



Taking stock of the evolution of the biodiesel industry in Brazil: Business concentration and structural traits



Olga M. Moreno-Pérez*, Gisele P.C. Marcossi, Dionisio Ortiz-Miranda

Group of International Economy and Development, Department of Economics and Social Sciences, Universidad Politécnica de Valencia, Camino de Vera, s/n, 46022 Valencia, Spain

ARTICLE INFO

Keywords:

Brazil
Biodiesel
Regulatory framework
Industrial concentration
Industrial structure

ABSTRACT

The Brazilian biodiesel industry has rapidly developed under the National Biodiesel Production and Use Programme (PNPB) launched in 2004, which is to be replaced by a new regulatory framework that is now under discussion. This paper aims to take stock of the evolution of the structure of the biodiesel industry in this country under the implementation of the PNPB -between 2005 and 2016- and to understand its current traits. The research combines a dynamic analysis of the industrial concentration indexes (closing the time gap with previous studies on this matter) and a multivariate analysis of the productive characteristics of the biodiesel plants operating in 2016. Results show that, following a period of de-concentration between 2005 and 2011, the industry entered in a stage of certain stability in the concentration indexes. This picture disguises the exit of biodiesel plants and firms from this market and a business horizontal growth in the last period. The static analysis has allowed for the identification of different 'business models' considering the scale of the plants and the input and output strategies of the firms producing biodiesel.

1. Introduction

In December 2016, the Brazilian Administration launched a new regulatory framework for the biofuel sector, a programme named *RenovaBio 2030*, which integrates biodiesel and bioethanol production. The new strategic policy is aimed to discuss biofuel sustainability involving conventional and second-generation biofuels, establish the trading rules and encourage investments in this industry until 2030. The ambition is to expand the production of renewable fuels in the country, in accordance with the Brazilian commitments at COP21 (UN Climate Conference) of increasing the share of sustainable biofuels to around 18% of the overall national energy mix by 2030. At the time of writing (July 2017) the programme has been submitted for public consultation.

Regarding the biodiesel industry, in which this paper is focused, the new programme would entail a profound change in the legal framework that has driven this sector in Brazil for more than one decade. The National Biodiesel Production and Use Programme (PNPB), which was launched in 2004, has boosted an rise in biodiesel production until making Brazil the second world producer after USA today (REN21, 2016). The academic literature has paid great attention to both the development and the economic, social and environmental results of this programme, as a worldwide benchmark for national biofuel policies (see, among others, Cremonez et al., 2015; Oliveira and Coelho, 2017;

Rico and Sauer, 2015; Nogueira and Capaz, 2013; Padula et al., 2012).

Some studies conducted at the beginning of this decade analysed the specific issue of the business concentration in the biodiesel industry throughout the initial stage of expansion of this market (Tanaca and de Souza, 2010; Leonardi et al., 2011; Dos Santos and Padula, 2012; Cavalheiro, 2014), and all of them reported the low concentration of this industry at such stage. The negative effect of the market concentration over competition and its positive relationship with the firms' profitability has long been stated (Peltzman, 1977). Cavalheiro (2014) confirmed that this atomization led to a highly competitive market, preventing that some companies had gains by way of a significant price differentiation at the biodiesel auctions. However, these works have not been updated, despite the changes that this sector has undergone thereafter – e.g. some reforms undertaken in the PNPB in 2012, the exit of biodiesel plants from the market and the business movements that have taken place over the last few years.

In this context, we have carried out a research with two main objectives. First, to assess the evolution of the structure of the Brazilian biodiesel industry throughout the entire PNPB implementation period, from 2005 to 2016, paying special attention to the changes in business concentration. Second, to examine the main traits of the structure of the biodiesel industry today - as the starting point of the upcoming regulatory framework, making emphasis on the different feedstocks utilised and the diversity of outputs

* Corresponding author.

E-mail addresses: omoreno@esp.upv.es (O.M. Moreno-Pérez), giplade1@doctor.upv.es (G.P.C. Marcossi), dortiz@esp.upv.es (D. Ortiz-Miranda).

that the firms operating in this sector produce.

The remainder of this paper is structured as follows. In Section 2 the methodology of this research is clarified. In Section 3 we comment the overall functioning of the PNPB and its main results based on the scientific literature, what will help to contextualise the analysis and provide explanatory elements to the following sections. The two specific objectives specified above are tackled in Sections 4 and 5, respectively, in which the insights from business economics and Industrial Organization theories will support the discussion of the driving forces and repercussions of this sector's dynamics and current traits. Finally, conclusions and policy implications will be exposed in Section 6.

2. Methodology

Regarding the analytical approach of this research, the changes in the concentration of the firms participating in this industry have been assessed by means of two types of indexes. First, the Concentration Ratios (CR) proposed by Bain (1951), who considered the business control in the hands of a limited number of firms as a key aspect to characterise an industry structure. They are calculated from the expression

$$CR(k) = \sum_{i=1}^k S_i \quad (1)$$

where CR(k) is the concentration ratio of the largest k industries and S_i the market share (in parts per unit) of the i industries.

