1992.
4 Fonte & Ferrão (1990); Fontes, Grennes & Hohnson (1989).
5 See Konanadreas & Hurtado (1978); Leamer & Stern (1976) for a more detailed discussion.

As stressed by Blandford (1987), these factors may induce importers to consider that the product is distinct according to its source, even if the product from different suppliers has the same technical characteristics and/or well established quality patterns. These factors which disrupt perfect market flow are particularly relevant in the case of international raw sugar transactions. Therefore, an evaluation of Brazilian sugar exports must employ a method which allows the identification not only of import relative price changes but of the other factors that can explain the market flows.

A number of empirical models have been developed to address markets in which homogeneity and perfect substitution between commodities is the exception rather than the rule. A model along this research line was selected for the present work. The approach chosen is based on the constant market-share model; a model that allows the inclusion of information complementary to that extracted from traditional supply and demand models. As its name indicates, the basic proposition of this model is that a country's market share of world exports does not change during the period under analysis. The constant share model allows one to compose an analytical context in which the reasons for a country's "failure" to grow as economically as fast as the world average are aggregated and quantified. This approach is considered to be particularly appropriate for investigating Brazil's share of the international sugar market over the last decade, since other factors, such as institutional arrangements and partnership traditions, have interfered in that market.

From an analysis focusing on Brazilian sugar exports from 1979 to 1994, Miranda-Stalder (1997) obtained evidence that validated the other-factors approach. She concluded that a small number of the estimated coefficients of elasticity of substitution between Brazilian sugar exports and those from other important exporting countries were statistically significant. This can be interpreted as an indication that market competition due to sugar pricing is relatively small. Stalder (1997) stressed that in some of the cases examined, there were signs of product

differentiation related to product origin. The author associated this differentiation with importer preference, which is determined by such factors as geographic location, historic relations, preferential agreements, institutional factors, and access to credit.

3. Characteristics of the international sugar market

The International Policy Council on Agriculture, Food and Trade – IPC (1996) listed the world sugar market's distinguishing characteristics: *"(a) Sugar is a staple food, providing a cheap source of energy especially in low income countries; (b) Sugar is an important source of export earnings for many developing countries; (c) Sugar faces growing competition from alternative sweeteners; (d) In the past, up to 30 percent of sugar trade was controlled by special government trading arrangements; but with the decline of US imports and the change in the Russia-Cuba relationship, the proportion has now fallen to under 10 percent; (e) The sugar market has long been subject to expressive government intervention in both the domestic and international markets."*

The original GATT/WTO agreement granted the international sugar market exceptions from its support liberalization rules, allowing the continuance of export subsidies, production subsidies, import quota regimes, and stipulating less ambitious tariff reduction schemes. These market-distorting mechanisms still exist. The WTO mandated sugar import tariff reduction is 20% instead of the usual 36%. Important players in the sugar market, among them the United States and the EU, maintain a quota mechanism, a strategy that has long characterized their sugar policy.

"In the United States, as in Europe, the failure to change the sugar regime can be explained in part by the fact that the cost falls on the consumer and not the federal budget.... The same reluctance to reform established sugar regimes can be found elsewhere in the world, notably in Japan. There is no evidence of willingness to lessen the protection

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afforded the struggling Japanese beet industry" (IPC, 1996). Brazil, the world's largest sugar producer and exporter since 1994/95 (Table 1), has an interest is seeing that any justification for these trade distorting, protectionist policies receive careful evaluation at all future WTO negotiations.

United States Department of Agriculture (USDA) data for the 1998/99 harvest season indicate that Brazilian sugar exports represented about 23% of the total world export volume, EU exports represented slightly more than 14%, Australia and Thailand each had a 12% market share, and Cuba contributed less than 10%, down from 25% in 1991/92. Importers of significant amounts of sugar at the international market have been: Russia, United States, China, Egypt, Canada and the European Union, as illustrated in Table 2.

4. Methodology

A Constant Market Share model, as put forward by Leamer and Stern (1976), was employed in this analysis. This procedure allows the identification and explanation of actual export growth according to the relative importance of factors such as: (i) market size; (ii) importing market structure; and (iii) the competitive-effect. The competitive-effect is calculated as a residual and should be understood as the portion of changes not associated to factors (i) and (ii).

