

Biofuels for Social Inclusion

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Convention

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➤ Social indicators of sugarcane, sugar and ethanol sectors

- Number of employees: these sectors employ a large number of people
- Inclusion of *low schooling* workers
- Official employment: formal contracts
- Age
- Earnings equations: linear regression model
- Job penetration: production is spread all over the country
- Impact of a higher hydrated ethanol demand to the detriment of Gasoline C in the Brazilian Economy

Sector of Main Agents

Sugar Cane Field

- 70,000 sugar cane producers



50% harvest manually and 50% mechanically

629,000 employees



Industrial Sugar and Ethanol Production



- 422 Sugar Mills/Alcohol Distilleries
- **567,000 employees**

Sugar cane field

- ✓ The sector counts on 70k independent producers, responsible for 25% of national sugarcane production
- ✓ 75% of sugarcane comes from self supply of vertically organized mills (which means that the mill owners have the sugarcane fields in addition to the mills)
- ✓ From sowing to harvesting, sugarcane production takes up 629,000 employees

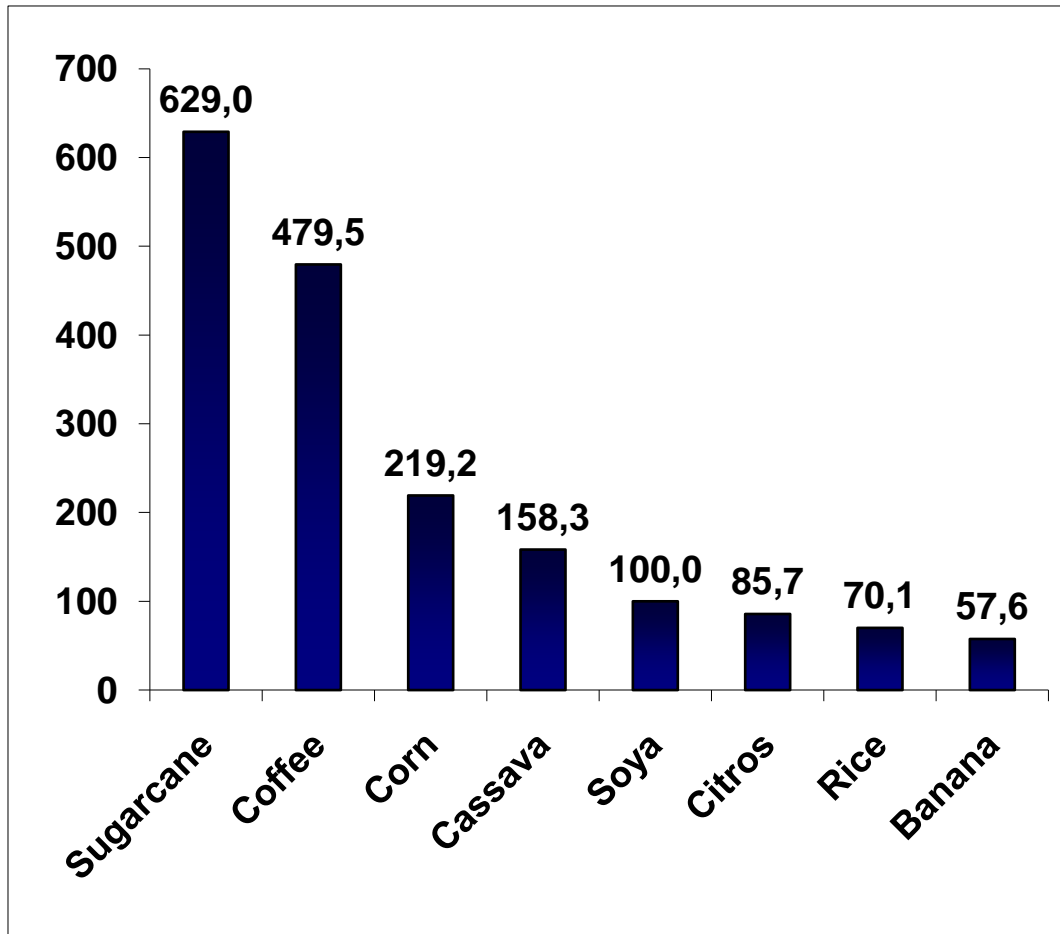
In the following process
422 Distilleries and Sugar Mills
employing over half a million
employees

From field to industry, economy is based on the labor of a million Brazilians

Number of Employees in the Main Crops Brazil, 2008

Agriculture
2,773,885

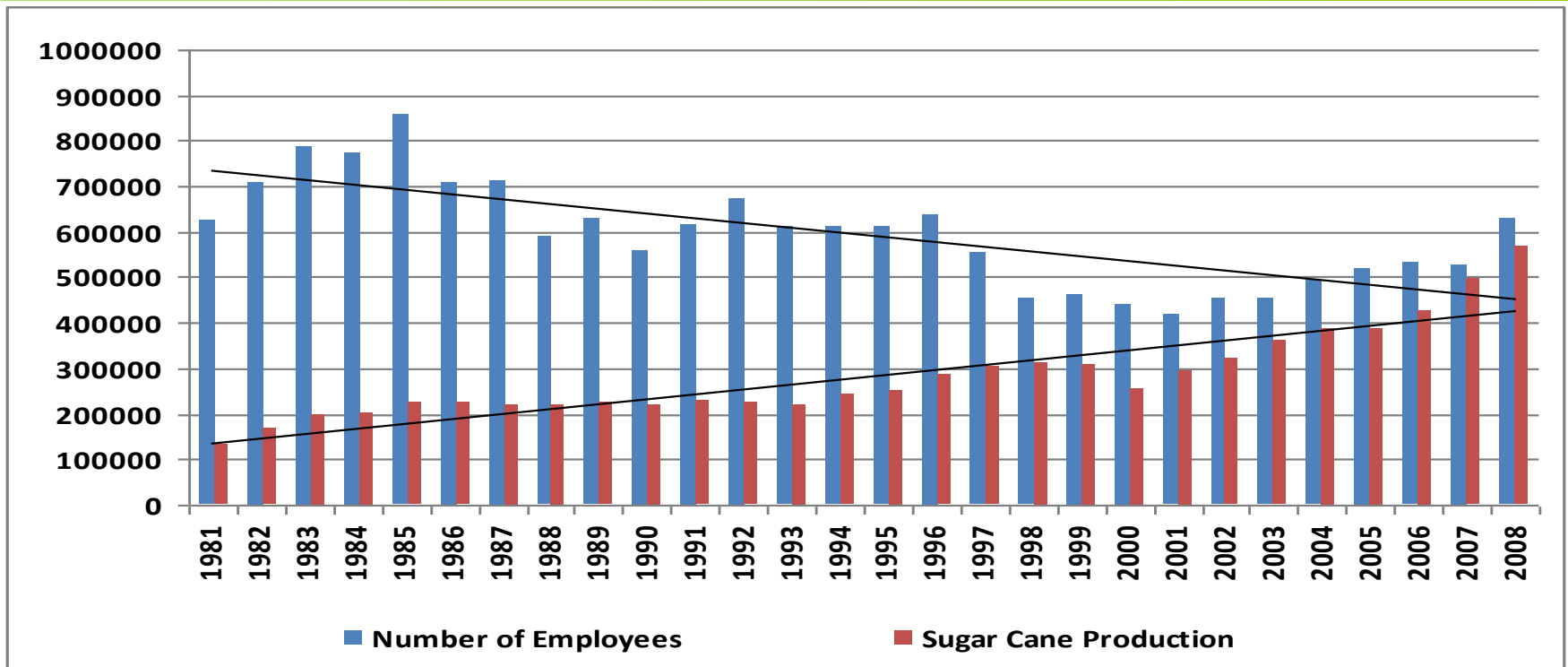
(thousand people)



