

Government Support and the Brazilian Sugar Industry

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Executive Summary

It is often assumed that the Brazilian sugar industry which supplies about half the international market for sugar owes its pre-eminent position to natural endowments and savvy private operators alone. Its competitiveness is said to be the result of market forces only. This is indeed the image which Brazil projects in international circles.

Outside Brazil, opponents of domestic sugar policies use this image to argue that the sugar market would be more efficient – and, presumably, sugar prices would be lower – if impediments to imports were removed. They assume sugar trade liberalization would be efficient because Brazil's natural advantages in producing sugar would then be fully expressed. If true, this constitutes a strong argument in favor of opening domestic sugar markets to international trade: dismantling import quotas and dropping import duties then become not only attractive, but eminently sensible.

But is the assumption true?

No, it is not. In reality, the immense power of Brazil's sugar industry is founded upon many years of strong government intervention. Government transfers the cost of pension liabilities from farmers to other economic agents, provides soft loans to agriculture, forgives and reschedules agricultural debts, forgives and reschedules tax debts at very favorable terms, makes possible arbitrage between sugar and ethanol markets, mandates blending of anhydrous ethanol into gasoline, encourages the sale of hydrous ethanol, and has been the source of immense economies of scale by making possible the doubling of the industry's size.

These economies of scale exist because with sugarcane Brazil makes sugar but also ethanol. When Brazil makes some 34 million tons of sugar it also makes some 5.8 billion gallons of ethanol. The ethanol market is a creation of the government, and the current enterprise value of the assets developed thanks to government intervention can be estimated at some US\$ 45 billion.

At the pumps, motorists buy pure ethanol or gasohol. They can choose because the government promotes "flex-fuel" cars that can take either. Until very recently, ethanol prices were made competitive by government fiat. Today, though gasoline prices are said to be "free" legally, they are in fact set by Petrobras, a monopoly thoroughly controlled by the federal government which owns more than 50% of its voting common stock. Flex-fuel cars and ethanol still get preferential tax treatment. Private motorists are generally barred from buying diesel-powered cars. As a result, about 95% of new car sales are "flex-fuel". Moreover gasoline in Brazil contains a mandatory amount of ethanol: this too allows the sugar and ethanol industry to access additional economies of scale. In 2008 - 2009 the volume of ethanol exceeded the volume of pure gasoline consumed by motor vehicles in Brazil.

The government policies that built this magnificent and powerful industry date back to the 1970's. Though changed often since then, these policies have relentlessly supported Brazil's sugar and ethanol expansion, turning it into the world's premier exporter of sugar.

Today still, the industry benefits from at least US\$ 2.5 billion per year of direct or indirect government incentives.

Estimated Brazilian Government Support for Sugar & Ethanol	US\$ million per year
Transfer of Sugarcane Farmer Pension Payment Cost (INSS)	800
North-East Sugarcane Grower Subsidy	60
Interest-Rate Subsidy	400
Interest-rate Subsidy on Rescheduled Taxes	500
Economies-of-Scale from Government-Created Ethanol Markets	610
Mandatory Gasohol Blend Revenue Improvement	80
Sugar/Ethanol Arbitrage Opportunities	10
Total Annual Government-Provided Support =	2,460

Annual sales of the Brazilian sugar and ethanol industry amount to about US\$ 35 billion, so the value of annual government support represents at least 7% of sales.

The industry would need its sugar sales price to increase by 15% to replace the government support effect; as Brazil sets the world market price for sugar – its exports amount to nearly half what is traded internationally – those incentives weigh on the world price.

Beyond sugar, Brazil supports its agriculture in general through a wide array of programs and this support has grown considerably in the recent past. Because of the dispersion and complexity of public subsidies, it is impossible to precisely measure support by product; however, the sugarcane industry benefits from many of these programs. Brazil's 2012/13 federal budget for agriculture amounts to US\$ 68 billion, 85% of which is to be paid out as loans. But the combination of subsidized interest-rates, soft lending terms, debt forgiveness and rescheduling as currently practiced means that a large portion of those credits should rightly be considered a subsidy.

For sure, Brazil is a giant in sugar. But to say that its dominance of the world market is entirely due to Brazil's natural endowments, efficient farmers and wise managers is wrong: government played an essential and powerful role in the Brazilian sugar and ethanol industry's rise and continues to do so today.

The Remarkable Story of the Brazilian Sugar and Ethanol Industry

Sugarcane was brought to Brazil by Portuguese colonists five centuries ago. By 1525 Brazilian sugar was being exported to Portugal¹. Between 1580 and 1640 it was the world's largest exporter of sugar. It was then overtaken by the British West Indies and, later, by the Spanish Caribbean islands. Today it is again the world's premier sugar exporter. In 1970 Brazil produced 80 million metric tons (MMT) of sugarcane with which it made 5.1 million tons of sugar², of which 1.2 were exported, and 168 million gallons of ethanol, practically none of which were exported. In 2012/13³ Brazil will have harvested some 595 million tons of sugarcane, producing 38 million tons of sugar, of which 24 will be exported, and 6.2 billion US gallons of ethanol of which 0.7 billion gallons will be exported.

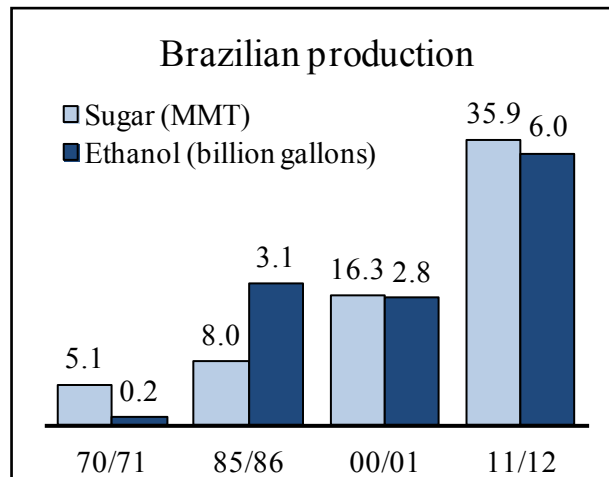


Chart n°1

Brazil is now the world's largest sugar producer and the second-largest source of ethanol⁴. Supplying nearly 50% of internationally-traded sugar, it is also the largest exporter of ethanol (most of which goes to the United States).

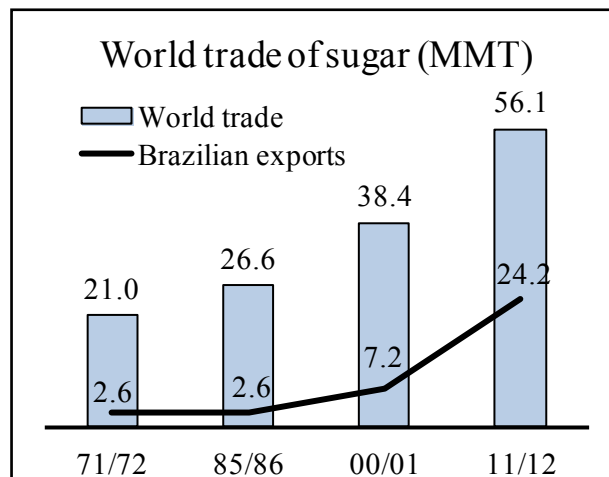


Chart n°2

¹ Source: El Azúcar En El Encuentro Entre Dos Mundos – AGFAE, Madrid, 1992, p.57

² Source: FAOSTAT. Throughout this paper, metric measurements are used, except where specified (e.g. US gallons)

³ May 2012 to April 2013; source: CONAB, December 2012

⁴ Behind the corn-based US ethanol industry

The industry is a domestic powerhouse. It accounts for 1.5% of Brazil's GDP, 6.5% of exports, 4.5 million direct and indirect jobs and 72,000 independent farmers^{5&6}. The Sao Paulo State sugar and ethanol industry trade association ("UNICA": União da Indústria da Cana-de-Açúcar) boasts an annual budget of US\$ 15 million⁷; it has representative offices in Washington DC and Brussels.

The Brazilian sugarcane industry's extraordinary growth is often presented as the inevitable consequence of free market forces. Indeed, Brazil's natural endowments – plenty of land, sunshine and water – make it an agricultural powerhouse. "In less than 30 years Brazil has turned itself from a food importer into one of the world's great breadbaskets."⁸ It is now the world's third largest exporter of agricultural products. It is the world's largest exporter of sugar, orange juice, coffee, soybeans, beef, frozen chicken meat and ethanol, and is second largest in corn.

It is argued that it would be most efficient (in economic terms) to let Brazil fully express its relative competitive advantage through free trade. Countries where sugar prices are higher than those in Brazil should allow Brazilian sugar unfettered access to their domestic markets. Thus, some say, sugar and ethanol prices would settle at the "right" level.

The argument is used to denounce sugar policies which attempt to maintain domestic sugar industries by isolating them from low prices on the Brazilian-dominated world market. Indeed, these policies notably rely on controlling imports through tariffs and tariff rate quotas which isolate a domestic market from the vagaries of the world market, and thus provide an environment supportive of domestic production of sugar beet and sugarcane.

Is Brazil's extraordinary success and remarkable dominance of world sugar trade only or mainly the consequence of market forces? This paper will show not.

Government support has played a major role in the development of Brazil's sugar industry. Despite partial liberalization since 1997, federal and state government intervention still impacts the economics of the sugarcane industry significantly. The role of the Brazilian government in fostering the world's largest and most advanced sugarcane sector can be seen as a formidable example of successful government intervention. The road to success was not without twists and turns, but Brazil has built a world-class competitive source of food and renewable energy – not a mean feat for what was a developing country.

It must be understood that adding ethanol production to a sugar mill reduces the cost of making sugar and, since 1975, successive Brazilian governments have willfully encouraged the production of ethanol from sugarcane to be used as a fuel for cars. The amounts are significant: in both 2008 and 2009, the volume of ethanol briefly overtook the volume of gasoline consumed by Brazilian drivers.

⁵ Source : The Sao Paulo State sugar and ethanol industry trade association (UNICA) ; see also interview of Marcos Jank, former President of UNICA, in *Brasil Econômico* of February 22, 2012

⁶ At the UNICA-organized 2009 Ethanol Summit in São Paulo both major future candidates to the position of President of Brazil, Dilma Rousseff (centre-left) and José Serra (centre-right), attended the opening ceremony and gave speeches strongly supporting the industry.

⁷ Source: *BrasilAgro*, June 6, 2012.

⁸ *The Economist*, August 25th, 2010, "The Miracle of the Cerrado – Brazil has revolutionised its own farms. Can it do the same for others?"