Table 1 – World Exports of Raw Crystal Sugar (1,000t); Major Exporting Countries, and Share in World Total (%); 1991-97.

COUNTRY	1991	(%)	1992	(%)	1993	(%)	1994	(%)
Brazil	1.614	5,9	2.273	7,1	3.008	10,3	3.616	12,0
E.U.	4.862	17,8	4.983	15,7	5.832	19,9	5.097	16,9
Australia	2.456	9,0	2.907	9,1	3.445	11,8	4.506	15,0
Thailand	2.863	10,5	3.719	11,7	2.401	8,2	2.720	9,0
Cuba	6.767	24,8	6.085	19,1	3.662	12,5	3.188	10,6
Others	8.701	31,9	11.866	37,3	10.955	37,4	11.008	36,5
WORLD TOTAL	27.262	100,0	31.832	100,0	29.303	100,0	30.136	100,0

cont.

	1995	(%)	1996	(%)	1997	(%)
Brazil	6.299	18,1	5.309	15,0	6.586	17,8
E.U.	5.414	15,6	4.209	11,9	5.152	13,9
Australia	4.594	13,2	4.288	12,1	4.462	12,1
Thailand	3.887	11,2	4.628	13,1	4.317	11,7
Cuba	2.603	7,5	3.830	10,8	3.582	9,7
Others	11.938	34,4	13.157	37,1	12.921	34,9
WORLD TOTAL	34.735	100,0	35.422	100,0	37.021	100,0

Source: International Sugar Organization (ISO), 1998.

Table 2 – Total Imports of Raw Sugar, 1991-97; (tons)

COUNTRY	1991	1992	1993	1994	1995	1996	1997	Tx Var (%)
Algeria	1.090.000	638.000	839.000	810.444	822.406	808.971	457.879	1,97
Argentina	0	0	10.720	296.502	197.163	12.931	49.334	2,18
Canada	957.289	1.014.699	1.162.116	1.148.601	1.024.540	1.259.603	1.067.238	1,98
China	1.017.737	1.103.400	453.816	2.264.656	2.937.276	1.254.853	801.806	1,98
E.U..	1.708.862	1.786.107	1.712.851	1.833.813	1.786.548	1.868.169	1.883.142	2,05
Egypt	736.000	465.000	504.000	565.655	1.075.953	718.258	1.356.617	1,87
Ghana	91.000	129.020	124.000	92.412	130.059	112.216	127.977	1,65
India	0	0	0	2.653.756	214.789	n.a.	205.043	n.a.
Iran	685.000	736.200	500.000	645.301	968.557	863.415	1.350.282	1,89
Jordan	191.317	487.000	317.000	160.000	403.913	415.750	160.182	1,8
Morocco	266.000	301.940	297.500	440.386	529.666	618.827	557.886	1,78
Persian Golf	325.300	331.000	345.000	398.847	397.980	551.084	874.442	1,79
Russia	-	5.143.705	5.063.447	2.248.158	3.186.029	3.275.300	2.984.951	2,55
Sri-Lanka	347.000	366.000	393.538	523.276	389.848	380.731	465.140	1,83
Uruguay	22.067	47.627	101.000	93.600	87.513	106.539	128.911	1,5
E.U.A.	2.354.493	2.045.224	1.828.751	1.602.946	1.637.320	2.869.709	2.953.040	2,06
Yemen	278.600	369.700	310.000	337.185	217.633	420.682	428.893	1,8
World Total	26.263.547	30.716.657	29.157.979	30.177.165	34.458.243	35.152.703	37.278.471	2,44

Source: International Sugar Organization (ISO),1998.

