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Article

Bottled water industry: A quantitative study approach

Italian Review of Agricultural Economics (REA)

Provided in Cooperation with:

Firenze University Press

Suggested Citation: Scalamonti, Francesco (2021) : Bottled water industry: A quantitative study approach, Italian Review of Agricultural Economics (REA), ISSN 2281-1559, Firenze University Press, Florence, Vol. 76, Iss. 2, pp. 31-44,
<https://doi.org/10.36253/rea-13095>

This Version is available at:

<https://hdl.handle.net/10419/325622>

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Citation: Francesco Scalamonti (2021) Bottled Water Industry: a quantitative study approach. *Italian Review of Agricultural Economics* 76(2): 31-44. DOI: 10.36253/rea-13095

Received: October 2, 2020

Revised: January 19, 2021

Accepted: June 7, 2021

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Data Availability Statement: All relevant data are within the paper and its Supporting Information files.

Competing Interests: The Author(s) declare(s) no conflict of interest.

Bottled Water Industry: a quantitative study approach

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Abstract. This paper is a survey of the Italian bottled water industry that with quantitative approach relates the consumes or operative volumes of mineral water market based on the middle trend of temperatures, the consumed income per-capita and the trend of the population. We present the weight-OLS models for four macro-markets – north western, north eastern, centre, southern – on the data of the Bevitalia survey and the ISTAT-Time Series dataset from 1980 to 2020. The results confirm that the operative volumes depend positively and significantly on itself lagged by one order and the other explicative variables up cited. However, the study not consider other important correlated industries as soft drinks or flavoured waters. In addition, the analysis could be more indepth at the level of regions, provinces and municipalities, or for case-study whit a qualitative approach. In conclusion, the study captures the market dynamics of the industry at long-term, and it brings to the attention of managers, researchers and business economists an industry much important for socio-economic implications and environmental impacts that can cause the consumption of bottled water that policy makers cannot afford to ignore.

Keywords: bottled water, quantitative study, sustainable development.

JEL codes: C51, L10, L66, M21.

1. INTRODUCTION

The drink water¹ or for human consumption is the most precious common good found in nature, a source of life but also a cause of war in many parts of the world. The well-known problem of water scarcity and climate change triggered by globalisation have led to a reconsideration of this important issue also in the debate of economists and beyond (Nanni, Prodi,

¹ The drink water is that which, as found at the spring, is bottled and placed on the market in compliance with Legislative Decree 105/1992 and its subsequent amendments and additions – Legislative Decree 339/1999, Legislative Decree 176/2011, and the Decrees of the Ministry of Health on food safety. The industry is subject to a complex and fragmented normative to protect consumers, reviewed on several occasions and in different historical periods (Amorosino, 2009; Enrichens, 2018). Thus, the law definition of the good is also important into public law of economy, because the drink water is part of the public and unavailable property of the State (Mattei *et al.*, 2007; Rodotà, 2018). The code ATECO (2007) of industry identification is: C - Manufacturing activities; 11.00 - Beverage industry; 11.07 - Soft drinks, mineral water and other bottled water industry, with specific reference to bottled mineral water production.

2008; Parag, Opher, 2011; Caniglia *et al.*, 2012; Collins, Wright, 2014; Carlucci *et al.*, 2016; Enrichens, 2018; Lee *et al.*, 2019; Lee *et al.*, 2020).

The mineral bottled water business could be said to exemplify the modern global economy and some studies have focused on (Gironi, Piemonte, 2010; Niccolucci *et al.*, 2011; La Moreaux, Tunner, 2012; Torretta, 2013; Kajtazi, Reshidi, 2018; De Marchi *et al.*, 2020), while few studies considered management and governance implication for the firms (Disanto *et al.*, 2007; He *et al.*, 2008; Caniglia *et al.*, 2012; Carlucci *et al.*, 2016; Bal, Oraman, 2019).