Source: Prepared based on data provided by PNAD 2008

- ✓ Sugarcane employees accounts for almost 22.7% of the agricultural jobs, followed by coffee and corn
- ✓ It is a very impressive number, indicating inclusion of many low schooling people

Evolution of the Number of Employees and of the Sugar Cane Production



In 1981 there were about 600k workers in the sugarcane production, almost the same amount than 2008

➤ In this period, production has risen by 328%

➤ These contradictory phenomena are due to both a rise in labor productivity and mainly an increase in mechanization

➤ In the recent period we can observe a positive trend in the number of employees, following the important growth observed in the sugarcane production

Ban on sugarcane burning



- ✓ Sugarcane burning is a detaching procedure that help manual cutters: otherwise it would be too difficult to harvest by hand
- ✓ Recently environmental concerns have established ban on sugarcane burning
- ✓ This change has brought mechanization as an economical and environmentally friendly procedure: the companies can use the dry matter as a source of energy and the environment will suffer much less

—————> **Loss of 114k job positions**

Public and Private Strategies

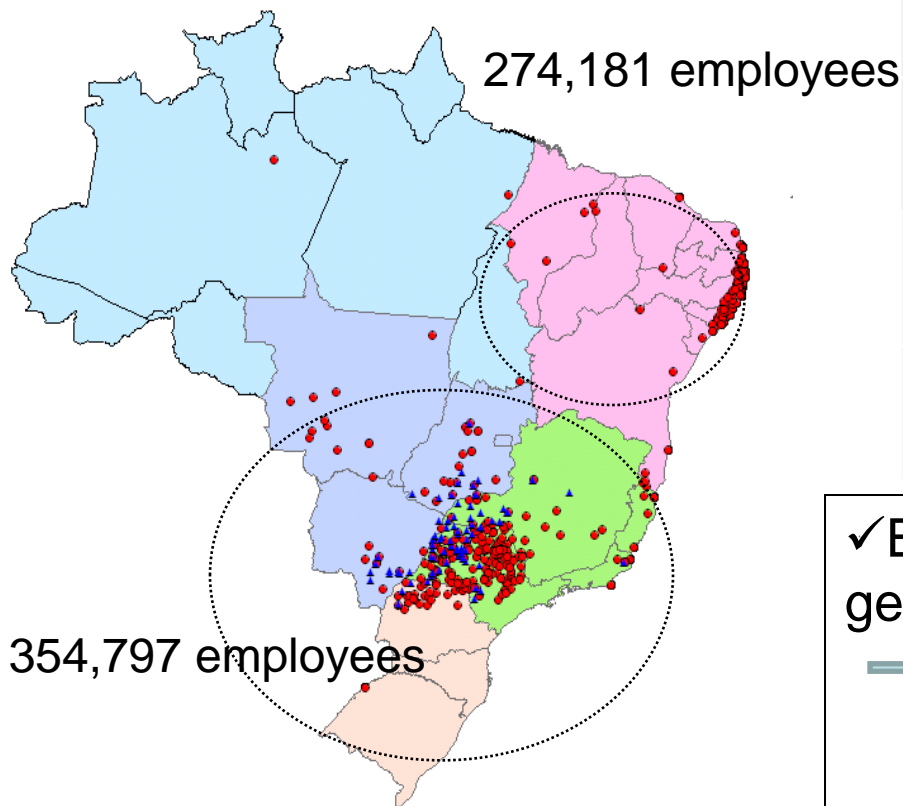


- ✓ Green cane: harvest mechanically
- ✓ Changes the worker's profile
- ✓ One harvesting machine substitutes for 80 working men
- ✓ The aim now is to think of new ways to relocate these people



- ✓ Private Strategies
 - ✓ UNICA has proposed a yearly training program for 7,000 workers, to provide necessary skills for other areas of services
 - ✓ Will provide training for other jobs
 - ✓ To be eligible for this training, a minimum schooling is required
 - ✓ Others workers shall count on public policies to improve literacy