4.1. Theory and Measurement of Export Growth Components

According to Leamer & Stern (1976), the components of the constant market share model can be derived based on a demand function that expresses the relation between the volume acquired of a given commodity from two different sources that compete in the international context. This function can be expressed in the following form:

$$\frac{q_1}{q_2} = f\left(\frac{p_1}{p_2}\right) \qquad (1)$$

where q_i and p_i (i = 1; 2) are the quantity sold and price of the commodity from the ith supply source. This relationship is recognizable as the basic form of the elasticity of substitution. It may be altered multiplying by p_1/p_2 to obtain:

$$\frac{p_1 q_1}{p_2 q_2} = \frac{p_1}{p_2} * f\left(\frac{p_1}{p_2}\right) \qquad (2)$$

This implies:

$$\frac{p_1 q_1}{p_1 q_1 + p_2 q_2} = \left[1 + \left(\frac{p_2 q_2}{p_1 q_1}\right)\right]^{-1} = g\left(\frac{p_1}{p_2}\right) \qquad (3)$$

where $g' < 0$

Equation (3) indicates that Country 1's share of the market in question will remain constant except as p_1/p_2 varies. When the relative

price increases, given that $g'<0$, the relative participation of Country 1 in the market should be reduced. According to Leamer & Stern (1976), this proposition establishes the validity of the constant-share norm and suggests that export growth rate change is associated with price change. The growth rate change is identified as the "competitive effect." When Country 1 fails to maintain its export share in the world market, this term assumes a negative value, indicating that Country 1's export prices increased in relative terms. The difference between the actual and the calculated performance according to the constant share norm allows one to identify the percentage change that can be explained by overall market growth and the percentage change related to the structure and evolution of the import markets for of Country 1 s products. However, the adequacy of the constant market share norm depends on the nature of the market being represented when the relation expressed by equation (1) is established.

The constant market share model assumes that when a commodity is homogeneous, market flows can be explained by relative price changes alone. This paper's analysis is conducted to ascertain the relative importance of factors other than price change in an explanation of Brazilian sugar export fluctuations, though change in relative price is not excluded as a potential determinant of international market flows.

For this purpose, certain market characteristics have been assumed in the analysis: (i) raw sugar exports have not been differentiated by the market; (ii) the product is differentiated by origin, however, this is associated to factors that establish an imperfect information context (such as custom complexities, language, market traditions, etc.); (iii) the price negotiated in the international market for raw sugar is based on the futures markets of the New York Cocoa, Sugar and Coffee Exchange – CSCE.

The analytical context considers the following definitions with respect to the exported volume of a given commodity i by Country A: V = Period 1 exports; V' = Period 2 exports; V_j = Period 1 exports to a

given country j ; V'_j = Period 2 exports to a given country j; r = percentage increase in total world exports of Commodity i from Period 1 to Period 2; r_j = percentage increase in total world exports of Commodity i to a given country j, from Period 1 to Period 2.

The following equation expresses country A total export volume for all its j (import) markets in Period 1:

$$\Sigma_j V_j = V \qquad (4)$$

A similar relationship is applied to Period 2, given as:

$$\Sigma_j V'_j = V' \qquad (5)$$

The difference between the export volume of commodity i to Country A in two periods analyzed can be expressed as $(V' - V)$. Therefore, applying the constant share norm to a first aggregate level – denominated Level 1 of this analysis – gives an indication of the change in world market size between Period 1 and Period 2 as Country A's market share remains constant. The increase in Country A's exports between Period 1 and Period 2 is a proportion identified as rV; which can be expressed by the following identity:

$$V' - V \equiv r V + (V' - V - r V) \qquad (6)$$

According to the identity (6), Country A's export growth can be divided in two portions:

(i) One represented as (rV), which expresses the overall growth in the volume of transactions (exports) at the international commodity level (representing growth in the market); and (ii) a residual portion, such as $(V' - V - rV)$, which indicates the magnitude of the difference in actual growth of the volume negotiated in this market by Country A between periods.

The second aggregate level of the analysis — Level 2 – considers that Country A's exports can be directed to different markets from one period to another. This allows one to capture the market structure effect or composition of the importing market. Therefore, considering that the

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constant share norm applies to exports directed to each of the j markets leads to the following expression:

$$V'_j - V_j \equiv \Sigma_j r_j V_j + \Sigma_j (V'_j - V_j - r_j V_j) \qquad (7)$$

Identity (7) can then be aggregated in three components, resulting in the following expression:

$$V' - V \equiv \underset{(a)}{rV} + \underset{(b)}{S_j (r - r_j) V_j} + \underset{(c)}{S_j (V'_j - V_j - r_j V_j)}. \qquad (8)$$