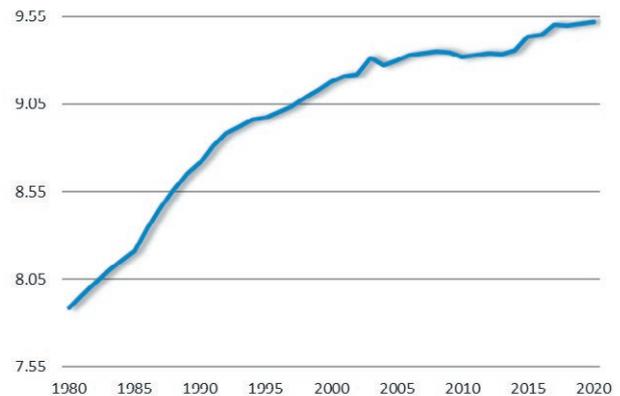
This study starts from these brief considerations to try to increase the debate among scholars of business economics and management on the topic of the marketing of bottled water, now of increasing interest in all markets (Fhelboom, Brika, 2020; Abdah *et al.*, 2020; Mahmood *et al.*, 2020).

The issue of water is certainly a matter of great importance and of general interest today, no longer confined to developing countries or linked to hydrogeological desertification conditions, but which must also be assessed on the basis of climatic impacts. The relationship between climate change and the uses of the resource leads us to investigate the possible causes of its wastage. In other words, bottled water is also under attack for its relatively high impacts on the environment and consumer prices (Gleick, 2010). Given its free availability in nature but not unlimited drinking water found in nature is a common and public good, but its bottle distribution is in the hands of a few dealers, creating thus the premises for the industry concentration and enforcement substantially high average prices per litre to bottled water (Spar, Bebenek, 2008; Marty, 2020).

Since the nineties, Italy has become the first country for bottling and for consumption of mineral drink water (ISTAT, 2020; Bevitalia, 2020). The graph in Figure 1 is the trend of operative volumes of bottled mineral water market from 1980 to 2020.

In the others hands, this is a representation of the industry life cycle (Vernon, 1966; Hymer, 1972) who since the 1990s has entered the shake-out stage and then the maturity stage. Therefore, the most appropriate form of market at these stages is monopolistic competition where weaker competitors are expelled and potential entrants find barriers to entry, which are structurally high for this industry. Consumers then make their purchases more selectively and the operating volumes of incumbent firms can slow down. It is therefore becoming more difficult for them to increase market shares and they must fight to maintain their position, including in international markets.

Fig. 1. The life cycle of bottled mineral water industry, log-values.



Source: reconstruction on Bevitalia survey.

The growth of purchases of bottled mineral water is attributable in sum to at least three qualitative factors (Hawkins, 2017): (i) the use of polymers in packaging, with significant savings for enterprises, but certainly a cause of environmental disease, (ii) a greater consumer focus on their health and a healthier lifestyle, (iii) a careful strategy of brand differentiation by firms, who are very careful in finding the most suitable levers of operative marketing. On the other hand, from a quantitative point of view they could depend, at instance, on the willingness of individuals to spend money and their consumption styles or even on the climatic situation of the period that binds to the need for water necessary to the organism, thus modifying the amounts of water needed.

Therefore, the purchase of bottled mineral water respect to consume tap water is now well structured and cross-structured by income groups, ages and geographical areas for several decades now (Ferri, 1999; Raspadori, 2002; Bevitalia, 2020). Just think that Italy is the first European country for consumption of bottled mineral water and exported volumes.

Italy is a country rich in water resources but where there is also a great differentiation between regions in the north, centre and south as regards the relative abundance of resource, access to markets and distribution networks. Umbria, at instance, according to its hydrogeological conformation and the particular orographic conditions of the soil is very rich in water. In another way, Umbria is the Italian region leading in consumption (ISTAT, 2020), and where several firms and groups are located: Cogedi, owner of established brands such as Oliveto and Rocchetta; Motette, one of the best performing groups in the industry (Competitive Data, 2020), and Siami, with a growing production (Bevitalia, 2020).

The bottled mineral water industry in Italy creates an interesting market and with important employment implications. Therefore, in the industry whose production has constantly grown there are some leader brands that are in the high price ranges and that have a good distribution capacity, both in domestic and foreign markets.

The paper has been structured in this way: (i) a part in which an expositive survey of the literature and the dynamics of the industry are reported, (ii) follows the presentation of empirical analysis and results, ultimately, (iii) in the conclusion we report considerations, limitations, future lines of research and policy implications.