Jobs in Sugarcane (2008): 628,978



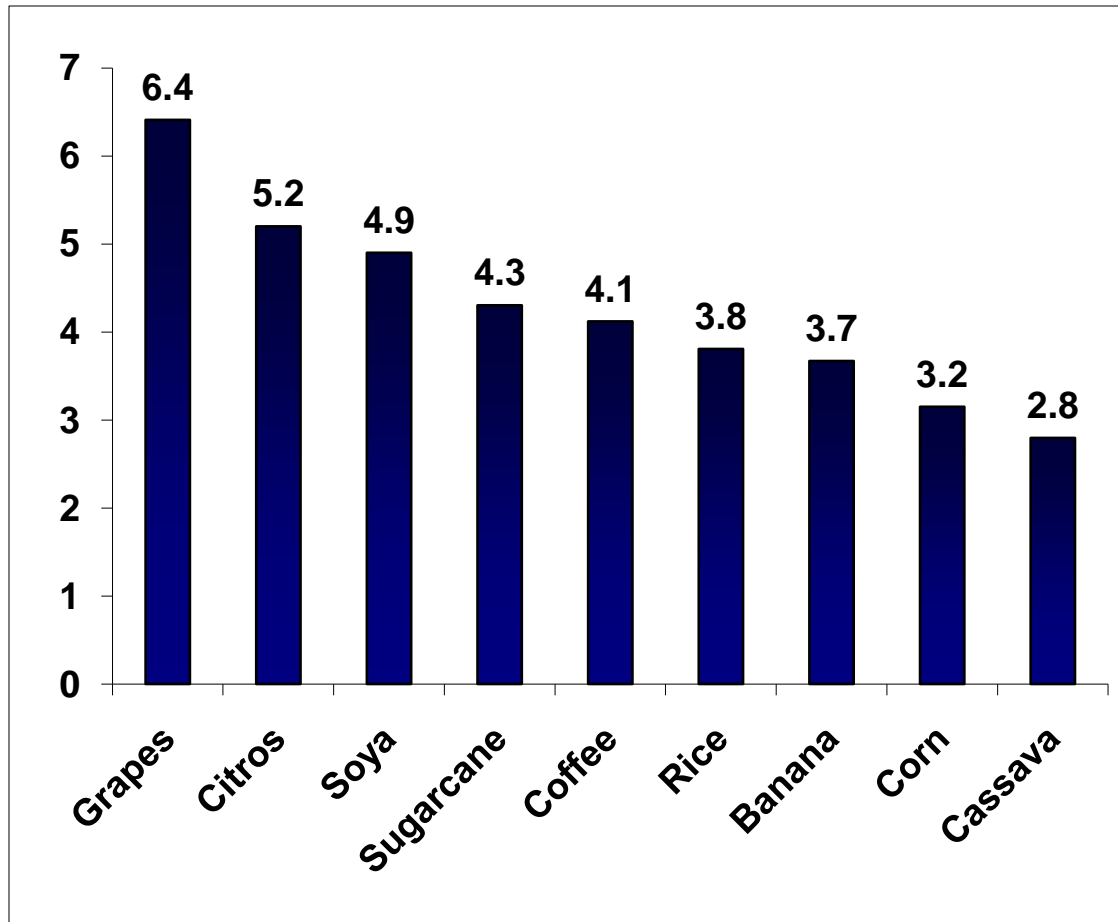
- Operating Sugarcane Mills
- ▲ Sugarcane Mills under construction

	NNE	CS
Industrial Units	78 (20.7%)	298 (79%)
Ethanol Production	8%	92%
Sugar Production	13%	87%
Job Positions	43,6%	56,4%

✓ Both regions are equally important for job generation
 ➔ With almost as many job positions as offered in the NNE region, the CS produces about 90% of main products
 ✓ This is explained by the highly efficient production which makes the CS region a benchmark of sugarcane products

Average Schooling of Crop Workers Brazil, 2008

Agriculture
4.0



✓ Traditionally Brazilian crop workers don't take schooling and the chart reflects this reality

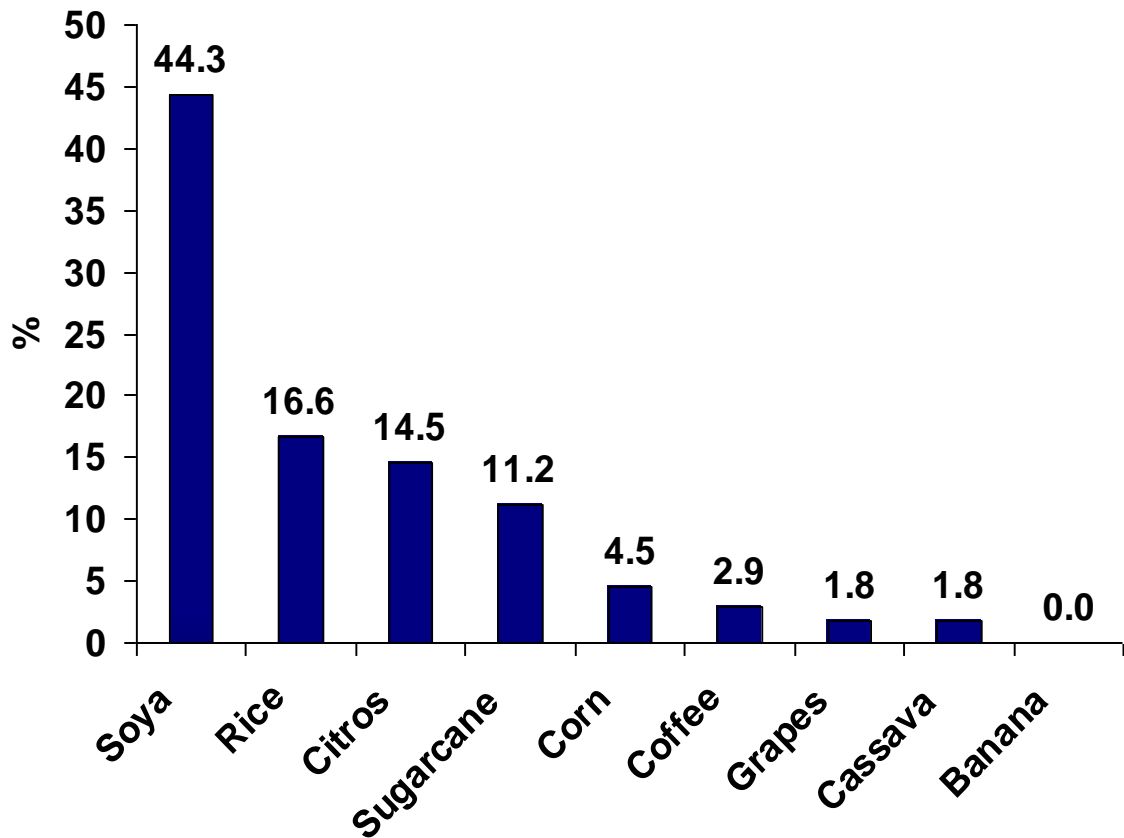
✓ The average schooling of agriculture workers is 4 years of study

