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**Poster (Painel)**

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**SOCIAL EXTERNALITIES OF ETHANOL PRODUCTION IN BRAZIL**

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**Resume**

SOCIAL EXTERNALITIES OF ETHANOL PRODUCTION IN BRAZIL Márcia Azanha Ferraz Dias de Moraes Cinthia Cabral da Costa Joaquim José Martins Guilhoto Luiz Gustavo Antonio de Souza Fabíola Cristina Ribeiro de Oliveira The search for renewable and clean energy sources is directly linked to greenhouse gas emissions by fossil fuels and their negative effects on environment. The positive environmental externalities caused by the use and production of ethanol are cited to justify public policies in this sector, therefore encouraging its use. However, benefits of ethanol over gasoline go beyond environmental issues. This paper presents a comparative analysis of social indicators related to the activities of producing sugarcane (for ethanol production), ethanol, oil extraction and oil derivatives. We also attempted to identify if there is job generation in the Brazilian economy by replacing 15% of gasoline consumption for ethanol. Annual Relation of Social Information of Ministry of Labor and Employment (RAIS) database shows that in 2009 about 455 thousand jobs were generated in two production chains of the ethanol sector: 242,606 in the sugarcane crop (considering only the sugarcane allocated to ethanol production, about 57% of the total) and 213,317 employees in the industrial sector (ethanol production). In the same year, the oil industry (including the petroleum extraction and production of oil derivatives) generated 97,827 jobs, which means only 21.5% of the total jobs in the ethanol and sugarcane sectors. The jobs generated in the ethanol sector are spread throughout to Brazil, which is an additional advantage over the oil sector, because this spread of jobs promotes earnings distribution. In this sense, sugarcane and ethanol reach over 1,095 municipalities, which is almost sevenfold the number of cities reached by oil sectors (163 cities). Figure 1 shows the jobs location in sugarcane/ethanol production and in oil sector (extraction of petroleum and production of derivatives) in Brazil. The interrelation of the sectors of ethanol and gasoline C with the other sectors of the Brazilian economy impacts the domestic labor market as a whole. New jobs are expected to be created when we consider the replacement of gasoline C by ethanol. The analysis of input-output matrix of the Brazilian economy may show such impacts through the multiplying effects of activities. From the multipliers and the coefficients of employment and wages of industries, we calculated the direct, indirect and induced (income effect) impacts resulting from the increasing demand for hydrous ethanol over gasoline C, on levels of employment and remuneration (wages and social contributions) in the country. Simulating an increase of 15% in the ethanol consumption as replacement for gasoline, the increase in jobs in the Brazilian economy would be 117,701 and the remunerations would increase in R\$235.9 million (about US\$131 million). However, studies indicated that sugarcane production should reduce the number of jobs generated in the short term, due the harvesting mechanization process. Therefore, we can expect a smaller increase in the number of jobs than considered in this study. By estimating an earning equation, we find that after filtering the effects of all other explanatory variables (worker characteristics, such as gender, age, educational level, race) and characteristics of the work itself (area, time working hours and main activity of the enterprise), the employee in the ethanol industry tends to earn 25.3% more than those in the agricultural sector (sugarcane). The employees in oil extraction and oil derivatives sectors tend to earn 72.8% and 110.2% respectively, more than those in sugarcane production. Regarding the educational profile, it is widespread in the literature that the agricultural sector in most countries is the one that still employs workers with low educational levels, in Brazil it employs even illiterate workers. Thus, although the average schooling of workers in sugarcane plantations grew 52% between 2002 and 2007, it still remains at levels substantially low. In 2007, the average years of schooling of employees in the sugarcane crop was 4.2 years of study, while the average for employees in the production of ethanol was 7.7 years, in the oil extraction was 11.7 years and in the fossil fuel industry, 11.3 years. This difference in years of schooling explains a relevant part of the wage gap. This has important implications, because it is believed that a policy of reducing the heterogeneity of education among workers in the agricultural and the industrial sector provides increase in the labor productivity and in consequently in wages, which contribute to reduce income inequality among these sectors. Finally, it should be noted that in formulating its energy matrix, it is important for Brazil to consolidate the participation of ethanol, taking into account its relevance to the inclusion of thousands of workers. In addition to its clean and renewable nature, the production of ethanol is able to employ a large number of people with different profiles and educational qualifications. Besides, it boots the regional development, through its importance and permeability in various states and cities in Brazil.

**Keyword:** externalities, RAIS, renewable