2. AROUND THE DYNAMICS OF BOTTLED WATER INDUSTRY

Water has become in the last hundred years from a free, accessible and necessary natural resource to all one of the most marketable products and a profitable business for firms in the industry (Gleick, 2010). In economics, two goods are interchangeable if they meet similar needs to the same extent, such that an increase in the price of one causes an increase in demand from the other, with the choice of the consumer being based mainly on the price convenience between the two goods (Katz *et al.*, 2020). Although these conditions may apply to bottled and tap water, on closer examination these hypotheses must be considered rather fallacious because the consumption of bottled water does not depend strictly on the price of the tap and vice versa.

Generally, the consumption of bottled water increases with increasing per capita income (IBWA, 2019) and the price can be increased by up to about five hundred times compared to the cost of tap water (Ferrier, 2001). Therefore, drinking bottled water is more a reflection of a wealthy lifestyle, and generally, it is perceived as a healthy or safe consumption due to the investments in communication and marketing of bottling firms of the industry (Disanto *et al.*, 2007; He *et al.*, 2008; Caniglia *et al.*, 2012; Carlucci *et al.*, 2016; Bal, Oraman, 2019).

Consumer choice then appears more complex and depends on additional factors (Lancaster, 1966), which go beyond the sole satisfaction of thirst or comparison between prices of competing brands (Abrahams *et al.*, 2000; Wilk, 2006; Doria *et al.*, 2009; Hu *et al.*, 2011; Del Giudice *et al.*, 2016; Biro, 2017; Capehart, Berg, 2018). Thus, defining two goods in this industry as interchangeable is by no means a foregone conclusion, and this is particularly true for mature markets or in those where the mean quality of tap water is not so lower than

that of bottled water. In fact, another aspect not to be overlooked is that the consumption of tap water would exist regardless of the consumption of bottled water precisely because of the other uses that are made of this resource.

The bottled water market, not by chance, is the example taken by Cournot to describe its model of oligopoly, where the marginal cost of production – practically given by that of the bottle alone – and the sunk costs of starting the business are represented by the only fee paid for the use of the resource (Sutton, 1991; Carlton, Perloff, 2005; Laino, 2013; Cabral, 2018). Thus, in front of the cost structure of the firms and the profit margins that expect, the industry is certainly very attractive for those firms that are manage to enter. For these reasons, it is a very good business opportunity.

The industry is characterised by barriers to entry, as the authorisation of regional government for the exploitation of water resources is required (Nicoletti, Fredella, 2005). In addition, incumbents may decide to lower sales prices at least to the level of the total middle cost of production of the newcomer, therefore, it will have to operate below the minimum efficient production scale represented by its marginal cost (Archibald, Rosenbluth, 1975; Salop, 1979; Dixit and Stiglitz, 2001).

The potential of the market has also attracted the big international corporations such as Nestlé, Danone, Coca-Cola – present in the industry through their own commercial divisions or marketing agreements – which together with the major Italian groups increase the competition (Brei, Tadjewski, 2015; Brei, 2017). Thus, the market has entered the maturity stage of its life cycle and competitive pressures on enterprises intensified (Mascha, 2006; Clarke, 2007; La Moreaux, Tunner, 2012). By the way, water is the main input for the production of soft drinks and this makes the two industries related and vertically integrated (Galizzi *et al.*, 1997; Senauer, Venturini, 2005).

Concentration processes in the industry began in the seventies, when firms start competitive strategies of horizontal growth and marketing differentiation (Baliano, Lanzetti, 1976). The competitive structure of the industry has now been consolidated with a level of concentration that anyway is not negligible (Bevitalia, 2020). Mineral water is a market composed of a heterogeneous productive system, which includes large groups and firms with a territorial characteristic. The first are able to invest in internationalization processes – now more necessary than ever to escape the stagnation of internal markets – the second are conditioned by the local market and usually have a poor marketing vocation. Therefore, these are the firms that suffer most from the raising

of barriers to the entry of the industry due to the marketing sunk costs of the bigger competing firms.

In other words, the bottled water market has entered a stage of maturity, in which the leaders are the ones that manage to guarantee high operating volumes and that have the financial resources to invest in marketing activities. Finally, this has repercussion on the structure of the industry and it is to the detriment of small competitors who, despite having the same peculiarities as the other firms in the industry in terms of productive plants, however, fail to reach satisfactory market shares.

