THE EFFECTS OF REGULATORY AUTHORITIES ON SUGAR MARKETS: AN EVALUATION OF THE USA CASE

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Abstract

Studies have shown that public regulatory authorities can serve their self-interest instead of the public interest. The US sugar market can be given as a concrete example of this situation. Regulatory action on the sugar market has led to the widespread use of high fructose corn syrup, which has been called the plague of the age. The production of high fructose corn syrup, which has increased daily in the US, has reduced sugar imports and significantly contributed to the economy with its undisputed role in the food sector. However, at the same time, the increase in chronic diseases and chronic health expenditures in the US has come to the fore as a problem that needs to be addressed. This study primarily focused on the activities of regulatory bodies and then emphasized the existence of the causality relation between the increase in high fructose corn syrup production and consumption and the increase in health costs. The findings of this study supported the negative perceptions and judgments the society has towards high fructose corn syrup. In addition, the study was conducted within the framework of the third best policy, which has been rarely used in the literature, and details how public efficiency can be achieved.

Key words: Political Economy, Regulatory Authorities, Sugar Markets, High Fructose Corn Syrup, Health Economics, Third Best Policy

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1. Introduction

Regulatory authorities are independent structures organized in the form of supreme boards. The concept of "public interest" led to the birth of public regulatory authorities. However, economists have debated whether the public

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interest is the main objective of such institutions (Kothari, 2010). In practice, the first examples of these institutions were found in the US where the Interstate Commerce Commission was established in 1887, and the Federal Trade Commission was established in 1914 for the prevention of unfair competition. The search to find a judicial solution to administrative problems in the US where an administrative jurisdiction organ did not exist resulted in the emergence of these structures (Lust, 1927; Sever, 2015). Similar institutions were established in Europe in the 1980s (Davis & Abraham, 2013) and in Turkey after the 1990s. The main debate is that these institutions, which are in charge of regulation and supervision, act to serve self-interest rather than the social interest because first politicians and then companies and bureaucrats can make legal regulations according to their own interests to ensure rent. In the literature, it is possible to find numerous examples supporting these findings (Milgrom & Roberts, 1998). Findings that regulatory authorities can serve self-interest rather than the public interest were first put forward in the 1960s with the theory of regulation by Joskow & Noll. The studies in this area were carried out in in accordance with the capture theory (CT), which was ignored in the literature. Findings have shown that regulatory activities conducted in non-competitive markets, such as natural monopolies, can actually serve self-interest rather than public interest.

This study analyzed the effects of regulatory authority activities on health economics. For this purpose, focus was placed on the sugar market, which is one of the markets that most affected by regulatory activities. The study tried to explain how high fructose corn syrup (HFCS), a flavoring substance, became widespread in the market. Additionally, the effects of HFCS production and consumption on chronic diseases and the economic costs of these diseases were discussed.

2. Literature Review

In the 1960s, regulatory measures in the areas of trucking and air transportation increased rather than reduced the overall level of prices. Similarly, while regulatory actions in the US electricity market were expected to lead to lower electricity prices, they actually increased the overall level of prices. In addition, regulatory authorities established to control water pollution can serve the interests of companies instead of preventing the harm by industry to the environment. These negative situations were clearly revealed in the 1960s in the theory of regulation put forward by Joskow & Noll (1960) who concluded that policymakers see market failures as an important reason to engage in regulation. However, regulatory authorities established for this purpose cause a lower productivity level than the market failures (Peltzman, 1976; Stigler, 1971).

As of the 1970s, the concept of market failure gave way to the concept of government failure. Neo-liberal policies gained ascendancy, and the role of the state was once again questioned. The development in technology and in the financial markets during this period positively influenced the competition environment. In turn, this created an environment suitable for the needs of interest groups. First, the areas under state monopoly that would be defined as natural monopolies are

exposed to privatization by the pressure of interested groups. Firms that buy these institutions as a result of the privatization of natural monopolies show efforts to become powerful in the market. The regeneration of these companies as monopolistic structures once again shines a light on the regulations (Posner, 1999).