✓ The workers of sugarcane sector have about 4.3 years of study

✓ Citros and soya have the best indicators

Percentage of Machinery Operators in the Main Crops. Brazil, 2008

Agriculture
7.0%

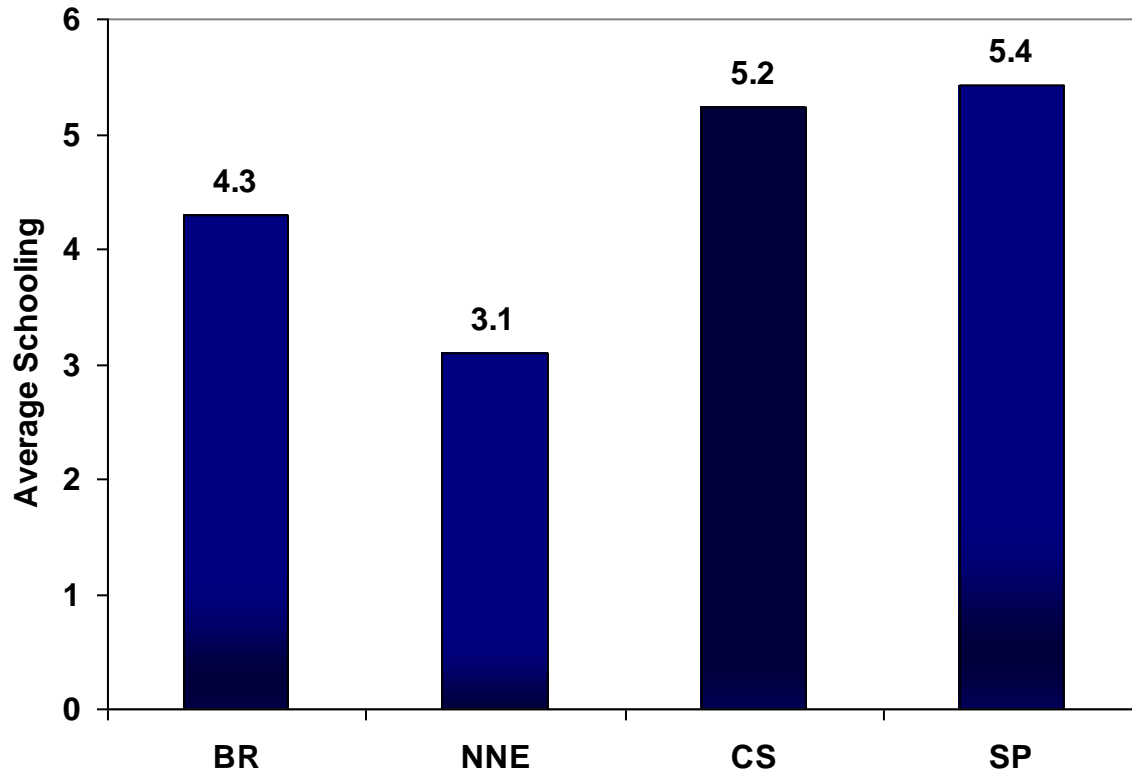


✓ The percentage of machine operators in agriculture is 7.0%

✓ In the soya crop this percentage is the highest: 44.3%

✓ Sugarcane: 11.2%

Sugarcane: Average Schooling - 2008



Source: Prepared based on data provided by PNAD 2008

✓ 4.3 years of study is the average, considering both regions under survey

✓ NNE region has the lowest education level

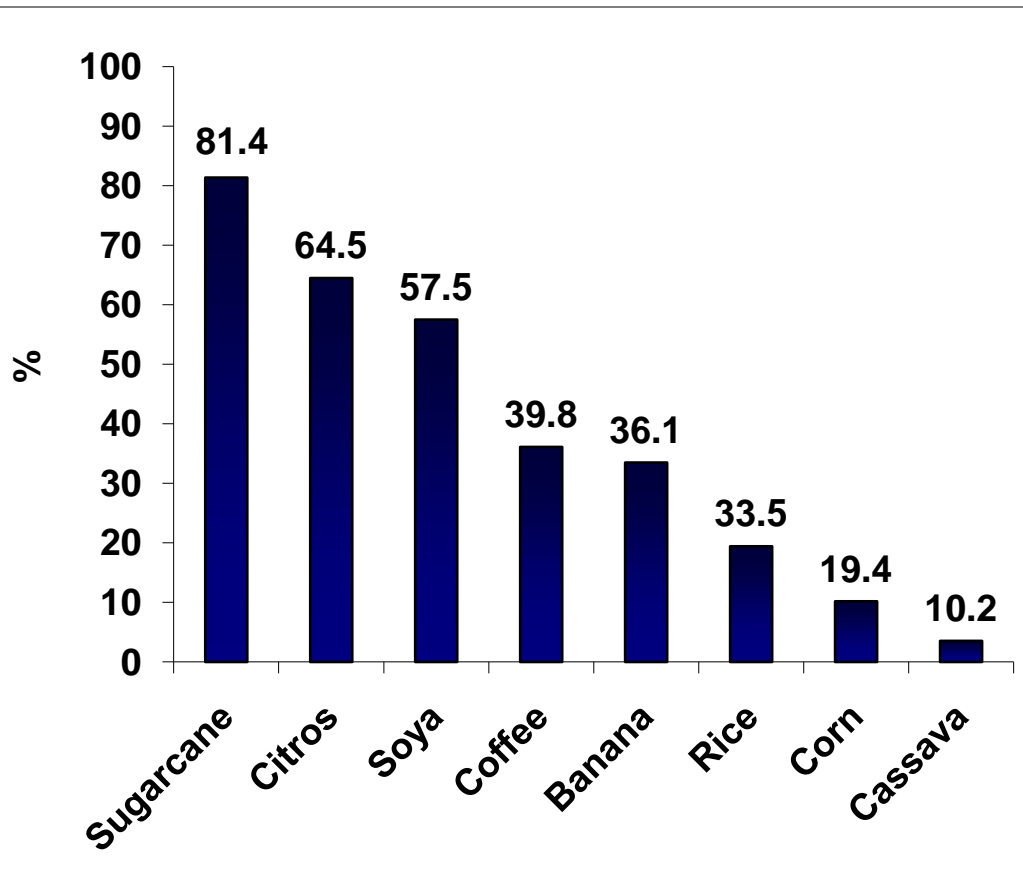
✓ The state of São Paulo has the highest level: 5.4 years of school, which still is very low