Therefore, sunk costs both economic and bureaucratic necessary for the start of the water mining and bottling in an appropriate plant near the source are a natural barrier to the entry of new firms into the industry. This means that incumbent firms can increase market share through merger and acquisition operations. In such a market, the gap between middle production costs and middle revenues is very wide, thus retail and marketing costs are spread over higher operative volumes. Firms with higher operative volumes can benefit from an impact of the middle retail cost on the middle total cost of production lower as a result of economies of scale, and at the end, they apply lower prices than their competitors (Bliss, 1988; Corstjens *et al.*, 1995; Sciarelli, Vona, 2000; Bolton, Shankar, 2003; Kopalle *et al.*, 2009; Biffignandi, Church, 2012; Ceccacci, 2013).

The competitive tension in the industry is justified by the fact that all the supply is aimed at the satisfaction of the same need, which is the supply of water to the organism. In this sense, horizontal differentiation of the production is fundamental to competitive strategies of the firms and the affirmation of the symbolic qualities of the product (Porter, 1985). In other words, it is about the perception that consumers have of the product. Thus, in the market can be found a multitude of brands and bottles (Gruber, 1994; Dube, Manchanda, 2005; Disanto *et al.*, 2007; Dolnicar *et al.*, 2014; Carlucci *et al.*, 2016; Bal, Oraman, 2019). In general way, the bottle and packaging are the constituents of the positioning of mineral water, which from a primary good for the satisfaction of a physiological need, it undergoes a process of sophistication that gives it new meanings, especially thanks to the proliferation of marketing activities that have made possible new forms of packaging, promotion and consumption (Finlayson, 2011; Twede, 2012).

The real discriminators for firms are marketing investments and transport costs. Therefore, consumers may prefer to purchase locally sourced water, because of the less impact they would have on its final price (Lambin, 2012; Kotler *et al.*, 2012; Caniglia *et al.*, 2012; Capchart, 2015; Carlucci *et al.*, 2016; Mundel *et al.*, 2017; Bal,

Oraman, 2019). However, this does not, affect the movements of the stocks of bottled water on the national territory, and the exports absorbs a not insignificant share of the operative volumes of the major enterprises in the industry (Bevitalia, 2020).

Ultimately, globalisation has certainly increased competitive pressures that weigh on management and corporate governance (Ferrucci, 2000; Milgrom, Roberts, 2005; Volpato, 2010; Hamilton *et al.*, 2011; Bosi, Trento, 2012; Gibbons, Roberts, 2013; Tunisini *et al.*, 2014; Grant, 2016; Golinelli, 2016; Sciarelli, 2017; Ferrucci, 2019), but it also represents for decision makers who manage to catch the benefits one a chance for extend the business into new markets (Chakrabarti 2011; Brouthers 2012; Matarazzo, Resciniti 2014; Cantele, Campedelli, 2016; Ruzzier *et al.*, 2017; Bannò *et al.*, 2018; Scalamonti, 2020a), such as those in the near Middle East or the Mediterranean countries of Africa (Ferrucci, Paciullo, 2015; Scalamonti, 2020b), or in Southern Asian and Eastern Europe – however already manned of the firms – in which the emergence of the middle class shifted the general consumption preferences towards more western styles (Wang *et al.*, 2000; Kim *et al.*, 2002; Florida, 2005; Lin, Wang, 2010; Vescovi, 2011; Guercini, Runfola, 2016; Neacșu, 2017). For many Southern Asian countries, the tap water is considered not safe especially for those who are not locals, at instance, the Middle East is characterized by consolidated bottled water consumption, with Turkey being by far the biggest consumer of bottled water in the region, which does it the more developed market and most easily accessible by firms in the industry (Akpınar, Gul, 2014). On the other hand, Africa has a constellation of emerging markets, but Latin America and Oceania also have growing consumer markets (IBWA, 2019; Kansole, Beidari, 2020).

3. EMPIRICAL ANALYSIS

From a macro perspective there has been a rise of the bottled water industry in both developed and emerging markets (Patsiaouras *et al.*, 2015; Howell *et al.*, 2020). At instance, Cohen *et al.* (2017) recently conducted a quantitative study to investigate predictors of bottled water consumption in China. Their results show that bottled water purchases are influenced by the mean age of the household, the mean level of education, a fairly high consumed income and the male gender component.