Equation (8) indicates that Country A's export growth can be decomposed into the following factors: (a) one which expresses the relative importance of the commodity's overall world export growth; (b) one related to the evolution of the import markets of the commodity provided by Country A (c) and a third factor interpreted as a competitive-effect, which is computed as a residual value.[6]

These factors serve as the basis for a model that describes the export demand side in a given commodity market. This method of analysis has been indicated as having a restriction in that it impedes the separation of factors associated with supply from those associated with demand. Leamer and Stern (1976) suggest possible factors that relate to commodity supply: (1) differential rates of export price inflation; (2) differential rates of growth in the available production factors used to supply exports markets and provide for domestic consumption; (3) different rates of productivity growth; (4) a producing country's focus on rapidly growing export markets.

Unfortunately, the interpretative possibilities of this analytical

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[6] This last effect can also be interpreted as an unexplained residual, indicating the difference between the actual increase in Country A's exports and the calculated increase according to the assumption that this country's market share remains unchanged.

method are restricted to the association of a negative sign to the competitive-effect, for example, to the possibility that the country fails to maintain its market share in a given market because its export prices are relatively higher than its competitors' prices.

4.2. Data

The data employed in this analysis are raw crystal sugar export volumes from 1991 to 1997, obtained from International Sugar Organization (ISO) statistics. The data from two sub-periods were evaluated: Period 1, from 1991 to 1994; and Period 2, from 1995 to 1997. These periods were selected because (i) Brazilian sugar exports increased significantly after 1994; (ii) the volume of world sugar exports increased about 20% from Period 1 to Period 2, and (iii) total exported volume represented a significantly greater proportion of total world production in Period 2 (25%) relative to Period 1 (10%-15%).

Total world export volume data, taken from the same ISO data source, were used to express the dimensions of the international sugar market. Brazilian export volumes were taken by destination country and based on a set of importing countries that together comprised at least 80% of Brazil's total export volume. The data on total import value by country were extrapolated and employed to evaluate and contrast import market growth in the two periods selected for this study.

5. Results

The annual average volumes of both world and Brazilian sugar exports in each of the sub-periods, Period 1 and Period 2, are listed in Table 3. These figures show that the average annual volume of Brazilian sugar exportation in Period 2 was more than double that found in Period 1, and the average annual volume of world sugar exportation was approximately 22% higher in Period 2 than in Period 1. As international

market flow expanded, the Brazilian share of this market also expanded, from a 9% share in Period 1 to a 17% share in Period 2. This market share growth, though impressive, was less robust than the country's export volume growth over the same time period.

The growth of Brazil's sugar export volume and world market share was due to several factors; one of the most significant being government initiated price and market deregulation. Brazilian sugar exports had been subject to an internal quota system that set a volume limit on tariff-free exports; any export above the quota limit was subject to a 40% tax. Liberalization of the quota system, in July 1994, and deregulation of anhydrous alcohol prices, completed in May 1997, provoked a change in relative prices that favored sugar over alcohol. The Brazilian production "mix" was changed; it was now economically rational to reduce alcohol production, particularly of hydrated alcohol, to increase the volume of available sugar.[7]

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7 According to data presented by UNICA(1998).

Table 3 - Brazilian Sugar Exports, annual average by country of destination; in tons; and Brazil´s share in its major customers sugar importation; Periods: 1991-94 and 1995-97

	Periods							
	1991/94			1995/97				
Country	Total Importation	Brazilian Exports	Brazilian Share (%)	Total Imports	Brazilian Exports	Brazilian Share (%)	(3)x(4)	(5)-(7)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Algeria	844,361	34,013	4.0	696,419	260,285	37.4	28,053	232,231
Argentina	76,806	57,307	74.6	86,476	71,020	82.1	64,522	6,498
Canada	1,070,676	0	0.0	1,117,127	76,489	6.8	0	76,489
China	1,209,902	4,325	0.4	1,664,645	165,358	9.9	5,951	159,408
U. E.	1,760,408	70,096	4.0	1,845,953	75,117	4.1	73,502	1,615
Egypt	567,664	187,156	33.0	1,050,276	521,664	49.7	346,270	175,393
Ghana	109,108	32,025	29.4	123,417	96,344	78.1	36,225	60,118
India	663,439	400,050	60.3	209,916	191,798	91.4	126,578	65,220
Iran	641,625	153,500	23.9	1,060,751	178,383	16.8	253,770	-75,387
Jordan	288,829	55,857	19.3	326,615	204,803	62.7	63,165	141,638
Morocco	326,457	230,314	70.5	568,793	350,012	61.5	401,282	-51,270
Persian Gulf	350,037	0	0.0	607,835	233,241	38.4	0	233,241
Russia	4,151,770	168,277	4.1	3,148,760	1,013,765	32.2	127,623	886,141
Sri Lanka	407,454	84,897	20.8	411,906	102,883	25.0	85,825	17,058
Uruguay	66,074	19,616	29.7	107,654	81,146	75.4	31,960	49,186
U.S.A.	1,957,854	151,949	7.8	2,486,690	285,704	11.5	192,991	92,712
Ymen	323,871	73,063	22.6	355,736	247,123	69.5	80,251	166,872
TOTAL	29.078.837	2.627.670	9.0	35.629.806	6.064.782	17,0	3.219.639	2.845.143