In 1972, William Jordan described this situation with the capture theory of regulations (capture theory or CT). In addition to monopolies, regulative actions in competitive markets increase prices and reduce the number of competitors. George Stigler, who introduced the theory of economic Regulation in 1971, stated that regulatory authorities are surrounded by economic interest. For example, the regulation of airline tariffs or the introduction of minimum quality standards for new firms reduces social welfare while contributing to company profits (Joskow & Noll, 1981). Capture theory is the first theory on the subject that shows that public regimes are unproductive, unsuccessful, and even vulnerable to corruption. It was also the basis for subsequent studies since it can be considered the first study in the literature on deriving personal benefit from the public regulatory authority. Thus, it is possible to establish meaningful models based on the interests between the state and the business world (Walters, 1993).

The U.S. Food and Drug Administration's federal regulations limit competition and increase costs in cases where there are no regulations, which in turn reduce investments (Baker et al., 2008). As a result, the costs incurred by regulatory authorities are paid by individuals, i.e., taxpayers. This causes a decrease in the disposable income of individuals. Less income means less safety, less health, less education, less nutrition, less housing, and a lower quality of life, all of which make life riskier for individuals. Statistically, the expense that the regulator created in this field is more than $14 billion. This cost requires the regulatory agencies' areas of activity to be redefined to reflect public interest (Keeney, 1997; Nar & Nar, 2019).

The US Department of Transportation's auto-gasoline mileage regulations applied between 1981 and1984 were investigated in terms of economic efficiency and equity. According to these regulations, low-income groups with fewer cars were exposed to inequality compared to higher-income groups. Attempts were made to compensate low-income groups who experienced losses by additional income compensatory measures. Food stamps, fuel stamps, supplementary gasoline, low-income family assistance coupons, and discounts in income tax rates were applied within this context. However, these measures did not reach the intended goal (Lakhani, 1980). After sulfur dioxide emission regulations were applied in the US between 1975 and1990, electricity production costs, which should have reduced, increased by 1.1%, resulting in consumers receiving higher bills (Lee, 2002).

The aim of the regulations in banking is to reduce financial fragility, prevent economic crises, provide stability, build competitive financial markets, strengthen public audits, and provide capital adequacy. However, it was found that regulations

introduced to banks to increase financial security (e.g. deposits being listed under insurances, bank rescue operations) contributed more to the instability of the banks and increased existing risks (Allen & Gale, 2004; Demirgüç & Detragiache, 2002).

The results of the regulations were directly reflected in the taxpayers' budgets. This may result in an excessive interruption of Medicare premiums, a high rate taxation of wage income, a decrease in the payments people in need, reduction of meal allowances, and cancellation of housing assistance, etc. The IMF's economists have calculated the size of these implicit subsidies as $ 83 billion (Herbst, 2013; Valdez & Molyneux, 2015).

The basis of the problem is foreseeing that the regulatory and supervisory authorities are rational institutions that act with the public interest. Unfortunately, a great number of regulatory activities are carried out for either personal interest or political interest. For example, labor force costs and minimum wage regulations can be determined according to the interests of companies. In the current market conditions, the rules are made flexible, and unions are made inactive. Similarly, agricultural regulations continue to benefit a minority of people, preventing the application of sustainable public policies (Mesquit, 2017; Pawłowski, 2009).

The most obvious example of this is the US sugar regulations. The US sugar regulations can be addressed in three separate periods. The first period is between 1789 and1890, during which sugar production was not significant, and thus protection was not required. However, customs duties were applied in order to create income from sugar imports. The second period after 1890 is when import tariffs were removed to facilitate a high level of sugar intake, and domestic sugar processing factories were supported by the incentives. The period beginning in the 1930s is the third period. In 1934, the Sugar Law was established to protect the domestic industry due to increased sugar production and falling prices. This law limited the import and production of sugar. The Sugar Law was terminated in 1974 because sugar prices in the world increased approximately three times that year. In 1977, a new protection policy was introduced into the sugar industry as a result of increased production and falling prices, and a regulatory authority was established under the name of the Commodity Credit Corporation (CCC). In the face of falling prices, support for producer prices as well as credit programs were put into practice. These arrangements became permanent with the new Agricultural Law of 1981. Many changes in the year 2000 were carried out by the CCC to prevent the accumulation of sugar stocks in the US. In particular, payments in kind, as well as cash payment programs, are important for producers in exchange for restriction of the cultivation areas. In this respect, it was possible to reduce the cultivation areas by 7-10% (Grossmann, 2012; Kıymaz, 2002; USDA, 1996).