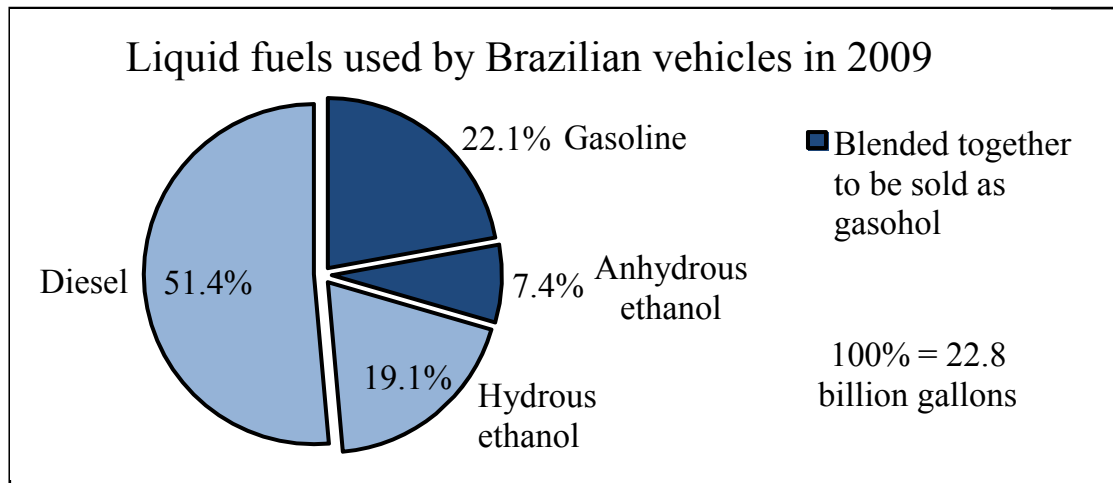


Chart n°1. Source: ANP, MAPA

(Note: With a limited rail network, commercial transportation in Brazil is done by road on trucks. This explains the large proportion of diesel consumption.)

Today roughly half of Brazil's sugarcane is used to produce ethanol. The most expensive part of the mill – the front end, where sugarcane is received, cleaned, cut or crushed and its sugar-laden juice is extracted – must be larger, thus creating economies of scale; the sugar extraction process can be simplified as residual sugar finds a ready outlet in the distillery: investment and energy dedicated to sugar is minimized; more sugarcane is produced, adding to field economies of scale and accumulated agronomic knowledge; milling experience also is augmented; industries serving the sugarcane sector also gain economies of scale and accumulated experience; and arbitrage between the fuel and sugar markets increases profits.

Thus, even when directed mainly to the support of its ethanol industry, Brazilian government intervention affects the unit cost of sugar production. This paper will show that the result is material: the competitiveness of Brazilian sugar owes a lot to public policies.

In the Sugar Industry, the Past Matters

It may seem curious that a report on the means and results of government intervention in the Brazilian sugar industry looks back fifty years or more, but this is a capital-intensive industry and, once built, a sugar mill and its estate easily run for over fifty years. What one sees today – the 22 million acres of waving green sugarcane, the hundreds of US\$ 500,000 cane cutting machines, the 435 mills and distilleries – is the result of nearly a century in which public policies played a major role.

Though field and factory productivity has much improved over the past century, the processes and technologies used to extract sugar from the cane have changed little. A mill uses a lot of energy to move the feedstock, to wash it, crush it, dry it, evaporate the juice, and to clean and dry the sugar crystals. The basic bits of equipment involved – the trucks, the boilers, the conveyor belts, the pipes, the pumps, the pans, the turbines and the centrifugals are similar to those which would have been used a century ago.

If productivity has risen over time it is through a long list of incremental advances often imported from other industries. High-pressure boilers come to mind; these have not only brought increased energy efficiency but also opened up the opportunity for mills to produce an excess of electricity which can be sold unto the grid.

The staying power of sugar industry assets is illustrated by the Oldesleben sugar factory located in East Germany. That factory last processed sugar beet in 1989, the year the Iron Curtain fell. The story

goes that its machines were already so old in 1945 that the Soviet Union decided against hauling them to Russia as war-booty. I remember a steam engine of 1886. Another major piece of equipment was dated 1879. All were in perfect working order, as attested by the 1989 campaign. Once built, sugar factories do not age quickly.

Whatever the accounting rules for depreciation, current capacity which would not exist without past subsidies is supplying subsidized sugar and alcohol today. Such is the case with more than half the Brazilian cane processing industry. Size and accumulated experience count. The size of an individual sugar mill and the size of a sugar industry impact competitiveness. What one sees today cannot be explained without a journey back into time.

If size is in large part the result of past and present government intervention, then the industry's performance cannot be ascribed to market forces alone.

In Brazil, Ethanol is Sugar

It may seem strange that a report on the means and results of government support for sugar is largely devoted to ethanol, but ethanol is sugar: it is fermented and distilled sugar which, in Brazil, all comes from sugarcane.

A sugar mill extracts sugar from sugarcane or sugar beet; the first steps in the industrial process create a sugar-rich juice; these first steps are the most expensive: they require most of the operating expenses and about 70% of the investment. Moreover, the single agricultural feedstock which is treated in this "front-end" represents about 65% of the cost ex-mill of the finished product, be it sugar or alcohol.

Thus, process economics say that a "sugar" mill is an "ethanol" mill, and vice-versa. It is one single business. Whether the sucrose contained in the sugar-rich juice is crystallized to be sold as food or whether it is fermented and distilled to be sold as alcohol is largely independent from the related farming and manufacturing.

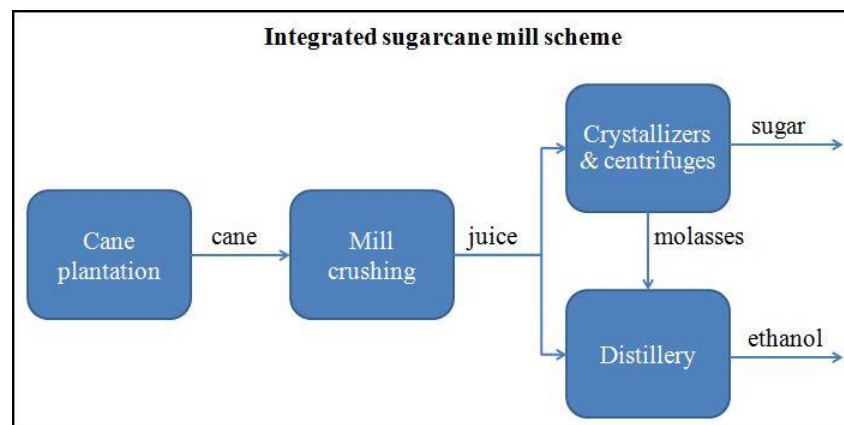


Chart n°2. Source: ProSunergy

When, as in Brazil today, half the sugarcane is used to produce ethanol and the balance is used to produce sugar, what happens in one of these two markets impacts the other⁹. Not only can mills arbitrage between these markets by choosing to favor the product which momentarily may offer the best returns, but economies of scale and accumulated experience are shared between both products.

⁹ "The main motivation for the establishment of an alcohol fuel segment was ... to strengthen the activity associated with sugar production." – from "Genesis and consolidation of the Brazilian bio-ethanol: A review of policies and incentive mechanisms" by Julieta A. Puerto Rico, Sonia S.P. Mercedes and Ildo L. Sauer – Renewable and Sustainable Energy Reviews, Elsevier Ltd, March 2010, page 1875.

Whether government support is directed to sugar or to ethanol, it affects both. When that support concerns half the activity, as it does in Brazil for ethanol, it impacts all of the products.

Government Support for Agriculture in General

The value of agricultural production in Brazil reached US\$ 118 billion in the 2011/12 crop, after growing an average 3.8% per year over ten years¹⁰. Agriculture accounts for an average 5% of country GDP, a high proportion if compared to the approximately 1-3% in developed countries, and enables another US\$ 381 billion in related agribusiness¹¹ added value: in total, agriculture and related activities represented 22% of Brazil's US\$ 2.3 trillion GDP in 2011.

The Brazilian federal government considers agriculture to be strategic and has played a consistent role in supporting it. Although most agricultural product prices and storage schemes are de-regulated today, the sector remains supported through limited direct subsidies (price and income support schemes), large and varied assisted capital financing lines, and numerous preferential tax schemes.

Price guarantees and public storage programs are focused on rice, corn and wheat under the PEP and PEPRO programs run by CONAB¹². CONAB, the "Companhia Nacional de Abastecimento" or National Supply Company, is the federal agency which implements agricultural policy and food supply management for the Ministry of Agriculture. Under PEP and PEPRO, CONAB will either buy or pay a subsidy for selected products to complement the price received by producers. Direct subsidy to sugarcane producers is limited to very specific conditions¹³; it amounted to US\$ 58 million in 2011. Ongoing negotiation in Congress may double the sugarcane subsidy in 2012/13 to compensate for drought effects in North-East region.

Farmers are also stimulated to buy subsidized insurance. For each crop government will bear different portions of the insurance premium. This form of subsidy has been rising steadily since 2005, reaching US\$ 152 million in 2011, but less than US\$ 1 million of it was directed to cane.

Assisted capital financing is the most important group of agricultural support measures. In excess of 20 different official credit lines exist, with interest rates and payment terms varying according to factors such as year, producer profile, crop and region. Some of these funding lines can be heavily subsidized if we compare their rates to what the government itself pays when borrowing. The PRONAF¹⁴ program, for example, will offer negative real interest to family farms and waive part of the principal due. Private companies can obtain subsidized rates too, for terms as long as 20 years.

¹⁰ 2002/03 to 2011/12, assessed in constant Brazilian reals of 2012 and converted to US\$ by the average exchange rate for 2012.

¹¹ Includes livestock, processing and distribution

¹² CONAB budgeted US\$ 1.6 billion for price support and another US\$ 1.4 billion for storage in 2011. 95% of inventories are made up of rice, corn and wheat. In addition, but of limited scale, CONAB purchases packaged foods, including some sugar, to assemble baskets that will be distributed as needed in civil defense actions.

¹³ The direct subsidy amounts to BRL 5 per ton of cane produced in North-East region, or in selected "challenged" areas of other states, limited to 10,000 tons per year per each individual sugarcane farmer, who must not have ownership rights (shares) in private or cooperative mills.

¹⁴ PRONAF held 3.2 million loan contracts worth US\$ 18 billion by the end of 2011, an average of \$5,600 per loan.