Source: ISO, 1998 and authors elaboration.

Expansion of the world sugar market and changes in exporter/ importer relationships significantly contributed to increase Brazil's sugar exports. Sugar demand increased in developing countries, particularly in Asia; and sugar supply from traditional exporters diminished as preferential trade agreements became less effective. Cuba, a traditional sugar supplier that accounted for 25% of world sugar export volume in the early '90, is now responsible for less than 10% of the world's sugar exports. In addition, as demand increased and supply diminished, international market prices increased.

These institutional factors and changes in commercial policy had a determinant role in the performance and actual competitiveness presented by Brazilian exports. When the effect of these institutional factors and commercial policy changes is combined with relative price changes, the result is the "competitive effect." This competitive effect can explain the expansion of Brazilian sugar exports relative to other sugar exporting countries.

Table 4 presents the percentage attributed to factors that explain Brazilian export expansion according to the constant market share model. These results indicate that the expanded world market is responsible for about 17.3% of Brazilian sugar exports during the period under analysis. The import market structural effect presented a negative percentage value (-37.9%), which suggests that Brazil has concentrated its sugar export efforts in relatively stagnant markets. These results were sustained by the geometric sugar import growth rates, shown in Table 2, for countries

Table 4 - Constant Market-Share Model Results

ITEM	1991/94	1995/97
I. ACTUAL WORLD TOTAL (ton)		
World Exports, annual average	29,078,837	35,629,806
Brazilian Exports, annual average	2,627,670 *(A1)*	6,064,782 *(A2)*
Brazilian Market-share (%)	9.0	17.0
II. BRAZILIAN POTENTIAL EXPORTS (ton) (Base = 1991/94)		
Constant Market-Share		3,220,934 *(B)*
Constant Importing Countries' Share Base: Average share in Period I		
		1,917,969 *(C)*
III. GAINS AND LOSSES	(ton)	(%)
TOTAL GAIN	3,437,112	100 *(A2-A1)*
Effects:		
MARKET SIZE	593,264	17.3 *(B-A1)*
MARKET COMPOSITION	-1,302,965	-37.9 *(C-B)*
"COMPETITIVE EFFECT"	4,146,813	120.6 *(A2-C)*

Source: Analysis results.

importing Brazilian sugar, except Russia, the EU, the United States, and Argentina. The competitive-effect presented a high positive value of about 120.6%. It should be noted that this percentage value includes a compensation due to the market structure effect's negative value

6. Conclusions

The results of this analysis lead to the conclusion that changes in relative prices and other factors present expressive importance in explaining Brazilian sugar export performance from 1990/91 to 1996/97. Expansion of the world market showed to be a positive factor of significant magnitude determining Brazilian export growth. However, evidence that Brazil has concentrated its export efforts in relatively stagnant markets suggest that the explanatory power of the competitive-effect may be over-estimated, since it is calculated as a residual when using the constant market share procedure. Therefore, even if a country's capacity to compete successfully in the international market has been established, the magnitude of the competitive-effect's impact on market expansion must be determined with some caution. It is also important to reaffirm that the competitive-effect in this model is an expression not only of positive relative price changes, but also other factors, such as deregulation of the Brazilian sugar and alcohol sector and the institutional restructuring of the international sugar market.

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