Therefore, to influence the purchases of bottled mineral water and the development of this market there are a whole range of socio-economic and cultural factors as ethnic group, age, income, employment, gender, but pur-

chasing patterns can vary by country or region (Abrahams *et al.*, 2000; Wilk, 2006; Doria *et al.*, 2009; Hu *et al.*, 2011; Del Giudice *et al.*, 2016), while, less important seem to be the health properties of the water or the organoleptic properties shown in the labels (Carlucci *et al.*, 2016; Biro, 2017; Capehart, Berg, 2018; Bal, Oraman, 2019).

3.1. Research question, methodological note and results

This study uses quantitative explicative variables to investigate the determinants of the operative volumes of bottled mineral water, which is an industry that operates just-in-time and in which market demand asks to face the peaks due to seasonality, or which depends on other seasonal factors such as incremental consumption due to the tourist presence.

Therefore, the research question is as follows: *are which determinants can explain purchases of bottled mineral water in Italy?*

We use aggregated data for ISTAT macro-markets: north-western, north-eastern, centre and southern with islands. Therefore, in reference to survey of literature, for explain the operative volumes of the bottled mineral water used: (i) the same dependent variable with one order of lag, which can be a measure of consolidated consumption style, according to the assumption that to influence the purchase at the time t there are implicitly marketing investments of the firms, (ii) the trend of the middle temperatures of the period which was reconstructed using a barycentric value for each macro-markets - the two most important chief city, (iii) the trend of population in the markets, and (iv) the consumed income per-capita.

The time series data on the operative volumes of bottled mineral water from 1980 to 2020 were reaped and reconstructed by integrate the Bevitalia survey, while the other data were taken from ISTAT-Time Series dataset. In Table 1 we report the main panel descriptive statistics of the log-variables. The H_θ indicator is a measurement that we present to seepanel heterogeneity², which we find in mean not to be high. For the mean of the groups is 0.02 and for their standard deviation is 0.15.

In Table 2 we report the statistical associations at panel level for regressors, which show that there may be a not insignificant problem of autocorrelation between variables, such that, we decided to model the variance

Tab. 1. The main descriptive statistics of log variables.

	Operative volumes	Temperature trend	Consumed income per-capita	Population trend
μ	7.554	2.748	4.568	7.240
σ_w	0.485	0.051	0.584	0.034
σ_b	0.301	0.083	0.000	0.301
<i>min</i>	6.190	2.551	3.050	6.941
<i>Max</i>	8.438	2.909	5.129	7.646
<i>Unit</i>	4.000	4.000	4.000	4.000
<i>Obs</i>	41.000	41.000	41.000	41.000
<i>Std</i>	litre	°C	Euro	unit
<i>Source</i>	Bevitalia	ISTAT-TS	ISTAT-TS	ISTAT-TS

Source: our elaboration.

Tab. 2. The correlation between variables used in regression models.

	Operative volumes	Temperature trend	Consumed income per-capita	Population trend
Operative volumes	1.000			
Temperature trend	0.609***	1.000		
Income per-capita consumed	0.872***	0.416***	1.000	
Population trend	0.546***	0.519***	0.075	1.000

Source: our elaboration.

of the cross-sectional type sample using a weight-OLS regression model. Therefore, with weights based on the estimated variances of regression errors and model convergence for maximum likelihood after iterations. In this way, we catch the heterogeneity not observed using the dichotomous variables that identify the four macro-markets and that stabilize the parameters, then submitted to regular significance test. With this technique we have the dual advantage of estimating efficient parameters even in the presence of correlation between the regressors and of being able to control any other effects induced by omitted variables. The parameters are estimate with Gretl open-source statistical software.

The model with the control for the four macro-markets dummies, which are not significant and whose effects are very similar to each other, produces more efficient estimates after taking the individual effects.

It confirms the assumption behind the growth of the operative volumes of the bottled mineral water. Therefore, markets feed their growth over time, but they are also positively correlated mainly to the trend of middle

² It was calculated as:

$$H_\theta = \frac{1}{N_i N_j} \sum_{i=1}^N \sum_{j=1}^N \left| \frac{\mu_{ij} - \theta_{ij}}{\mu_{ij}} \right|$$

Tab. 3. The regression model.