✓ Other data on this issue point out that:

✓ 23.8% (about 120k workers) are illiterate

Main Crops: Data of Agriculture Formal Workforce. Brazil, 2008

Agriculture
38.8%



Source: Prepared based on data provided by PNAD 2008

✓ The proportion of workers who are formally employed in the Brazilian agriculture is very low: less than 40%

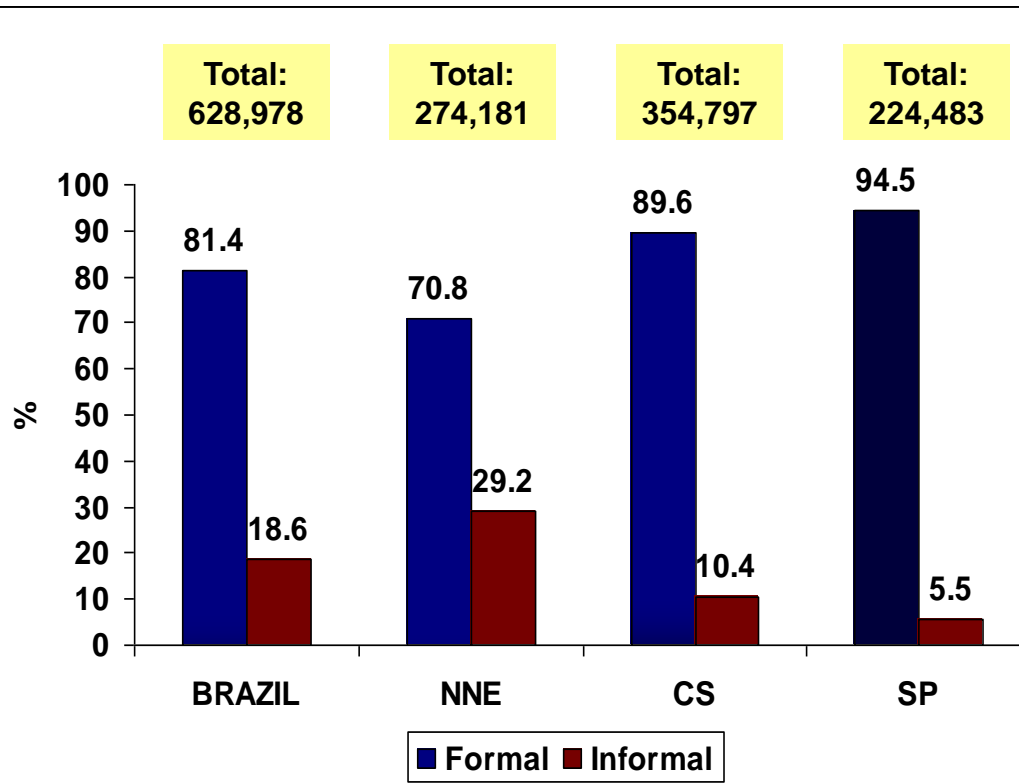
✓ Sugarcane shows the best indicator: about 81.4% of the employees are formally hired
✓ meaning that they had been hired under a formal labor contract

✓ These employees have all labor rights established in the legislation:

- ✓ enjoy the right to receive unemployment insurance;
- ✓ remunerated annual vacations
- ✓ Extra month of salary per year
- ✓ Among others

Sugarcane: contrasting number of formal and informal Workers.

Brazil, NNE, CS and São Paulo, 2008



- ✓ In 2008 Brazilian sugarcane sector had about 18.6% of informal workers
- ✓ In the North-Northeast region the proportion of informal workers is higher, though smaller than agriculture as a whole
- ✓ In the Center-South region there are about 90% of formal hired workers
- ✓ The state of SP has a very impressive proportion of formally hired workers

Sugarcane: Number of Employees by Age Bracket

Age Bracket	1981		2008	
	Number of Employees	Total %	Number of Employees	Total %
10-15	95,576	15.3	538	0.09
15-20	128,578	20.6	52,202	8.3
20-30	134,033	21.4	209,971	33.4
30-40	106,516	17.0	173,067	27.5
40-50	84,041	13.4	114,18	18.2
40-60	51,886	8.3	66,147	10.5
> 60	24,396	3.9	12,880	2.0
Total	625,016	100.0	628,978	100.0

- ✓ The sugarcane sector successfully reduced the proportion of child labor
 - ✓ from 15.3% in 1981 to less than 0.1% in 2008
- ✓ Increased the proportion of adult workers
- ✓ These are the results of multiple efforts:
 - ✓ Government social programs
 - Bolsa Familia, Bolsa Escola
 - ✓ Sugarcane Producers' concern
 - ✓ Better law observance
 - ✓ Requirements of the market itself

Sugarcane: Number of Employees and Wages. 2008

	Number of Workers	Monthly average salary (US\$)	Wage/ National Wage *
BRAZIL	628,978	349.22	1.51
NNE	274,181	244.83	1.06
CS	354,797	429.57	1.86
SP	212,157	456.67	1.98