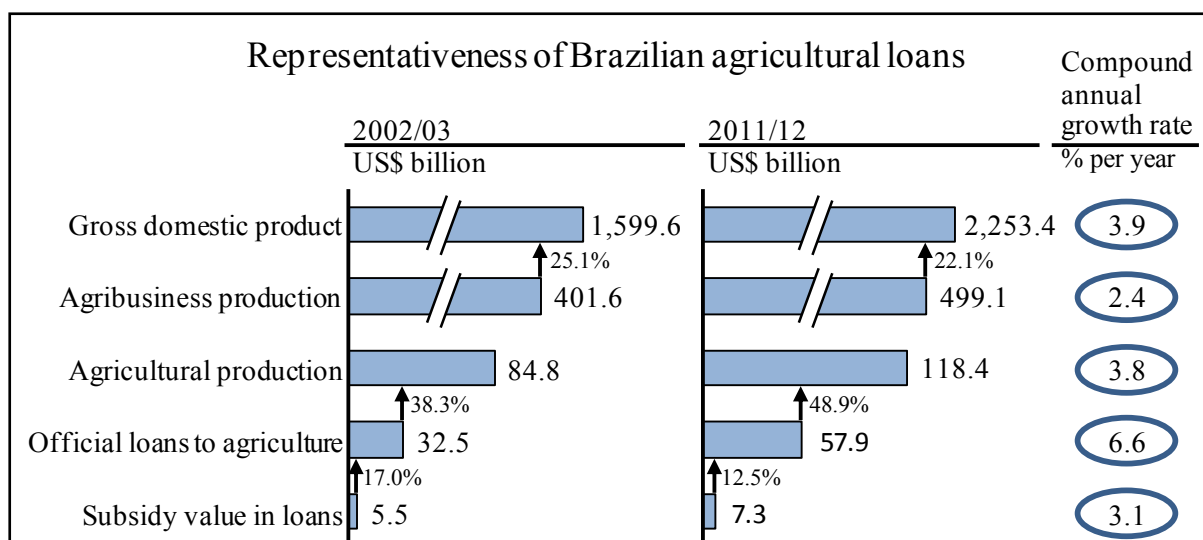


Chart n° 3. Sources: IBGE, CEPEA, MAPA, ProSunergy

Official loans to agriculture in the federal budget have been increasing almost every year. As the Minister for Agriculture, Walter Rossi, said in June 2010 “We reached that BRL 100 billion [US\$ 50 billion] magic number. That is a lot of money in any country.”¹⁵ For 2012/13 the federal government budget for assisted loans to agriculture is US\$ 68 billion. For a country of 195 million inhabitants, that amount of soft loans is remarkable. On average in each of the past 10 years, these loans amount to 50% of the value of agricultural production.

The importance of government intervention through the allocation of soft loans cannot be overestimated: agriculture only gets such amounts because they are government-backed. Left alone, the private credit sector would mobilize far less capital at much higher rates: there can be no doubt that Brazilian agriculture would not have developed as rapidly without public support. Conservatively measuring subsidy as the difference in rates between loans made and government borrowings¹⁶, *these subsidized credits have cost the Brazilian treasury between US\$ 4 and 8 billion each year.*

Subsidized credit is provided to agriculture through a wide array of procedures. The following table lists the credit programs supporting agriculture in the 2011/12 federal budget.

The "Subsidy" column shows the percentage of loan amount that lender would not pay back, were the loan priced at the same rate it costs the government to borrow (SELIC rate). Agricultural loan rates are often lower than SELIC. There are only a few cases where subsidy is negative, not exactly because government is making a margin on farmers, but because agents' commissions embedded in the loan rate make it larger than SELIC.

Calculations were made by deducting the Net Present Value (NPV) of payment terms at the loan rate from the NPV of a hypothetical payment at the SELIC rate, during the standard or average payment term of each credit line. NPV is the current value of future cash flows, discounted by a chosen rate.

Note that some credit lines overrun their specific budgets: it appears that line overruns are accepted as long as the overall total amount budgeted for the year is not exceeded.

¹⁵ O Estado de São Paulo, 8th of June 2010.

¹⁶ Some programs comprise a range of rates. Average loan terms have to be estimated and this impacts the calculation of the value of the subsidy. A longer term repayment schedule implies a higher-value subsidy. Average cost of government borrowing represented by SELIC rate.

	2011/2012 US\$ million		
	Budget	Loans	Subsidy
Agriculture total official credit lines	67,030	57,874	% of loans
Business agriculture - Working capital and distribution	43,642	39,239	
Controlled interest	34,885	31,402	
Rec.Obrigatório (MCR 6-2) (Exigibilidade)	21,756	15,125	6.38%
Poupança Rural (MCR 6-4)	7,207	10,995	6.38%
Recursos Próprios	204	171	6.38%
FUNCAFE	1,142	746	3.31%
Pronamp Rural (Proger rural)	3,379	3,039	7.03%
Fundos Constitucionais	1,197	1,326	8.65%
Free interest	8,757	7,837	
Poupança Rural (MCR 6-4)	2,040	1,079	-0.73%
Recursos Livres	1,088	2,152	-0.73%
CPR Aval/Compra	816	557	-0.73%
BB-Agroindustrial (MCR 6-4)	4,351	3,518	-0.73%
Recursos Externos - 63 Rural	462	532	-0.73%
Business agriculture - Investment	14,685	11,617	
BNDES credit lines	5,711	2,798	
Moderfrota	544	4	4.45%
Moderagro (incluso Prodefruta e Prodeagro)	462	279	19.23%
Moderinfra	544	124	21.68%
Pograma ABC (incluso Produsa e Propflora)	1,713	825	26.85%
Produsa	-	-	NA
Propflora	-	-	NA
PRODECOOP	1,088	223	21.68%
Moderfrota Pronamp (Moderfrota Proger)	272	4	8.59%
PROCAP-AGRO	1,088	1,340	13.48%
Prolapec	-	-	NA
Proleite	-	-	NA
PNCEBT - Brucelose/Tuberculose	-	-	NA
Other credit lines	5,439	5,534	
Fundos Constitucionais	1,577	1,801	34.27%
Pronamp (Proger)	870	1,147	16.52%
Recursos Externos - 63 Rural	218	192	17.91%
Rec.Obrigatório (MCR 6-2)	2,448	1,804	17.91%
Poupança Rural (MCR 6-4) Livre	-	178	17.91%
Recursos Livres	326	412	17.91%
Finame Agríc. Esp.	-	-	NA
Special lines under controlled interest	3,535	3,285	
BNDES/BB-PASS ethanol stocking	1,360	-	NA
BNDES PSI-BK	2,176	3,285	20.17%
BNDES /Prorenova sugarcane renewal (starts 2012)	-	-	NA
BNDES/BB Procer - Agribusiness	-	-	NA
FAT Giro Rural	-	-	NA
Coopgiro FAT - Banco do Brasil (custeio)	-	-	NA
FCO Comercialização	-	-	NA
Family agriculture	8,702	7,018	
Pronaf	8,702	7,018	39.41%

Under the (conservative) assumptions used here, subsidies are determined by the difference between the interest rate on the loans and the interest rate at which the federal government borrows. The “Subsidy” column does *not* account for debt that would be written off in a debt rescheduling scheme.

So this is only part of the picture: what is unseen is the amount of debt which is written-off or rolled-over at below inflation interest-rates each year. Because of the complexity of the subsidized interest-rate credit delivery system, these amounts are difficult to measure. Loan conditions and re-negotiated terms generally are specific to each borrower. Credits are often distributed through the commercial banking system (which takes a commission for the related administrative tasks) so that borrowings are widely dispersed. Terms change over time with successive laws authorizing renegotiation.

To give an idea of the rules allowing favorable re-negotiation of agricultural debts, here is a sample list of applicable laws:

- Law 12.788/2012: The Treasury acquires defaulted agricultural loans from private banks and settles with discounts ranging from 30 to 70% on due balances. 110,000 loans affected for a remaining amount of US\$ 6 billion in February 2011 – *the amount forgiven is unknown*.
- Law 11.775/2008: On 2.8 million agricultural contracts, this law increased terms by 3 to 10 years, forgave 5 to 70% of the balances due and US\$ 500 to 8,000 bonuses – with specific parameters for each class of loan. This concerned about US\$ 41 billion in outstanding loans – *the amount waived is unknown*.
- Law 9866/1999: Creates a 15 to 30% bonus on punctual debt repayments for settlements already re-negotiated under law 9138/1995. *The amounts involved and forgiven are unknown*.
- Law 9138/1995: Debts can be re-scheduled for up to 10 years at a 3% interest rate, with yearly payments. Debtor may choose to base payments on product prices. Applicable to all loans below US\$ 220,000. Concerns debts amounting to US\$ 7.6 billion; *the amount waived is unknown*.
- Law 7843/1989: Article 4 mandates that agricultural loans must be re-negotiated when unpaid for any reason other than “producer will”. *The amounts are unknown*.

A recent analysis of support for agriculture¹⁷ notes that “debt rescheduling and management programmes have come to play an important role in Brazilian agricultural policy. These programmes have become the most important source of subsidies for Brazilian commercial producers... All main credit programmes have, since 1995, benefitted from rescheduling conditions.” Further, “the 2008 debt renegotiation process is, in concept, different from the others... The new policy is more of a debt liquidation and regularization – for the delinquent renegotiated debts covered by the previous programmes – than a rescheduling programme, as previous programmes were.”¹⁸

It is interesting to note that law firms advertise their services to find issues with debt settlements proposed by the Treasury with the aim of obtaining larger discounts than offered. A settlement of a debt, even if it entails a reduction in the principal owed, opens the right to apply for further public loans.

The amount of debt write-offs is unknown. Indications are, however, that US\$ 5.9 billion is the amount of debt already under rescheduling schemes and in those schemes write-offs can represent between 30 and 70% of the amounts renegotiated¹⁹. If one estimates the amount of agricultural debt outstanding at between US\$ 150 billion and US\$ 260 billion²⁰, it can be inferred that about 1% at least of current agricultural loans have been written-off. That is US\$ 1.5 to 2.6 billion.

¹⁷“WTO Disciplines on Agricultural Support”, David Orden, David Blandford and Tim Josling, editors, Cambridge University Press, 2011, pp 234-235

¹⁸ Ibid. Page 236

¹⁹ Source: Valor Econômico, January 16th, 2013, “Governo volta a renegociar dívida rural”.

²⁰ Source: MAPA (Brazilian Ministry of Agriculture).