	Model 1	Model 2	Model 3
	Operative volumes		
Operative volumes (t-1)	0.763*** (0.040)	0.796*** (0.040)	
Temperature trend	0.213*** (0.054)	0.052* (0.028)	0.113** (0.057)
Consumed income per-capita	0.146*** (0.034)	0.125*** (0.034)	0.783*** (0.007)
Population trend	0.166** (0.079)	0.192*** (0.041)	0.984*** (0.017)
North-Western effect	-0.610 (0.506)		
North-Eastern effect	-0.630 (0.485)		
Centre effect	-0.652 (0.488)		
Southern effect	-0.624 (0.525)		
Constant		-0.532*** (0.167)	-3.460*** (0.131)
Standard error	0.023	0.024	0.050
Log-likelihood	378.079	372.617	261.962
LR-test (p-value)	(0.857)	(0.984)	(0.997)
Convergence iterations	3	2	2
Not observation (%)	4 (2)	4 (2)	-
Observations (%)	160 (98)	160 (98)	164 (100)

Note: *** significant at $\alpha = 0.01$; ** significant at $\alpha = 0.05$; * significant at $\alpha = 0.10$.

Source: our elaboration.

temperatures for the period, and after also trend of consumed income per-capita and that of the population.

The parameters we have estimated are all positive and significant (Tab. 3) and in progression from model 3 to 1 the estimates of parameters improve after first inserting the delay of an order of the dependent variable and then explaining the composition effects of the panel for the four macro-markets.

4. CONCLUSIONS

4.1. Final considerations

The analysis that we propose investigates the quantitative determinants of its operative volumes. The consumption of bottled mineral water should not be a matter of preference, since water is a vital and necessary good to the organism of living beings, but in most

western economies or in westernized world this is provided as tap water or as bottled mineral water. Thus, the choice between the two increasingly becomes a matter of preferences and styles of consumption (Disanto *et al.*, 2007; He *et al.*, 2008; Caniglia *et al.*, 2012; Carlucci *et al.*, 2016; Bal, Oraman, 2019). This is true in countries with mature markets such as Italy, or where on mean the quality of tap water is not said to be worse than that of bottled mineral water (Cidu *et al.*, 2011).

The purchase of bottled mineral water today can be considered as a habit or a style of consumption, which many people adopt because they perceive this type of good as safer, or healthy, or of better quality (Ferrier, 2001). Although, a more complete background must consider other factors such as the level of education or the demographic aspect (Abrahams *et al.*, 2000; Wilk, 2006; Doria *et al.*, 2009; Hu *et al.*, 2011; Del Giudice *et al.*, 2016; Biro, 2017; Capehart, Berg, 2018).

Consumption of bottled mineral water is geographically popular in all regions with some differences that have attenuated over time (ISTAT, 2020; Bevitalia, 2020). The high consumption of bottled mineral water is then promoted by the fact that there are numerous springs in all regions. Thus, among the most interesting discriminated elements is the income gap between northern and southern. It is no coincidence that the southern macro-market is the one where there is some great consumption of bottled mineral water and in which firms manage with to have a better positioning of the product according to the applied sale price (Carlucci *et al.*, 2016). In addition, firms that adopts competitive price strategies may prefer to increase the operative volumes obtained in the nearest markets, as this policy of marketing has a better impact on their costs.

The literature that debates the industry shows that consumers pay for bottled mineral water a mark-up mainly due to effective brand position strategies of the firms through the levers of operative marketing, whose aim is to have the maximum depth in the typology of product offered (Gruber, 1994; Dube, Manchanda, 2005; Disanto *et al.*, 2007; Dolnicar *et al.*, 2014; Carlucci *et al.*, 2016; Bal, Oraman, 2019).

Therefore, it is not surprise that due to consolidated consumption styles, the variations in the operative volumes of the bottled mineral water in Italy – considered in the four ISTAT macro-markets: north-western, north-eastern, centre and southern with islands – depend positively and significantly mainly of the operative volumes lagged by one year, and more marginally also by variations in middle temperatures trend of the period (IRI, 2016).

The analysis could be suitable for regions, but it could also extent to provinces and municipalities (Bol-

lino, Espa, 2015) and it could also be in-deep. In this sense, it might be interesting to use spatial regression models or the more appropriate linearly approximated almost ideal demand system(AIDS-LA), which is the more simplified version of the popular AIDS model used in the empirical demand analyses (Deaton, Muellbauer, 1980; Green, Alston,1990; Moschini, 1995; Banks *et al.*, 1997). Base assumption is that non-linear Engel curves cause an increase in consumed income, but at the same time they also cause a decrease in income share allocated to each good, with a consequent decrease in income elasticity. In other way, a specific case study (Yin, 2017) could be made on significant enterprises of the industry.