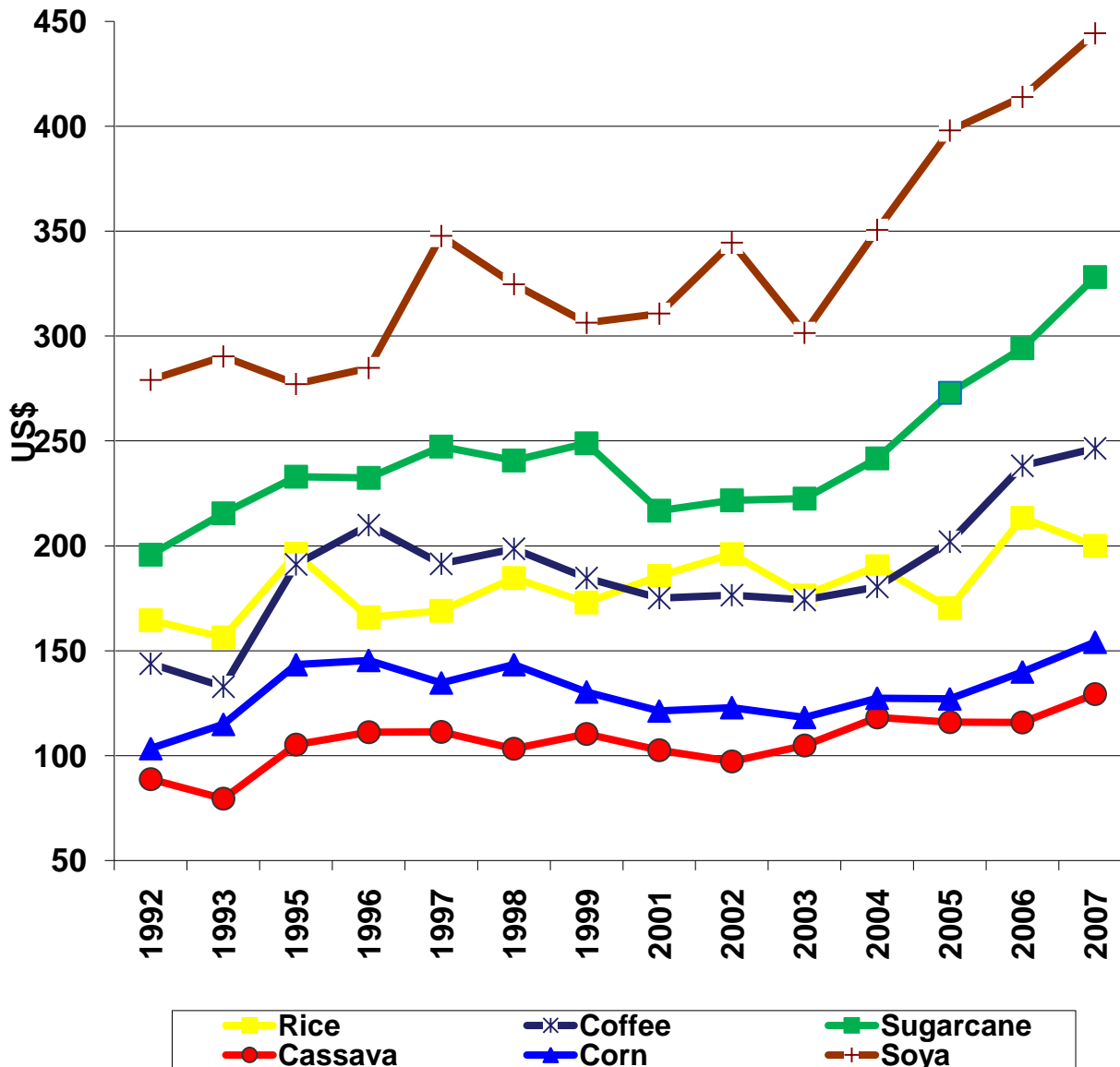
in US\$ 2008

* National Minimum Salary for 2008 was US\$ 230.56

Source: Prepared based on data provided by PNAD 2008

- ✓ On average, workers in sugarcane sector earned 51% above the national official minimum salary
- ✓ The workers in the sugarcane sector in the state of São Paulo earned the highest salaries, almost double the national minimum salary.

Wages: sugarcane and other crops



- ✓ The wages of soya sector are the highest ones
- ✓ Earning Equation estimated showed that:
 - ✓ After controlling the effects of other variables that influence wages:
 - ✓ schooling, age, region, color, gender, etc
 - ✓ the average monthly wage of other crops workers in comparison with sugarcane wages are:
 - Coffee: 9,9% lower;
 - Cassava: 23,2% lower;
 - Corn: 30,1,% lower;
 - Soya: 0,2% lower ;
 - Rice: 30,1% lower



SOCIAL EXTERNALITIES OF DIFFERENT FUELS IN BRAZIL

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Objective

Comparing social indicators in the following activities

- I. Ethanol production (sugarcane and ethanol)
- II. Extraction and production of petroleum by-products

Methodology

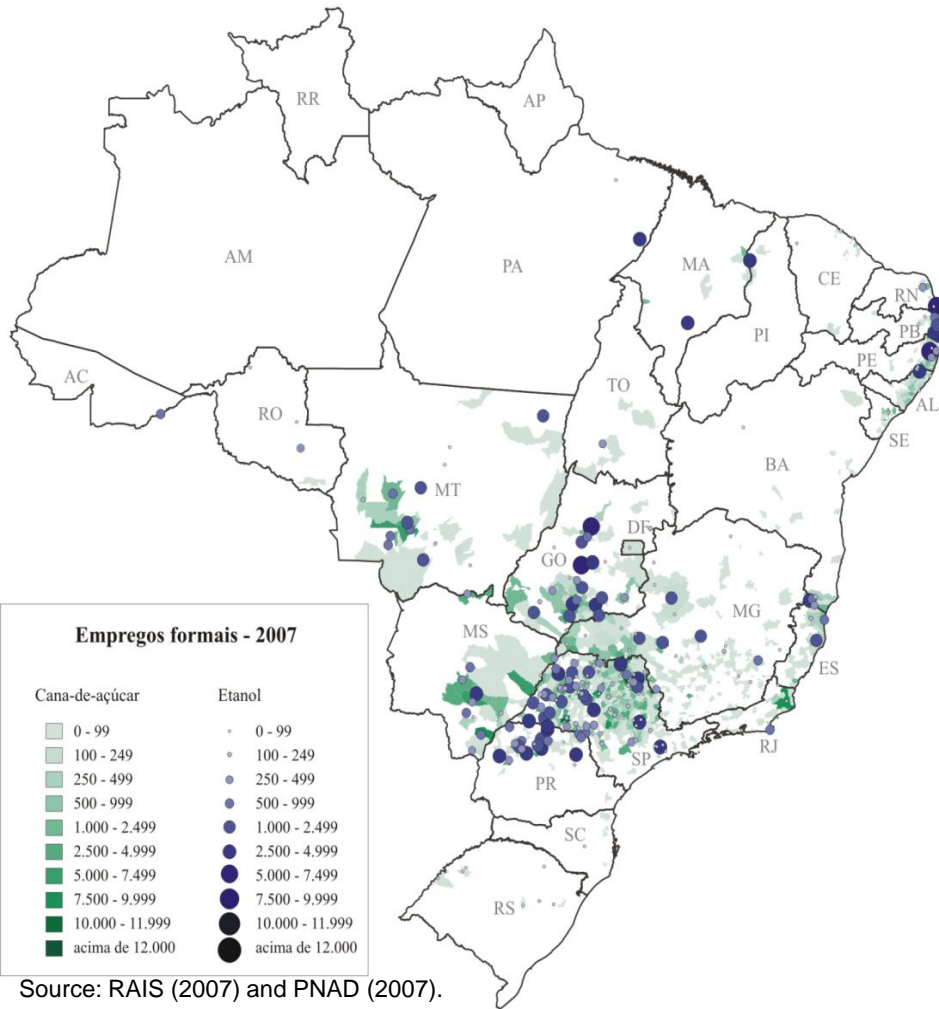
- I. Survey of socio-economic indicators
- II. Penetration assessment: location quotient calculation
- III. Measurement and analysis of impacts of variations in the demand for ethanol and gasoline on the economy (production and jobs): Input Product Matrix