The OECD considers that direct agricultural subsidy levels are, in practice, quite limited: “Brazil provides a relatively low level of support to its farmers, despite maintaining an extensive range of price and credit policies²¹. But as will be shown in the case of the sugar and ethanol industry, under further investigation it can be argued that that view is dated and misses significant amounts of support. *Billions of dollars of forgiven and outstanding subsidized agricultural debt – much of which is non-performing – is only partially accounted for* as the official Brazilian government view is that a full account cannot be made until the related loan programs are renewed and liquidated and this may take years²².

Not only loans but tax collection too can be quite soft²³. Recently, there have been four tax-resettlement programs in 2000, 2003, 2006 and 2009, unofficially called “REFIS I, II III and IV”. These programs govern re-shuffling and consolidation of past tax debts, forgiveness of fines, and reductions in interest-rate inflation-adjustment rates on balances carried forward.

Recourse to tax settlement programs is facilitated and encouraged: the period for entering the 2009 program was still open in January 2013²⁴. And the practice is so widespread that in one assessment of the 30 largest publicly-traded corporations no less than 18 were active in those programs²⁵ either by having recourse to them directly or through acquired companies. Tax settlement programs are applied to all sectors, not only agriculture²⁶.

The sugar and ethanol industry, which represents about 10% of Brazilian agriculture output²⁷, shares in many of these programs, some of which are specifically tailored to it. It thus benefits from below-market interest-rates, from extended repayment schedules, from debt and tax write-offs and rescheduling, and from other government-sponsored incentives. An attempt to measure these subsidies is made below but, first, the way in which Brazil’s sugar and ethanol industry developed with government support must be described.

²¹ Brazil Agri Support – OECD 2011 Summary

²² “For 2003/04 to 2005/06, at the time the notifications were made [to the WTO] the government did not have data available on loan repayment delinquencies or the government decided to notify defaults on later notifications, together with the implementation of the 2008 debt settlement package. Hence, the option used was to assume zero default on the annual payments as they were due. With this methodology adopted by the government, the subsidies associated with overdue payments in the debt rescheduling programmes are captured only when a new programme is launched. *The benefits received by producers because they did not pay the annual instalments as due on their rescheduled loans are not captured unless a new rescheduling occurs.*” David Orden, David Blandford and Tim Josling, Op.cit, page 255

²³ Outstanding federal tax in Brazil under official collection procedure was of US\$ 500 billion in 2010; independent estimates pointed at another US\$290 billion still pending collection measures. 280,000 companies are involved but 70% of the balance is concentrated in 12,000 large debtors. Sources: Consultor Jurídico magazine, April 4th, 2010, and Valor Econômico, May 28th, 2010.

²⁴ Medida Provisória 574, sourced from Valor Econômico of October 31st, 2012.

²⁵ Source Valor Econômico, May 28th, 2010.

²⁶ Much of what is owed in taxes to the State could be considered a direct subsidy: under Brazilian law, a debtor is entitled to renegotiation and such renegotiation results in the forgiveness of 30 to 70% of the principal. Indeed, in 2008, federal data estimates show that taxes owed to the federal government were distributed as follows:

- US\$ 17 billion in REFIS (this amount had already been reduced after re-negotiation);
- US\$ 75 billion under processing for unpaid dues (which may enter REFIS at some point);
- US\$ 200 billion as under-performing.

²⁷ US\$ 48 B. (source: UNICA) out of US\$ 499 B. (sources: IBGE, CEPEA, MAPA).

The Foundation of Brazil's Sugar Supremacy: the Proálcool Program

Proálcool, First Phase (1975 – 1980)

In Brazil as elsewhere, government intervention in sugar and ethanol has been of major importance. Though modern public market management tools have been used since 1933²⁸ at least, the industry's current state is largely the result of the 1973 oil crisis and Brazil's response to it.

The immediate cause of the 1973 crisis was an oil embargo established by the Organization of Arab Petroleum Exporting Countries, ostensibly to punish countries which had supported Israel during the October 1973 "Yom Kippur" war. The embargo, however, was over by March 1974. Of greater significance was the subsequent decision by the oil cartel to manage supplies in such a way as to establish a "fair" price for crude oil.

Worried about the impact of rising energy prices, a deteriorating balance-of-payments and dependency upon foreign fuel supplies, Brazil decided to encourage the domestic production of ethanol to be blended with gasoline. This was the "Proálcool" program²⁹ launched on the 14th of November 1975. The goal was to produce 925 million gallons by 1980, up from 180 million gallons in 1972/1973 – a five-fold increase. At the time the Brazilian sugar and ethanol industry faced disastrous world sugar prices and serious over-supply. Bankruptcies were looming. The opening of a whole new market was a godsend to the industry.

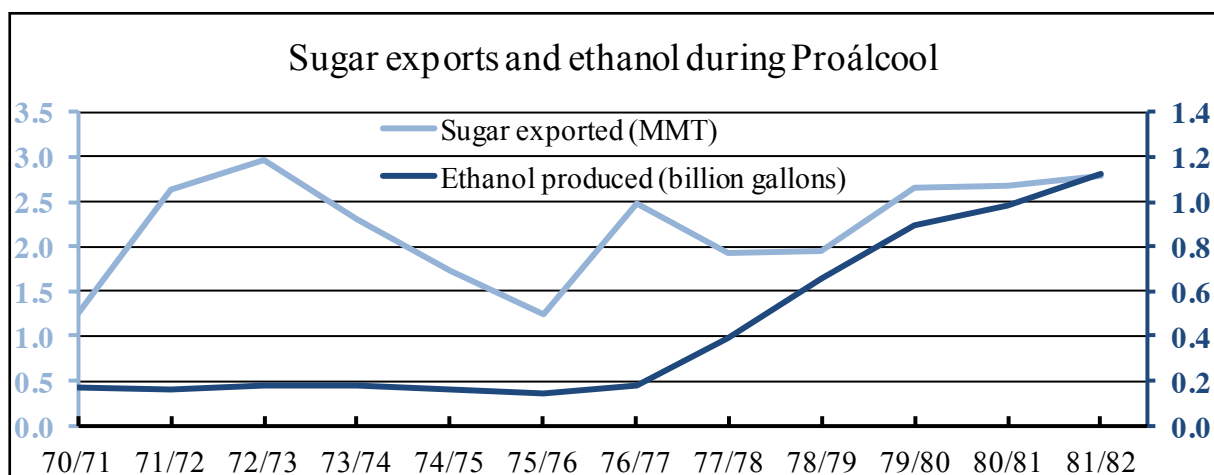


Chart nº6; sources: IAA/Codeplan, UNICA

Using ethanol to supplement gasoline supplies was not without precedent: in 1931, Brazil made it compulsory to mix 5% of domestically-produced ethanol with imported gasoline; in 1938, this obligation was extended to gasoline produced in Brazil. During the Second World War in some states in the North-East, this blend ratio was even raised to 42%. It is during this period that the practice of distilling thick juice directly took off; previously, ethanol was nearly always made from fermenting molasses, the sugar-rich final co-product of the sugar production process. As the war ended and the world moved on, lower oil prices and safer oil supplies brought ethanol usage down to 2.9% of gasoline sales by the early 1970s. Ethanol was not the only recipient of government support during

²⁸ Establishment of the Instituto do Açúcar e do Alcool (IAA). "The role of the IAA was essential in the process of expanding the use of automotive ethanol. This action occurred not only as a financial agent for the sector through the provision of incentives and investment with own resources but also as a planner, executioner and operator of the production policy of the fuel through the construction and operation of distilling plants, of its own property." - Puerto Rico, Mercedes & Sauer, op. cit. The IAA was the market maker: it bought sugar and ethanol from producers and sold it domestically and on international markets. It set production quotas and producer prices. No mill could be built without its permission.

²⁹ "Programa Nacional do Alcool" – Decree nº76.593

and after the war years: sugar prices were set at levels encouraging production and led to capacity expansion in the centre-south.³⁰

In its first phase Proálcool encouraged the production of anhydrous ethanol which had to be blended into gasoline both to alleviate a trade balance problem and to address difficulties in the sugar industry. Up to a technical limit of 25% ethanol content the blend would run on available engines: the government had only to mandate the rise in the blend and assist in the expansion of the distilleries.

Proálcool, Second Phase (1980 – 1997)

A second phase of Proálcool was launched because of the second oil shock. The second oil shock started in 1979 when the Iranian revolution disrupted supplies and was followed the next year by the breakout of war between Iraq and Iran. In the eyes of the Brazilian authorities it became clear that much more gasoline needed to be substituted by ethanol. But this could not be done by more blending: the 25% technical blend wall had been reached already.

The solution was to promote the development and sale of vehicles equipped with engines running on pure alcohol. These would totally eliminate the need for gasoline in a large part of the fleet. But engines had to be purpose-built to accept this, a separate distribution system had to be set up³¹ and prices for these vehicles and for hydrous ethanol had to be competitive.

To provide enough demand for all the ethanol that could be produced, the Brazilian government decided to:

- Contract and subsidize the automotive industry to produce alcohol-only engines;
- Give alcohol vehicles a tax advantage;
- Set the price for hydrous ethanol at a level which made it competitive: thus, the price for hydrous ethanol was legally set at 65% of the price for gasohol³²;
- To help make ethanol profitable, tax imported oil at 12.5% of its CIF price;
- Subsidize the distribution of the new fuel.

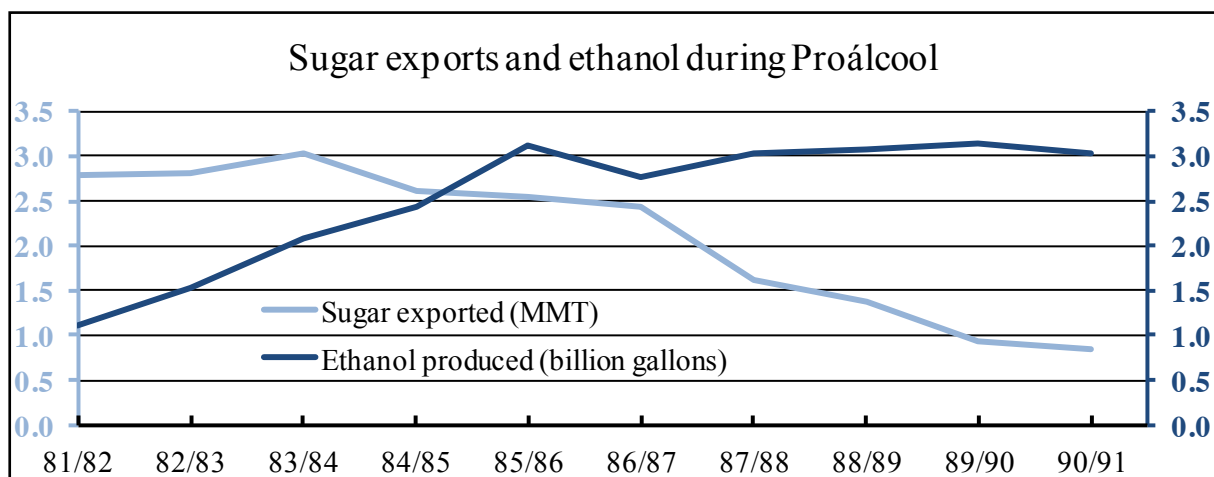


Chart n°7; sources: IAA/Codeplan, UNICA

³⁰ “O Desenvolvimento da Agroindústria Canieira do Brasil desde a Segunda Guerra Mundial”, Tamás Szmrecsányi and Eduardo Pestana Moreira, Estudos Avançados (11)5, 1991.