The study discounts the methodological limitations, such as it refers only to the product category of bottled mineral water. Thus, it overlooks other important correlated industries such as soft drinks and flavoured water. A mineral water producer can make use of any excess production capacity to produce soft drinks and flavoured water, provided that it has the necessary flexibility of the plants to benefit of the economies of scope, even if the reverse is not possible as water is the main input for the production.

Among other things, within the industry identified by ATECO taxonomy are included categories of goods which are lowly interchangeable on both the demand and supply-side. There is a problem of delimitation the market or industry, specifically to bottled water and, within this, a problem of differentiation between mineral water or flavoured water, which in turn are different from soft drinks. Therefore, the possibility to produce with flexible plants and to benefit of economies of scope does not seem sufficient for to include in the same market or industry of the productions that are different from each other like soft drinks. Moreover, the high horizontal differentiation of products also confirms that flexibility demand-side is not an appropriate criterion for one wide definition of the industry and market.

Attention in the law and economic debate on issues of competition protection has grown over the years in Italy. Thus, it is important the definition of *geographic relevant market* given by authority of the protection of competition, in addition to typical definition for industry of the industrial economics for bottled mineral water. Since, it is more useful for to identify situations where there is risk of situations of abuse of market power of the incumbents (Bruzzone, 1995). This can be defined as the smallest of competitive contexts – product set or geographical area, within which it is possible to create significant market power by incumbent firms given the degree of products substitutability. Finally, these brief considerations can be extended to all those

industries grouped into conglomerate and spurious taxonomies.

4.2. Policy implications

We close with a few brief considerations on the good that identifies this particular industry, as the profile of the water resource remains complex and multifaceted (Urbani, 2009). For the market and the economy in general, it is necessary to minimise the gap between consumer demands and the need for businesses to make profits (Katz *et al.*, 2020). In this sense, the allocative function of the market and its efficiency are not compromised. The management of complex goods such as water must necessarily involve two aspects. The first is that of the management of a common good, and the second is that of productivity. This means that water management and its market need idiosyncratic industrial investments and economic policy choices that respect the objectives of social and environmental sustainability in a now changed global social, political and economic background (Marelli, Signorelli, 2019).

For economists, when a good is not exclusive or the subject of rivalry and its consumption is accessible to all, thus it is a common good and it is precisely from this type of goods that a whole series of problems arise about their governance (Ostrom, 1990). Therefore, in the current stage of globalization characterized by high fragmentation, the role of enterprises in society also changes and for businessman and managers is important to increase their ethical awareness (Orlitzky, Moon 2011; Chirieleison, 2017). Specifically, there has been a rise in enterprises responsibilities initiatives providing bottled drinking water in emerging and developed markets (Brei, Böhm, 2011).

Business decision makers – businessman and managers – could adopt more selective and responsible behaviour in respect to manage the environmental impacts of their business (Fhelboom, Brika, 2020; Abdah *et al.*, 2020; Mahmood *et al.*, 2020). It is also essential in Italy to prepare appropriate policy for the protection of environmental and territory sustainability, as is already being done in other parts of world (Tao, Xin, 2004; Barnes, Cao, 2014; Kooy, Walter, 2019; Tosun *et al.*, 2020). On the other hand, consumers may also decide to adopt better purchasing behaviours, maybe inspired by the economy of small decisions (Erev, Haruvy, 2016), or more focused on a common civic sense and responsibility (Zamagni *et al.*, 1999; Bruni, Zamagni, 2004; Becchetti, Rosati, 2007). Thus, policy makers should take note of the possibility that greenhouse gas emissions – linked to higher development rates – can be reduced by

pushing active demand substitution policies that change consumption habits over time (Hallett *et al.*, 2010; Nicolucci *et al.*, 2011; Sarkodie, Strezov, 2019).

Among the many definitions that characterize today's debate on the future of man and the environment, of particular attention is certainly that of sustainable development in the sense of satisfying the needs of the present without compromise of the possibilities for development for future generations. This concept has since been extended also in relation to the direct and individual responsibility of people, which refers to a voluntary and conscious adherence of each to these principles.