SUMMARY OF INDICATORS FOR THE ANALYZED INDUSTRIES (2007)

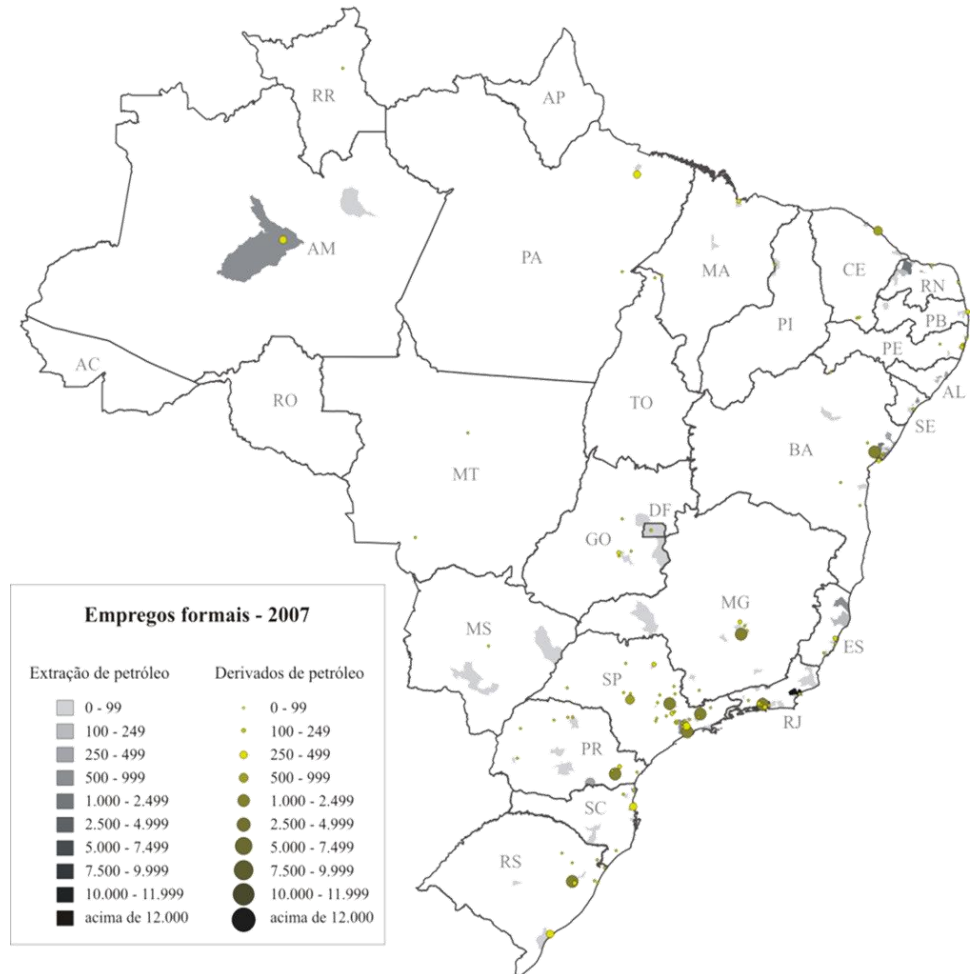
Industry	UF*	Municipalities	Jobs	Establishments	Average age	Average schooling
Sugarcane	23	990	274,342	16,262	33.9	4.2
Ethanol	24	229	190,894	567	35.8	7.7
TOTAL Sugarcane & Ethanol	25	1,042	465,236	16,829		
Petroleum Extraction	21	113	54,847	894	37.7	11.7
Oil By-products	23	100	18,228	345	36.5	11.3
TOTAL Petroleum extraction & By-products	24	176	73,075	1,239		