³¹ As its name indicates “hydrous” ethanol contains water: if mixed with gasoline, the water will separate and damage engine operation. Therefore, a physically separate delivery system has to be installed: separate storage tanks, separate transportation vessels, separate pumps.

³² The energy contained in a given volume of hydrous ethanol is about 70% below that contained in the same volume of gasoline. To make ethanol attractive to the consumer, it is therefore necessary that its price be no more than 70% of the price of gasoline.

Estimates vary and the nature of government aid is uncertain, but it can be safely stated that from 1976 to 1985, *Proálcool* was boosted by US\$ 17.4 billion³³ in government funds. That represents US\$ 5.8 per gallon of additional ethanol. 209 projects to build or expand distilleries were financed through Proálcool³⁴. Today Brazil has approximately 435 sugarcane mills, 168 of which are pure distilleries making only ethanol, but only 16 of which are pure sugar mills: the industry remains heavily skewed towards the government-created ethanol market.

In addition to direct investment amounts, the government picked up the difference between the price at which ethanol was sold and its cost, thus *subsidizing ethanol sales by some US\$ 12 billion*³⁵.

Overall with Proálcool “Public sector subsidies and tax breaks helped get the program started: farmers planted more sugar cane, investors built distilleries to convert the crop to ethanol and automakers designed cars to run on 100 percent alcohol. The government financed a distribution network to get the fuel to gas stations and kept alcohol prices low to entice consumers.”³⁶ Petrobras, the government-run monopolistic petroleum company, was in control of the distribution of ethanol and played a key role in managing the fuel market.

But the main fact is that the Brazilian state mandated and organized a market which more than doubled the size of its sugar industry. It set production levels for sugar and ethanol, provided financial incentives for building distilleries, managed exports of sugar and ethanol, set prices for all products and established mandatory blend levels. That is governmental intervention on an epic scale.

The effect of the Proálcool program on the Brazilian sugarcane industry was quite dramatic:

- In 5 years, sugarcane production expanded by 50%;
- Between 1975/76 and 1990/91 sugarcane production surged from 68.5 to 222.4 million tons (+225%), but sugar output grew only by about 25%: practically all of the growth was devoted to ethanol whose supply shot up from 147 million to 3 billion gallons;
- Innovations were introduced: field and mill productivities were boosted by payment of the sugarcane on the basis of sugar content, new cane varieties and improved industrial installations;
- In 1985, 96% of all vehicles sold in Brazil were powered by pure-alcohol engines; production of alcohol-powered cars jumped from 3,000 over 560,000 units per year³⁷;
- Domestic gasoline production exceeded consumption³⁸.

The industry trebled in size overall and this feat had little or nothing to do with market economics. It owed everything to government intervention. Proálcool remains the cornerstone of Brazil’s sugar and ethanol industry.

In 1985 sugar prices surged and factories seeking the highest returns maximized sugar output, thus cutting ethanol output. Though hydrous ethanol production recovered by 1987, the ethanol fleet was still growing (government incentives remained) and had to be supplied. Moreover, subsidized low ethanol prices meant even owners of gasoline engines would sometimes fill up – or top up – with pure ethanol instead of gasohol. The result was that Brazil had to import ethanol, both hydrous (to satisfy demand) and anhydrous ethanol (to satisfy the mandatory blending). In fact, “gasoline surpluses were

³³ 2012 US\$; source: Op.cit. Puerto Rico, Mercedes & Sauer

³⁴ “Evolução da Agroindústria Canavieira Brasileira de 1975 a 1995”, by Pery Francisco Assis Shikida and Carlos José Caetano Bacha, RBE, Rio de Janeiro, 53 (1) 69-89 Jan./Mar. 1999.

³⁵ 2012 US\$; source: “Historia e Economia dos Biocombustíveis no Brasil” by Fernando Tavares Lávora, Centro de Estudos da Consultoria do Senado.

³⁶ World Resources Institute - <http://projects.wri.org/sd-pams-database/brazil/national-alcohol-program-proalcool>

³⁷ Puerto Rico, Mercedes & Sauer, op.cit., page 1883

³⁸ Ibid, page 1883

being exported at lower prices than the imported ethanol. The [ethanol] deficit lasted for at least 8 years.”³⁹

But consumer confidence in the alcohol engine had disappeared, prices moved in favor of gasoline and car manufacturers introduced more efficient gasoline engines (injection): whereas sales of alcohol cars had reached a market share of 95% in 1984, by 1994 it had fallen to 10.6% and only 2.3% in 1995.

In short, after 1985 ethanol demand stabilized as the fleet of alcohol vehicles wasn't renewed and the domestic industry slowly turned to sugar, egged on by a favorable exchange rate. *After 1990, as the industry turned away from ethanol, Brazilian sugar exports increased. That would not have been possible without the asset-base created by the government's support for ethanol.*

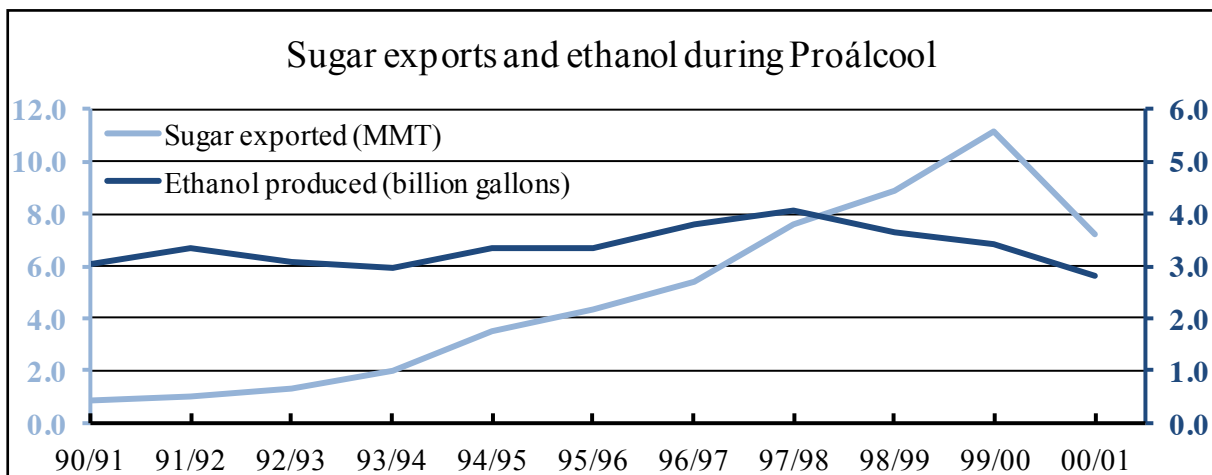


Chart n°8; sources: IAA/Codeplan, UNICA

“Liberalization” (1997 – 2013)

Liberalization was implemented progressively from 1990 with the closing of the Instituto do Açúcar e do Alcool, when the price for sugar was freed (but not the price of sugarcane). But those who say the Brazilian sugar and ethanol industry is operating under free market rules would generally consider 1997 as the year when sugar was freed from government intervention totally. That year the government renounced its powers to price sugarcane, to set production quotas, to control exports, etc.⁴⁰ Officially, the most blatant direct sugar and ethanol industry public management tools were discarded then or soon after.

However, observation of the industry shows that government intervention continued in subsequent years. An econometric analysis of price/quantity adjustments for fuels from 1990 to 2001 reveals “the existence of a measure of price inertia typical of price control systems practiced in the 1990’s”; it mentions that “government tended to absorb external price shocks, not passing them through to the retail sector” and concludes “results show activities still operating under the aegis of the State which controlled their operations without necessarily following economic logic.”⁴¹

³⁹ Ibid, page 1883

⁴⁰ Essentially, this was marked by Law n°9478/1997 of August 6th, 1997, on national energy policy which was accompanied shortly by government decrees reorganizing sugar and ethanol institutions.

⁴¹ “Ajustes no Mercado de Alcool e Gasolina no Processo de Desregulamentação” (Adjustments in the Ethanol and Gasoline Markets in the Deregulation Process), by Marta Cristina Marjotta-Maistro. Doctoral thesis under the guidance of Dr Geraldo de Sant’Ana de Camargo Barros, Piracicaba, July 2002, ESALQ/USP

Thus, liberalization was far from total and the Brazilian government kept a set of tools with which to influence the ethanol market. These tools are used today to support domestic ethanol production and sales. Together they constitute a well-stocked policy toolbox which will be reviewed in some detail but, first, it is necessary to show what happened as the touted “liberalization” unfolded.

Hard times for hydrous

Despite incentives the attraction of alcohol-only vehicles declined: having peaked at 2.8 billion gallons in 1991, sales of hydrous ethanol fell to 1.3 billion gallons by 2000. In 1990, the tax reduction benefitting dedicated alcohol-powered cars was lifted. Hydrous prices – which were still government controlled until 1999 – became uncompetitive against gasoline in the middle of the decade as oil prices eased.

The overall fleet of vehicles was growing, so anhydrous blended into gasoline to make gasohol took up some of the slack. This phenomenon was encouraged by the federal government which raised the mandatory blending level: set at 14% until 1992, the blend was increased to 22% until 1998, then to 24% until 2000 when it dropped back to 20% then was raised again to 22% in May of 2001. Domestic anhydrous sales grew from 586 million to 1.7 billion gallons over the same period though overall ethanol production stagnated just above 3 billion gallons.

Starting in 1999, a favorable exchange rate allowed sugar exports to surge and drain feedstock from ethanol. From 1992/93 to 2001/02, sugarcane allocated to sugar production grew from 40% to 55%. Had the government-organized “ethanol miracle” run its course?