The main regulatory agency in the US sugar market is the Department of Agriculture (USDA), which determines the legal framework of the relevant public policies (IEG Vantage, 2018). Another institution operating in this area as an independent regulator is the Commodity Futures Trading Commission (CFTC) which regulates and controls the commodity markets. These markets include

traditional agricultural products such as sugar, wheat, corn, and soya beans as well as nonagricultural products such as precious metals (CFTC, 2018). The aim of these institutions is to protect the rights of US farmers and businesses and ensure that they can continue their activities in fair terms in the global markets (Landis, 1987; Winden, 2004).

Nowadays, US sugar regulations are carried out under the context of price support to domestic producers. In addition, low-interest loans, payment in kind, and down payment arrangements are in place. In addition, price and quantity quotas for foreign products are applied when required. The importance of sugar is governed by tariff-rate quotas under the North American Free Trade Agreement (NAFTA) and the Uruguay Round Agreement (USDA, 2018). Notwithstanding, agriculture subsidies in the US are extremely unproductive transfer programs. The annual cost of price support programs, i.e. subsidies, under economic regulations is between \$12.4 billion and \$30 billion. Moreover, the loss created by quotas and taxes is between \$12 billion and \$18 billion. Therefore, in sugar markets, self-interest conflicts with the interests of the public, which in turn hinders social welfare (Nar, 2013; Tullock et al., 2002).

The USDA has stated that, in the event of sugar stocks becoming inadequate, it can intervene with the sugar markets to prevent an increase in sugar prices (Mueller, 2011). However, it is not known for whom or why these limitations are introduced or removed. At this point, interest-based relations between (i) politics, (ii) bureaucracy, and (iii) businessmen emerge. This triple structure is referred to as the "iron triangle" and directly targets the activities of the regulator. At the end of the day, politicians who are regarded to be acting for the public interest are actually pursuing vote maximization. It is understood that those who establish regulations are striving for bureaucratic maximization. It is also recognized that interest groups that are comprised of business people wish to seize public resources through lobbying activity. Along with the numerous corruption cases in Western democracies, the prevalence of interest groups in the US supports these evaluations (Mueller, 2011; Yandle, 2001).

Figure 1. Iron triangle
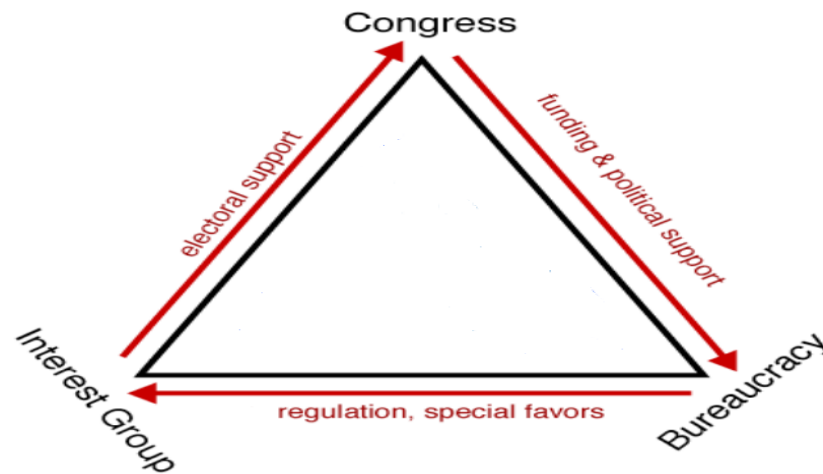
Figure 1 shows the actors involved in policy-making processes, namely (i) congressional committees, (ii) federal bureaucracy and (iii) interest groups. While these actors aim to maximize their profits within the political process, their interest-based relations are as follows: (i) congressional committees provide financing and political support to federal bureaucracy and maximize their budgets. The bureaucrats who manage the bureau get power and income opportunities and their prestige increases in the society. (ii) The federal bureaucracy provides the interest groups with the necessary arrangements in line with the wishes of the Congress. (iii) The interest groups transfer part of the profits they earn to Congressional members in the form of donations or help and offer support for elections through lobbying (Burstein & Linton, 2002; Iron Triangles, 2018).