Second, the Herfindahl-Hirschman Index (HHI) (see Hirschman, 1964), defined as:

$$HHI = \sum_{i=1}^N S_i^2 \quad (2)$$

Where S_i is expressed as a percentage. HHI ranges from 0 (many small companies) to 1 (monopoly). A HHI below 0.15 indicates an unconcentrated industry, between 0.15 and 0.25 a moderately concentrated market and above 0.25 a concentrated one.¹ Whereas CR(k) informs on the degree of competition of the market focusing only on the largest firms, HHI provides a picture of the distribution of the firm size in an industry. This paper combines the indexes CR(2), CR(4), CR(8) and HHI to construct a more comprehensive yearly evolution.

Later, with the purpose of exploring and describing the structure of the Brazilian biodiesel industry today, a Multiple Correspondence Analysis² (MCA) has been performed with SPSS Statistics version 20. MCA is a multivariate data analysis technique that simplifies a dataset of observations (here biodiesel plants) described by more than two nominal variables into a small number of dimensions – similarly to what Principal Component Analysis performs with quantitative variables. The last step of the analysis was to combine the MCA with an agglomerative hierarchical clustering (Carvalho, 2008), in order to identify relatively homogeneous groups of biodiesel plants. Further details on this procedure are exposed in Section 5.

The consultation of a wide variety of sources have been necessary to conduct this analysis, as the limitations presented by official statistics has been a major challenge. The National Agency of Petroleum, Natural Gas and Biofuels (ANP) registers the volumes of biodiesel sold in the auctions, as well as the industrial units participating in the bidding process. The same office issues a monthly report informing on the biodiesel production and the feedstocks utilised at the regional level, the production capacity of each biodiesel mill and the firms authorized to build new plants or to expand/modify the existing units. This information is complemented with the monthly reports published by

¹ Thresholds set by the US Department of Justice and the Federal Trade Commission. <https://www.justice.gov/atr/horizontal-merger-guidelines-08192010> (accessed in December 2016).

² See the classic text of Greenacre (1984) for a comprehensive explanation of this method.

MME on the bioethanol and biodiesel market.

However, the governmental agencies do not consistently track or record the merger and acquisition movements that have taken place in this industry – a relevant information to know the way the business structure has evolved. Similarly, the information on the biodiesel plants that temporary or definitely retire from this market is not always up-to-date, and there is no comprehensive information on the feedstocks utilised for biodiesel production.

In order to address these limitations, other sources such as press releases, websites of related institutions (i.e. the Brazilian Association on Vegetal Oil Industries – Abiove; the National Supply Company - CONAB) and the informative journal *BiodieselBr* were consulted. The website of firms producing biodiesel, when available, provided further details on the type of feedstocks utilised and the outputs, other than biodiesel, manufactured by the company. Additionally, 10 telephone inquiries were made to the power plants for which this information was insufficient or not updated in the consulted sources.

3. The functioning and expansion of the biodiesel sector in Brazil

The effective introduction of biodiesel into the Brazilian energy matrix started with the PNPB, an inter-ministerial programme created by Federal Law no. 11097 (2005) and coordinated by the MME. It was aimed at fostering the biodiesel production and consumption in the country in a sustainable way, both technically and economically, focusing on social inclusion and regional development (MME, 2015). This regulatory framework was supported on a set of instruments aimed at driving the way the economic agents participating in the biodiesel supply chain operate and interact with each other, which are explained briefly below.

First, the programme introduced blending mandates to stimulate the consumption and production of biodiesel in Brazil. A voluntary blending percentage of 2% of biodiesel into petroleum diesel (denoted as B2) was authorized in 2005, and it turned mandatory in 2008 for all of the diesel commercialised nationwide. The Government increased the blending rates gradually thereon to reach B7 in November 2014 and B8 in March 2017, and the forthcoming targets are B9 in March 2018 and B10 in March 2019. Each biodiesel plant is authorized by the ANP to produce a maximum volume of biodiesel per year, although they produce much below their full nameplate capacity. By 2016, the total amount authorized was 3.68 Mm³, but the utilisation factor was 50.3% (ANP, 2017). The overcapacity has been explained as a result of the strong incentives that the PNPB introduced to foster biodiesel production (Nogueira et al., 2016) and the expectations of upcoming increases in the blending mandates.

Second, distributors buy biodiesel in auctions held on a bimonthly basis. The plants are the bidders, and offer biodiesel with a discount to a reference maximum price per region set by the ANP. Until the 25th auction, biodiesel B100 (without blending) was sold by the mills to the State-led company Petrobras, and later re-auctioned between it and the authorized distributors. However, the Ordinance MME 276 (2012) provisioned that from the 26th auction, held in June 2012, distributors would choose the suppliers to whom they would buy the biodiesel. Regional restrictions were eliminated and the volume of biodiesel bought would no longer be defined previously by the ANP. These changes were aimed at reducing the public intervention and encouraging competition among biodiesel plants. Petrobras still intermediates the transaction and charges a fixed amount per cubic meter.

Third, a special tax system was introduced to promote the diversification of feedstocks used for biodiesel, particularly in the poorest areas of the country. Reductions are set for biodiesel producers in federal taxes, PIS/PASEP and COFINS,³ on the condition they utilise palm or castor oil in the North, Northeast and Semi-arid regions. These

³ PIS/PASEP (Programme of Social Integration/Programme of Patrimony Formation of Public Servants) are social contributions payable by legal entities; COFINS (Contribution to the Social Security Funding) is levied on the gross revenues of enterprises.

Download English Version:

<https://daneshyari.com/en/article/5105547>

Download Persian Version:

<https://daneshyari.com/article/5105547>

[Daneshyari.com](https://daneshyari.com)