In the face of possible growing water famines, it is necessary to establish strategies to reduce waste within a clear framework of market regulation – including for territorial levels – and that politics must have the will to govern (Bollino, Signorelli, 2018). It will also be up to the policy to redefine a framework for reconciling efficiency in industrial management – which requires the remuneration of capital – and the needs in the management of a public and common good (Polytechnic of Milan, 2019; UNESCO, 2020).

Indeed, climate change is more unpredictable and is making water an increasingly scarce and polluted resource, threatening sustainable development while reducing biodiversity. A growing demand for water will determine the need for a policy response that can improve water management in the light of the effects of climate change (Carullo, 2009).

Climate projections indicate an increase in precipitation in Northern Europe and a reduction in Southern Europe (UNESCO, 2020). Therefore, key actions to achieve effective adaptations and resilience to extreme events in the European region include: (i) increased water efficiency and savings strategies, (ii) monitoring and data sharing, (iii) coherence between climate change adaptation measures and their prevention by reducing the risk of related natural disasters, (iv) the possibility of drawing on structural funds to meet these objectives.

In this sense, the agricultural sector is the one that will suffer most from climate change compared to other production sectors with negative shocks on farmers' incomes (Day *et al.*, 2018). Therefore, while the impact of these changes is difficult to quantify, it is conceivable that both a decrease in water availability and an increase in demand due to higher consumption may occur locally (Dell *et al.*, 2014; Costantini *et al.*, 2018). Therefore, it becomes necessary to plan coordinated industrial policy actions in order to mitigate climate impacts and reduce the waste of resources (Luciani, 2020), who must find, in farmers and producers/bottlers, the main actors and

interpreters aware of the management and protection of a resource of the highest value for the community.

Finally, a reference to the long-standing problem of negative externalities and environmental impact – wastes and emissions – or the “shifting of burdens” problems in industrial processes that that shifts the attention on identification of appropriate fees that enterprises must pay for the exploitation of the common economic resource (Alesina, Passarelli, 2010; Bollino, Micheli, 2012). In other words, the problem of the congruence of concession fees that enterprises have to pay for water bottling – but more generally for the exploitation of public resources – and the problem of the governing the common resources are now topical in Italy.

In this sense, the assessment of the impacts of the life cycle of production processes (LCA) and therefore of products is of extreme importance. This analysis can help interpret data on emissions and resource consumption associated with a product's life cycle in terms of environmental burdens and human health (Bigerna, Polinori, 2015). At instance, the European LCA platform, which provides guidelines, is an important added value to the work of researchers and professionals who want to assess the negative externalities of production processes (Baldo, 2008; EU, 2010).

Therefore, even for water resources, attention is being paid in the various institutional levels to the risk of a possible crisis caused by water scarcity, especially in light of the latest climate change (Polytechnic of Milan, 2019; UNESCO, 2020). The strong global dependence of the markets has led many bottled mineral water firms to improve the attractiveness of their products through packaging, transforming the historic glass bottle into an additional and design element. The glass bottle that constituted a “void to render” and that biggest firms could sometimes produce by integrating the production process downstream, was progressively replaced by a container accessible outside the production chain at low cost, keeping the organoleptic qualities of water unchanged (Twede, 2012; Hawkins *et al.*, 2015; Marty, 2020). In other ways, this has allowed firms to greatly reduce the costs attributable to plants, thus making production more profitable and cheaper distribution thanks to the use of polymers in packaging. Therefore, today, firms are also required to make a further effort towards the use of biodegradable materials, in order to have as eco-friendly water bottling as possible.

In this sense, the Mineracqua Federation – a section that is part of Confindustria network and that brings together the biggest Italian firms in the industry, could also play an important role in raising awareness of water but, in general, of the importance of the circular

economy today (Hawkins *et al.*, 2015; De Marchi *et al.*, 2020). It is precisely in an area where the use of recycled polymers would help to reduce greenhouse gas emissions that are responsible for rising temperatures (Holtz-Eakin, Selden, 1995; Goldewijk, 2001; Houghton, 2008; Ciccone, Jarocinski, 2010; Jones *et al.*, 2011).

In conclusion, the operative implications of this study are: (i) to have caught the market dynamics at long-term of the bottled mineral water industry (Makov *et al.*, 2019), and (ii) to want to bring to the attention of managers, researchers and business economists a market of considerable interest for the socio-economic implications and environmental impacts that arise from the consumption of bottled mineral water – especially if these are in plastic (Orset *et al.*, 2017) – and that policy makers cannot afford to overlook.

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