The resurrection of hydrous ethanol: the “flex-fuel” vehicle story

Why did flex-fuel cars appear in Brazil? As the old ethanol-only fleet aged towards extinction, hydrous ethanol remained relatively abundant and from January 1999 oil prices started increasing: the import price of oil in Brazilian reals (BRL) went from about BRL 20/bbl in 1998 to BRL 65/bbl in 2001. Hydrous ethanol thus regained competitiveness against gasoline and generated demand for vehicles which could run on it. Naturally, automobile companies were eager to tap this market.

However, consumer memories of the 1985 crisis, when sugar production was favored to the point of severely – though briefly – curtailing the availability of ethanol at the pumps, made a return to pure-ethanol engines impossible. A way to allow consumers to use hydrous ethanol without tying them to that one fuel was needed. Automotive companies revived research on technology which allows an engine to accept a range of fuel combinations, from gasoline only to ethanol only and anything in-between. In 1994 Bosch began development of a “flexible-fuel” mechanism. Other equipment manufacturers, such as Magnetti Marelli and Delphi Automotive Systems, quickly offered solutions. This research was of course encouraged by the government which saw the advantages of supporting a market for domestic ethanol. The first commercial flex-fuel car, from Volkswagen, was introduced in March 2003. It was quickly followed by General Motors (Chevrolet) and then others.

Four months earlier the federal government had both lowered the sales tax on flex-fuel cars and increased taxes on gasohol. By the time sales of flex cars became the norm in 2006⁴², the low sales tax⁴³ “fuelled” flex-fuel car buyers to the tune of *US\$ 300 million* and a specific additional tax⁴⁴ *increased the cost of gasohol to consumers by US\$ 29 billion*⁴⁵.

⁴² 83% of 2006 new car sales were for vehicles with flex-fuel engines.

⁴³ “IPI”: the rate for flex-fuel car purchases was set at about 2 points below the normal rate was.

⁴⁴ “CIDE”

⁴⁵ Calculated in 2012 US\$; From 2002 to its extinction in June 2012, the CIDE tax on gasoline raised US\$ 49 billion (2012 US\$)

Ethanol was also favored by large states such as São Paulo and Minas Gerais taxing that fuel less than gasohol⁴⁶. In 2004, the state of São Paulo dropped its ICMS tax on hydrous ethanol from 25 to 12%. As a result, though the 9-year average weight of São Paulo in national fuel consumption is 29%, its 9-year average in national consumption of hydrous ethanol is 56%.

The rest, as they say, is history: in 2003, 72,000 flex-fuel cars were registered; by December of 2012, there were 18.5 million flex-fuel cars on the road in Brazil. By 2008, 60% of the sugars contained in the harvest were used for ethanol production.

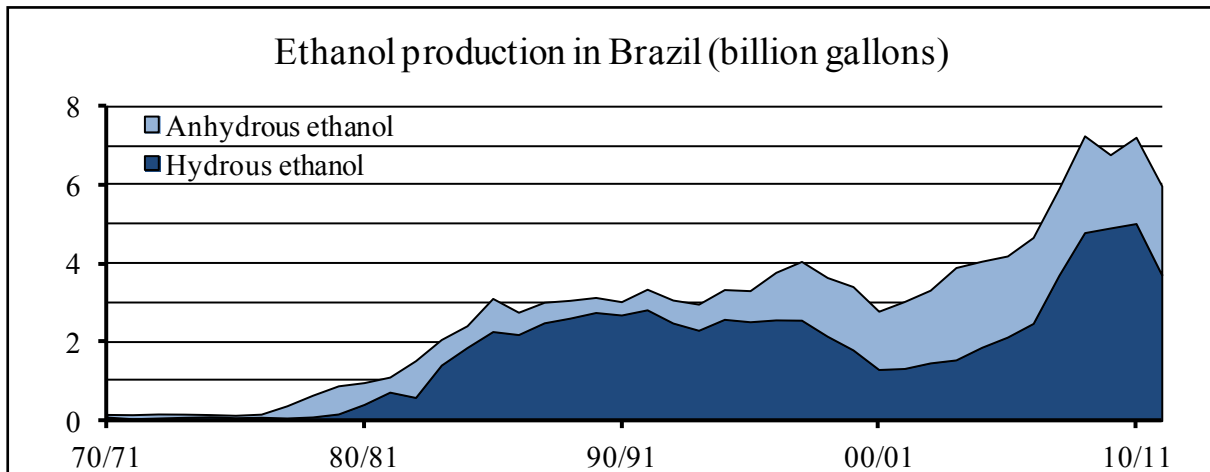


Chart n°9. Source: IAA/Codeplan, UNICA

It can be argued that the introduction and success of the flex-fuel car was the result of “market” circumstances. However, three of the main market factors which drove this success were the result of government intervention: consumers were influenced by the tax incentive on flex-fuel car purchases, the availability of hydrous ethanol and its low price relative to gasohol. It is clear that consumers flocked to the – *government-induced* – lowest-cost automotive solution.

Current Government Support Instruments for Sugar & Ethanol

Brazilian government support for the sugar and ethanol industry continues today. Support is provided through a myriad of paths, some of them specific to the sugar and ethanol industry, others more widely used.

The number and variety of support mechanisms make it difficult to count the impact of each precisely. Hereunder is an overview of the main tools used today by Brazilian public authorities to help the sugar and ethanol industry.

Financial support mechanisms

Brazilian agriculture, including sugarcane, benefits from a reduced mandatory contribution to the government pension fund scheme INSS. Farming pays a special tax, informally called “Funrural”, defined as 2.1-2.6% of revenue instead of the standard 28.3% on payroll⁴⁷ that non-agricultural sectors pay. *The benefit for sugarcane farming will amount to about US\$ 800 million for the 2012/2013 crop year alone.* The related pension liability to the country isn’t reduced: the difference will be picked up by other economic agents. So it represents a real subsidy to sugarcane production.

⁴⁶ “ICMS”, a state sales tax

⁴⁷ The 28.3% is composed of 20% for all employers, plus 3% for employers in some sectors including agribusiness, plus 8 to 11% taken from the employee’s paycheck, less 2.7% for agribusiness employers.

Further, some cane growers in the northeast receive a direct subsidy of some US\$ 2.5 per ton of sugarcane – press reports say the subsidy amounts to US\$ 58 million per year.

One perennial problem is the surge in the ethanol price during the inter-crop period, from February to April. This is largely due to a lack of storage capacity. In order to remedy the problem, in 2009 the government established a specific soft-loan credit line to finance the construction of additional private ethanol storage tanks called the “Sugar-Alcohol Support Program”⁴⁸. The national development bank BNDES has opened credit lines of US\$ 1 to 1.2 billion each year since then for this program but uptake to date has been limited.

Confronted by a second weather-damaged sugarcane crop in succession, in January 2012 the government launched the US\$ 2.2 billion “Prorenewal”⁴⁹ scheme of cheap loans to boost about 1 million hectares of sugarcane renewal and expansion. During 2012 US\$ 800,000 was borrowed to renew or develop 400,000 hectares of sugarcane. The facility was renewed for 2013 with again a potential credit line of US\$ 2.2 billion.

In 2012 BNDES began a new program offering low-interest loans to improve or build ethanol plants. Reportedly, some US\$ 14 billion would be available for such projects. In September 2012 for example, the Boa Vista mill secured a loan of US\$ 180 million for mill and cane expansion; annual sugarcane crushing capacity will increase from 2.5 to 7 MMT.

Under conservative assumptions Brazilian agribusiness benefits from subsidized interest-rates to the tune of US\$ 4 to 7 billion per year. The sugar and ethanol industry accounts for 10% of Brazilian agribusiness. So a rough estimate would find that the amount of interest-rate subsidy given to the sugar and ethanol industry is *at least US\$ 400 million per year*.

Recent policy has increased the rescheduling and discounting of non-performing agricultural debts. Calculation of the subsidy levels involved is difficult: “The specific conditions of each debt modality in terms of payment schedule, interest rates, and the debt balance covered makes the calculation in advance of subsidies associated with this debt rescheduling a difficult task.”⁵⁰ Of particular interest would be to know the overall amount of debt forgiven in these distress operations but it is not published.

As mentioned previously, REFIS is a general mechanism by which distressed companies see taxes owed to public entities (for general taxes, pension dues, social security taxes) consolidated into low-interest, long-term debt whose present-value is tiny.

A REFIS deal brings a waiver of fines for the defaulted taxes being re-negotiated, accelerated carry-forward of losses for corporation income tax, an *unlimited-duration* repayment schedule, generally set at 1.2% of turnover, and a *below-commercial interest rate* applied to the balance. In effect, the REFIS process results in a large discount being applied to these debts: it is to be repaid only very partially.

To take an example from the 2010 accounts of Guarani, the fifth-largest Brazilian sugar and ethanol company⁵¹: the initial amount owed was US\$ 42 million; once re-negotiated, it fell to US\$ 25 million and the accountants (Deloitte) calculated the net present value of that balance to be US\$ 8 million. *In this case, the total amount forgiven was US\$ 34 million, an 81% reduction of the original debt.*⁵²

On the basis of a sample of Brazilian sugar and ethanol companies which publish detailed accounts and which represent 25% of the country’s sugarcane crush, the amount of debt under REFIS for the

⁴⁸ “Programa de Apoio ao Setor Sucro-Alcooleiro”, also called “PASS”

⁴⁹ “Pro-renewal”

⁵⁰ David Orden, David Blandford and Tim Josling; Op.cit., page 236

⁵¹ Processing 19 million tons of sugarcane; owned by Tereos International (France) and by Petrobras

⁵² 2010 Tereos accounts – note 15, Financiamento de Impostos (REFIS/PAES)

whole industry can be estimated to be *between US\$ 6.6 and 7.8 billion* which represents the amount *after* initial renegotiation of the outstanding debt – and *examples show that the amounts forgiven could represent a third or more* of that. Because of its low interest rates and long repayment schedules, *the net present value of REFIS for the industry could be only half that amount, a subsidy of about US\$ 3.6 billion*. The value of the subsidy on the interest alone is 6 or 8% of the principal. *That is US\$ 500 million per year*.

Setting the mandatory blend

As mentioned earlier in this report, the Brazilian government sets the blend of anhydrous ethanol in gasoline. This power has been frequently used to balance the market for ethanol – higher when there is an excess of available ethanol, lower when the reverse is true.