JOB PENETRATION - 2007

Sugarcane and ethanol

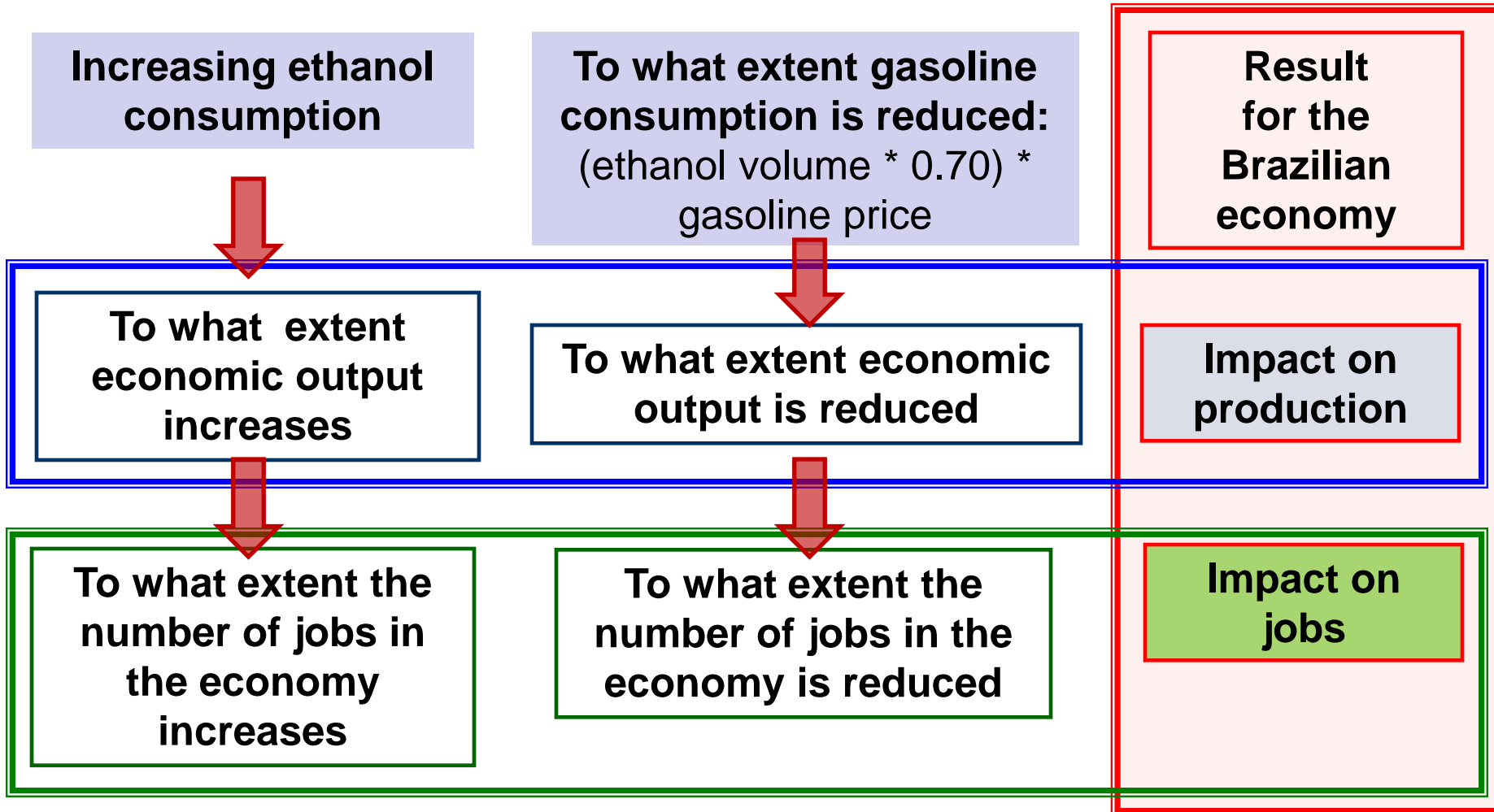


Petroleum extraction and oil by-products



**IMPACT OF A HIGHER HYDRATED
ETHANOL DEMAND TO THE DETRIMENT
OF GASOLINE C IN THE BRAZILIAN
ECONOMY**

INPUT PRODUCT MATRIX – IMPACTS



Number of jobs generated and Increase in the remuneration value in the Brazilian economy as a result of a 15% increase in the demand for hydrated ethanol and of an equivalent reduction in the consumption of gasoline C, considering direct and indirect effects and the income effect



117.701 jobs positions

R\$236 millions (US\$131 millions)

FINAL CONSIDERATIONS

- ✓ Internationalization of ethanol and better exposure to the external market induced companies to adopt stricter norms
 - ✓ Better observance to labor and environmental legislation
- ✓ Labor laws applied: reduction in underaged workers and improved labor conditions
- ✓ Greater number of formal jobs in sugarcane sector
 - ✓ Better than the agriculture national average
 - ✓ SP state stands out from the other states
- ✓ As highlighted in the literature, the effect of schooling on income was also captured in the estimated regression
- ✓ Considering the low schooling level of workers in the sector, the need to rely on **private strategies** and **public policies** stands out
- ✓ Public policies: for ensuring the literacy and improving the schooling of workers in sugarcane fields

- ❖ High job generation in the two links of the ethanol production chain
 - BR: the sugarcane & ethanol industry employs more than **6 times** the number of workers employed in petroleum production
- ❖ High penetration and interiorization of generated jobs:
- ❖ Multiplying effect on the economy: a 15% substitution of gasoline with ethanol generates almost **120,000 additional jobs** and almost **R\$ 240 million in total income**
- ❖ These results show that public policies designed to stimulate ethanol consumption result in significant social and economic benefits when the location and number of jobs generated are considered

HOFFMANN, R. e OLIVEIRA, F.C.R. *Evolução da remuneração das pessoas empregadas na cana-de-açúcar e em outras lavouras, no Brasil e em São Paulo - site www.esalq.usp.br/gemt/content.php*

HOFFMANN, R. e OLIVEIRA, F.C.R. *Remuneração e características das pessoas ocupadas na Agro-Indústria Canavieira no Brasil, de 2002 a 2006*. Piracicaba, Abril 2008 - site www.esalq.usp.br/gemt/content.php

MORAES, M.A.F.D. *A desregulamentação do setor sucroalcooleiro do Brasil*. Americana: Caminho Editorial, 2000, 238p

MORAES, M.A.F.D. *O mercado de trabalho da agroindústria canavieira: desafios e oportunidades* – Economia Aplicada, São Paulo, v. 11, n. 4, p. 605-619, out-dez 2007

MORAES, M.A.F.D. *Indicadores do Mercado de Trabalho do Sistema Agroindustrial da Cana-de-Açúcar do Brasil no período 1992-2005*. Estudos Econômicos, São Paulo, v. 37, n. 4, P. 875-902, out-dez 2007

- MORAES, M.A.F.D. e PESSINI, M. *Analysis of the labor market of the Brazilian sugar alcohol sector. Maio, 2004***
- MORAES, M.A.F.D. e FIGUEIREDO, M.G. *Relatório de Pesquisa – Grupo de extensão em mercado de trabalho – Projeto: Migração espontânea de trabalhadores no setor Sucroalcooleiro. ESALQ/USP Abril, 2008***
- MORAES, M.A.F.D. e FERRO, A.R. *Relatório de Pesquisa – Grupo de extensão em mercado de trabalho – Projeto: Indicadores de Mortalidade e de Aposentadorias. ESALQ/USP Abril, 2008***
- MORAES, M.A.F.D. *O mercado de trabalho da agroindústria canavieira: desafios e oportunidades – Economia Aplicada, São Paulo, v. 11, n. 4, p. 605-619, out-dez 2007***
- MORAES, M.A.F.D. ; Costa, C.C.; Guilhoto, J.J.M.; Souza, L.G.A.; Oliveira, F.C.R. *SOCIAL EXTERNALITIES OF DIFFERENT FUELS IN BRAZIL. Relatório de Pesquisa***
- MACEDO, I. C. e CARVALHO, E.P. *A energia da Cana-de-açúcar – Doze estudos sobre a agroindústria da cana-de-açúcar no Brasil e a sua sustentabilidade. – São Paulo: Berlendis & Vertecchia: ÚNICA, 2005***

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Thanks for your attention

Feel free to contact

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