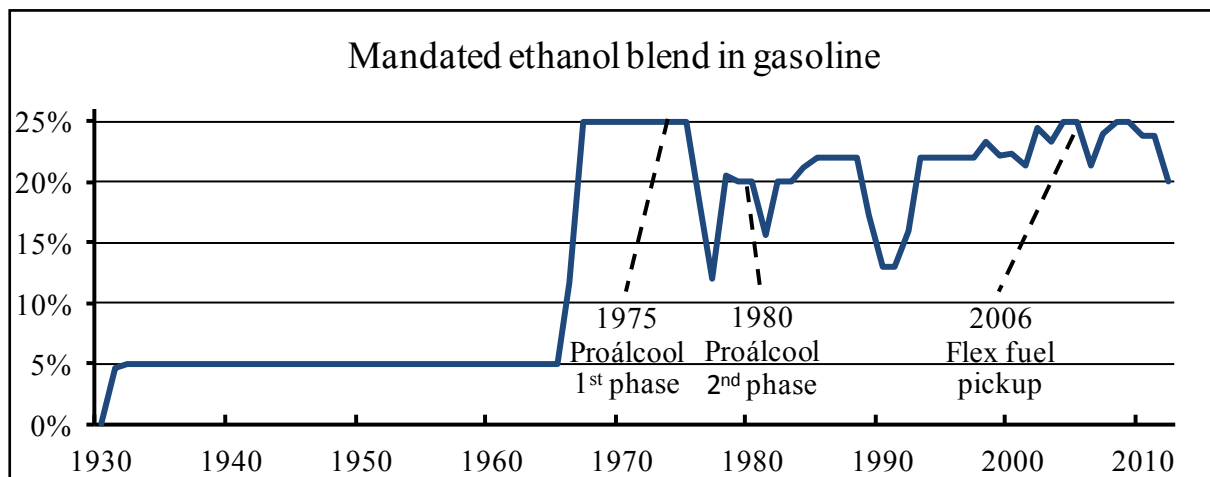


Chart n°10. Source: MAPA⁵³

The government has just announced an increase in the blend from 20 to 25% which will take place on the 1st of May 2013. In a full year, this amounts to a displacement of some 525 million gallons from hydrous to anhydrous ethanol.

Anhydrous ethanol is priced on average 10 to 15% above hydrous and the cost of dehydration is small: *the 2013 change will increase the Brazilian sugar and ethanol industry's margin by about US\$ 80 million per year*.

Mandatory blending provides a secure market for 25 to 35% of the industry's output. The government-mandated anhydrous ethanol market absorbs the equivalent of some 10 to 13 million tons of sugar – an amount equal to domestic Brazilian sugar sales.

The power to set gasoline prices

As Marcos Jank, the former President of UNICA, remarked "*Ethanol's main competitor is oil, and the price for gasoline is set by the Government.*"⁵⁴

Brazil's annual output of 24 billion liters of ethanol is sold domestically in two ways⁵⁵: 40% is mixed with petrol under mandatory blending rules and 60% is used in "flex-fuel" vehicles where it competes head-to-head with petrol. (Representing nearly 45% of all on-the-road light vehicles and over 90% of

⁵³ Between 1966 and 1977, blending was mandatory in ranges up to the values shown. The full enforcement of blending really started from 1977.

⁵⁴ October 2010 DATAGRO International Conference in São Paulo

⁵⁵ Some years, there are exports.

new car sales, flex-fuel cars can be filled with petrol or with ethanol depending on the relative price of each⁵⁶.)

The government retains the capability to set gasoline prices. Though gasoline/gasohol prices at the retail level were officially freed in 1996, from that year until 2002 the government still controlled prices paid to the monopoly national Petrobras (ex-refinery). Thereafter, gasoline prices were legally free. But that freedom is relative since the federal government owns over 50% of Petrobras' shares. It thoroughly controls the company (which, at one point, had the largest capitalization of any Latin American corporation) and uses it to implement industrial policy⁵⁷.

Though the price for petrol does not always determine the domestic market price for hydrous ethanol, it sets a ceiling. Historically, that ceiling is high relative to other countries by government fiat, a situation which benefits ethanol structurally. As the president of Brazil's central bank testified recently to the federal Senate, "any international comparison shows our gasoline price to be at the top of the range in Latin America and against other competitors."⁵⁸

For many years Brazil's policy of high gasohol prices has provided support to hydrous ethanol sales. The industry's current situation relative to gasohol is, however, uncomfortable: from the end of 2009, the government lowered taxes on gasohol and refused to let relatively high international gasoline prices be transmitted to the domestic market completely. Ethanol has become uncompetitive and consumers equipped with flex-fuel cars have been quick to favor gasohol: In Brazil hydrous ethanol competes against gasohol at the pump. With 45% of its light-vehicle fleet "flex-fuel", some 18 million vehicles fill-up with either gasohol or with ethanol. Today, about two-thirds of the flex fleet uses gasohol because it is cheaper.

This turn of events may seem counter-intuitive as the difference in international and domestic prices for gasoline cost Petrobras US\$ 1.6 billion in 2012 and the rush of consumers to fill up with gasohol weighs upon the trade balance. But it appears that in order to control inflation and to keep the currency from rising, the government is content to moderate gasohol prices.

That current government gasohol price policy hurts ethanol sales today should not distract from the *structural* truth: installed sugarcane milling capacity owes much to the government's promotion of pure alcohol and flex-fuel cars. For Brazil's competitors this subsidized built-up capacity is now turning to produce more sugar and anhydrous ethanol: competition on these markets cannot be seen as entirely "fair".

Taxation which favors flex-fuel

Beyond control over gasohol prices and the amount of ethanol blended into gasoline, Brazil uses a series of tools to sustain ethanol sales and, thus, its sugarcane industry:

- The IPI sales tax on flex-fuel cars is levied at 200 basis points (2%) less than on gasoline-powered cars. This provides an incentive for the fleet to remain able to use ethanol. Unsurprisingly, approximately 95% of new car sales are flex-fuel vehicles.
- Taxes are lower on ethanol than on gasohol. This is true of federal taxes and, in key cases, of state taxes. Tax calculations for fuel are complicated by the existence of federal and state taxes, by the number of taxes levied at different stages in the sales and distribution system and by frequent changes.

⁵⁶ As a rule of thumb, because ethanol "packs" 30% less energy per volume than petrol, for ethanol to appeal to consumers its price per litre needs to be 30% below that of petrol.

⁵⁷ For example, equipment purchases by Petrobras must satisfy a minimum national content. As the recently-discovered large offshore "pré-sal" deposits are developed, this represents billions of dollars of domestic demand.

⁵⁸ Testimony to the Brazilian Senate's Economic Committee; quoted in Portal Terra, December 11th, 2012.

The University of São Paulo publishes a yearly “study on taxation of fuels”⁵⁹. For 2011, it shows taxes of:

- 36.58% on gasohol⁶⁰ vs. 21.6% on ethanol in the state of São Paulo;
- 40.2% on gasohol vs. 30.4% on ethanol in the state of Minas Gerais.

(Today in São Paulo, the rates are about 35% on gasohol against 31% on ethanol.)

Limiting competition: private diesel vehicles

Private purchase of diesel-powered cars is simply prohibited. This very explicitly authoritarian approach to consumer vehicle choice also skewers the market in favor of flex-fuel cars. (Commercial vehicles can be diesel-powered.)

The ability to impose export taxes

If proof was needed that Brazil regulates the ethanol market and so, by the direct link of processed sugarcane, the sugar market, it would be enough to look at the 2011 government threats to tax sugar exports in order to ensure sufficient supplies of ethanol to the domestic fuel market.

An export tax for sugar exists but its rate currently is zero. In April 2011, however, President Dilma Rousseff instructed Brazil's National Oil Agency, or ANP, to draft regulations that will treat ethanol as a "strategic fuel" and no longer as an agricultural commodity, Haroldo Lima, the agency's director, told Reuters. As was reported at the time: “World sugar prices are 25% off 30-year highs set in February and Brazilian cane mills have been pushing production of the sweetener close to capacity and at the expense of ethanol production ... For years, Brazilian officials have threatened *to tax sugar exports as a way of ensuring greater output of ethanol* in between cane harvests.”

For any country counting on the world market for all or part of its supplies of sugar that the largest exporter – with a 50% market share – would contemplate throttling its exports with taxes should ring alarm bells.

Cross-Subsidization

The association of Brazilian Center-South Sugar and Ethanol Millers, UNICA, writes: “Economies of scale stemming from ethanol production have lowered the price of Brazilian sugar and increased its presence in global markets”⁶¹. It would be difficult to better describe the effects of cross-subsidization in the Brazilian sugar and ethanol industry.

Cross-subsidization happens when resources paid for by one line of business are allocated to another or where the mere existence of a line of business improves the efficiencies of another. In the case of the Brazilian sugar and ethanol industry, the development of ethanol has resulted in lower sugar cost-of-production: the government-mandated Brazilian ethanol market improves the competitiveness of Brazilian sugar.

Commenting upon the industry's growth from 1975/76 to 2010/11, Dr Plinio Nastari, the founder and CEO of DATAGRO, a major and well-regarded Brazilian consultancy in the field of sugar and ethanol, stated⁶²: “Since 1975/76, when the Alcohol Program was established, cane crush grew eight-

⁵⁹ “Estudo sobre a Carga Tributária dos Combustíveis”, Universidade de São Paulo – Faculdade Economia,, Administração, e Contabilidade de Ribeirão Preto – Amaury José Rezende, Silvio Hiroshi Nakao, Gustavo Abrão. July 2011.

⁶⁰ Gasoline is blended with anhydrous ethanol; ethanol is hydrous ethanol.

⁶¹ “From Alcohol to Ethanol, a Winning Trajectory”, by Margarita Cintra Gordinho, Editora Terceiro Nome, UNICA, 2010; page 99.

⁶² “Update on Brazil's Ethanol Industry”, 17th National Ethanol Conference, Orlando, Florida, February 22-24, 2012 – page 2.

fold; sugar production grew 5.5 times and ethanol production grew 48 times. In 1975/76, producers were trying to extract all sugars from molasses, *and thus making expensive sugar and ethanol.*"

There are five mechanisms through which sugar costs benefit from ethanol production:

- **Process simplification:** In a unit designed to produce sugar and ethanol in equivalent volumes, sugar can be extracted in two "strikes" only, leaving the still-sugar-rich molasses to be fermented and distilled. But in most standard sugar mills, the process is designed to extract as much sugar as possible, leaving as little sugar as possible in the molasses and more equipment has to be installed: the thick juice is treated thoroughly to remove impurities in the carbonation and clarification stages; often, sugar is extracted in three "strikes" as the remaining sugar-containing paste ("massecuite") is recycled through vacuum pans and centrifuges. It also means that more energy has to be expended. This is what Dr Nastari refers to when he says "producers [in 1975/76 – before the Proálcool program] were trying to extract all sugars from molasses, and thus making expensive sugar and ethanol."⁶³

For new mills this process simplification is amplified in the start-up phase when, if you have a ready market for ethanol like in Brazil, you begin milling the sugarcane with only a distillery as the outlet for the juice: this provides a low-cost, easy to scale-up process which can use low-quality cane and milling. Once your field, milling and distilling operations are running smoothly and quality has improved, you add the sugar house. A mill project can thus generate cash earlier than with sugar only. This sequence greatly facilitates "greenfield" projects. It is very comforting for investors.

- **Factory economies of scale:** Doubling the size of a sugar factory reduces the unit cost of sugar by between 10 and 15%. Now 50% of Brazilian cane is used for ethanol and 60 to 70% of factory costs are generated before the sugar house: alcohol production lowers the unit cost of producing sugar in dual-product facilities by approximately 10%. That is cross-subsidization on a massive scale, quite apart from the additional experience and economies of scale in cane production itself.

Excluding mills that are pure distilleries and mills whose size in sugar already carries high economies of scale, *the amount of economies-of-scale cross-subsidization can be estimated to be between US\$ 460 million dollars and 760 million per year*⁶⁴. These savings would not exist but for the Brazilian government's creation and maintenance of an ethanol market.

It can be argued that this reduction in cost should be applied to the industry's marginal market, its exports of sugar. If so, these economies-of-scale savings are to be credited to 24 million tons of exported sugar; that amounts to some US 5.6 cts/lb. Since Brazil sets the world market price for sugar - its exports supply close to 50% of that market – and since that price is now around US 18 to 22 cts/lb, the government-induced cross-subsidy effect alone could be depressing the world market price for sugar by about 25 to 30%.

- **Extended campaign:** By adding a distillery to a sugar mill, the mill can use poor quality sugarcane towards the start and the end of each campaign, or if weather conditions deteriorate during the campaign. This allows better utilization ratios of fixed assets and costs.
- **Accumulated experience:** Doubling the accumulated experience on sugarcane in the field and in the front-end of the mills inevitably improves productivity as lessons are learned and applied more quickly.

⁶³ Ibid.

⁶⁴ The data used is that of the last normal campaign, 2009/10

- **Arbitrage:** By co-producing sugar and ethanol a mill will be in a position to arbitrage between the two markets. If one of the markets is more remunerative, the mill will divert more sugar-containing juice there. Though limited by the respective capacities of the distillery and the sugar house, this arbitrage makes a significant contribution to profits. For Brazil as a whole 5 to 7% of the sugar can be switched from one outlet to the other. For Brazilian mills the option to favor the most remunerative market is an advantage directly derived from the government-created and managed market for ethanol.

A quick calculation shows that such arbitrage boosts industry Earnings Before Interest, Tax, Depreciation and Amortization by millions of dollars. The precise effect will depend upon what products are arbitrated, volumes arbitrated and relative prices. Advantage of this opportunity clearly is taken by the industry on a weekly basis and for small variations in market prices.

The bottom-line is that it is widely recognized that the co-production of ethanol and sugar improves industry efficiency and financial results: without ethanol, Brazilian sugar would be materially more expensive to produce; and ethanol in Brazil is a government-created and government-supported activity. It follows that the actual competitiveness of Brazilian sugar – which represents half of world trade and sets the world market price – is a result of government support.

Import duties

Brazil maintains a 16% import duty on sugar. Given that it supplies roughly 50% of world exports and thus determines the world market price structurally, the duty is largely symbolic, but it exists. The duty has been higher in the past as the industry was developing and Brazil's WTO-bound rate for sugar is 35%.

On ethanol the duty is 20% but it is currently suspended.

The Enterprise Value of Government Support

An estimate of the accumulated value of sugar and ethanol assets due to government intervention can be given: with practically all fuel-ethanol facilities built and run thanks to government interventions and with half the sugarcane dedicated to ethanol, it follows that *half the investment in fields and mills is the result of public support*.

At current market values those productive assets amount to some US\$ 45 billion⁶⁵ and represent a potential capacity, in sugar terms, of some 40 million tons – 23% of the world's sugar output.

The Exchange-Rate Issue: a Discussion

Brazilian sugar exports over the last 20 years rose from less than 4% to nearly 50% of world trade. All observers of this remarkable performance note that a generally weak currency has helped. For a commodity such as sugar, the product characteristics of which are standardized, price is by far the main competitive determinant. A weak exchange-rate relative to competitors will boost competitiveness just by reducing costs as expressed in US\$, the currency international trade is quoted in.

⁶⁵ Acquisition market value for mills and the cost of planted sugarcane

It would of course be wrong to think that Brazil's exchange rate is the consequence of its sugar and ethanol policy, or of any of its other commodity policies. The value of its currency depends upon macro-economic and financial factors beyond the control of any single industry.

Weaknesses in the Brazilian real were largely linked to the poor state of public finances, particularly at the state level. Poor public finances are not mandated by Adam Smith's "invisible hand". They are the result of deliberate decisions. Brazil is an important democracy and how local governments decide to manage – or mismanage – their finances surely is a matter for the Brazilians to decide. But domestic financial imbalances have consequences for foreigners and not only in terms of export competition: it should not be forgotten that, in 1999, an IMF-led rescue programme injected \$41.5 billion⁶⁶ into Brazilian coffers, most of which was financed by countries Brazil attacks for their trade policies. In August 2002, again the IMF offered Brazil a loan package, this time of \$30 billion.⁶⁷

Devaluations can make a mockery of concessions on import tariffs made in good faith by trading partners. Interestingly, with its currency showing unusual strength since the 2008 financial crisis in developed countries, the Brazilian government has woken up to this fact and is now leading an attempt to have the World Trade Organization take account of the effects of exchange rate movements on international trade.

For commodities at least the exchange rate issue is essential. Though economists will say that in the long run currency values will align with productivity and inflation differentials, exchange rate misalignments often are the result of exogenous factors. Over the short and medium term their effects on prices can be enough to destroy an industry which is physically very efficient. It is stupid to pretend that a devaluation of 10 or 20% means that competitors are 10 to 20% less efficient economically suddenly and structurally.

Over the past 20 years Brazil's sugar and ethanol industry has often benefitted from its weak currency. That, too, has helped it attain its current supremacy. Since the 2008 financial crisis, however, Brazil's currency has strengthened against the dollar, the euro and the pound and, as mentioned above, the country has been confronted by the resulting dwindling international competitiveness.

The Current Crisis: Will the Government Help Again?

Today the industry continues to ask for federal and state favors⁶⁸. Its main current complaint is that gasoline prices have been kept relatively constant over the past five years whilst production costs for ethanol have increased, thus damaging sales of hydrous ethanol. About two-thirds of the flex fleet uses petrol because it is cheaper. A specific complaint is that the government, through its control over Petrobras, has not passed on to consumers the full cost of gasoline imports, thus maintaining gasohol's price-advantage at the pumps whilst costing Petrobras the difference⁶⁹. In 2012, gasoline imports surged.

Ideally the industry would like gasohol prices to rise by 20%. The challenge, however, is significant: fuel prices are a key component of the country's overall macro-economic policy and it would be surprising to see the tail (the sugar industry) wag the dog (the country). Macro-economic policy is geared towards maintaining, if not improving, Brazil's competitiveness in the face of the current world economic slowdown. Raising the price for gasohol would increase costs. Further, low hydrous ethanol consumption automatically generates additional petrol imports, thus helping to contain the

⁶⁶ The Economist, May 11th 1999 & December 3rd 2001

⁶⁷ The Economist, October 19th, 2002

⁶⁸ See interview in Brasil Econômico, February 22, 2012.

⁶⁹ "Defasagem no diesel cai e perdas da Petrobras diminuem" by Gustavo Machado, Diário Econômico.com; November 19th, 2012.

exchange-rate. As, essentially, a producer and an exporter of commodities and low-technology goods, the country's industrial base cannot long afford a strong currency. The government reacted vigorously to its currency's strengthening by raising tariffs to their bound rates, by imposing a tax on foreign capital inflows, by lowering interest rates, and by officially querying the WTO habit of ignoring exchange-rate effects on trade.

But the government is still helping the industry: as mentioned earlier, new soft loan credit lines have been opened for sugarcane renewal, for ethanol storage, for modernization and expansion of fields and mills; the price for gasohol has been increased by 4 to 6%; taxes on ethanol have been lowered and today the government is talking of exempting ethanol from the PIS/COFINS tax which stands at 9.25%, at least partially – this could alleviate taxes for the industry by some US\$ 1.8 billion a year⁷⁰; additional cuts for payroll taxes and social security contributions are also being discussed. Further, on the 1st of May 2013 the mandatory blend ratio of ethanol in gasoline will be raised from 20 to 25%.

One thing is certain: the end of Brazilian government support for its sugar and ethanol industry is not in sight.

Conclusion

Having built up production and economies of scale through massive subsidies and government support, Brazilians can now reasonably state they are competitive in sugar on the world market. This is all the more true since, providing about 50% of world sugar exports, Brazil sets the world market price structurally: if exports are not remunerative enough over two or three campaigns, cash outlays for the upkeep of the sugarcane will fall and so will yields. The following years, exports will drop and the world market price will rebound.

How Brazil reached world dominance in sugar, however, should not be forgotten. Nor should be ignored the continuing material support given by federal and state authorities to its sugar and ethanol industry.

This report presents a strong body of evidence showing that government support has been of major importance to the development of the Brazilian sugar industry, and that it continues to be instrumental in maintaining its strong competitive position. Indeed, conservatively estimating current annual income support shows that *the industry benefits from some US\$ 2.5 billion per year from direct or indirect government incentives*. Further, important amounts of debt owed to the federal government have been written-off over the years. Because of the complex and many procedures involved over many years, *the exact amount will never be known*.

Most of this support is provided through the government's creation and maintenance of an ethanol market but, for Brazil's trade partners, it mostly affects their sugar industries by making Brazilian sugar exports much more competitive than they would be otherwise. To maintain industry revenue without Brazilian government support would require world market prices to be at least 15% above current levels.

One should not, however, deduct from this that Brazil alone is causing the world market price to be significantly lower than it would be under perfect market conditions: nearly all sugar exported unto the world market benefits from some material amount of government support. The world market price is a "dump" price and not only because, under economic theory, it should be a marginal price. Its level has a lot to do with government intervention. The world market price should never be used as a yardstick to measure what benefits or costs may accrue from free trade in sugar.

⁷⁰ Sugaronline Weekly Brazil Report, March 13, 2013, "Tax Relief Lets Cane Ethanol Best Minds Focus On Growth" by Bob Moser