One of the areas where this is often experienced is the Department of Agriculture. The three-dimensional structure is particularly evident in the agricultural sector. Government committees are the most important part of this frame. Both in the Senate and the House of Representatives, from allocations to quotas and tariffs, there are strong agricultural committees that present existing arrangements in favor of interest groups. These committees are "spending serious money to prevent declines of prices in the market". For example, sugar is expensive in the US. This is caused by a successful pressure group comprised of groups of small sugar cane producers. Sugar cane does not grow well in the US. Although it is possible to supply sugar from other sources, a small but successful pressure group prevents imports; thus, a special monopoly occurs. As stated by Tullock, "a large part of the earnings is in the hands of lobbyists and a small number of large farm owners." The amount transferred to the other farmers is around $1 billion and is an extremely small part of the cake. The resulting costs are not limited to consumers and taxpayers. This turns into a diseased structure that affects the whole society in the form of negative externality in the long run (Pawłowski, 2013; Tullock, 1989; Tullock, 2007).

3. Methodology

First, the theoretical framework was prepared by conducting a detailed literature review about the research question. By doing so, the significance of the study and why the research question was worth studying was explained. The data used in the study were shown in metric tons. The difficulty of reaching the data as well as the classification of the data according to different weight units constituted the difficulties and limitations of the study. The fact that the weight units have been indicated in terms of pounds, short tons, and metric tons for different years made the calculations difficult. For this reason, calculations were made by converting them into the most useful method, namely metric tons. No studies were found in the literature that presented all the data together in metric tons. Thus, the data were presented in a uniform manner to facilitate future studies.

Within the scope of the study, the data provided by the USDA and the U.S. Department of Health & Human Services was compiled and transformed into tables and graphs. Correlation analysis (SPSS 20) was then used to determine whether there was a significant relationship between the variables and the degree of the relationship if any. Statistical analyzes were performed at a confidence level of 99%.

4. Results

Sugar Markets and HFCS

Interest or pressure groups can intervene both directly and indirectly in political decision-making processes. These groups are able to change legal arrangements according to their self-interests and undertake rent-seeking activities. This is an important social as well as economic problem that has become a major dilemma in the US where lobbying activities are legal (Congleton & Hillman, 2015; Lambsdorff, 2002). Assessing the problem in terms of sugar markets will help in the understanding of the seriousness of the issue.

When the history of the sugar cane plant is reviewed, we see that it first originated in New Guinea. It is thought to have spread to the southeast Asian islands more than 2000 years ago. Later it reached China, India, and the Middle East where refining techniques were used to transform the juice of the cane into sugary solids used in culinary applications. It then began to grow in the Mediterranean, especially in the south of Spain and Sicily (Richardson, 2009). The first production of sugar plants in the US began in Florida in 1850. However, sugar cane production and its processing industry could not develop because of the geographical proximity to Cuba. However, due to the embargo imposed after the revolution in Cuba, production has been growing rapidly since 1960. In addition, sugar became a political product under protection as the by-product of processing as well as its contribution to production and employment over the following years (Kıymaz, 2002; OECD, 1998).

Figure 2 shows the limited sugar cultivation areas in the US. Sugar beets and sugar cane are the two primary agricultural commodities used to manufacture sugar in the US. The crop quantity that can be taken from the soil is shown in metric tons.

Figure 2. US production of sugar from sugar crops (1,000 metric tons)
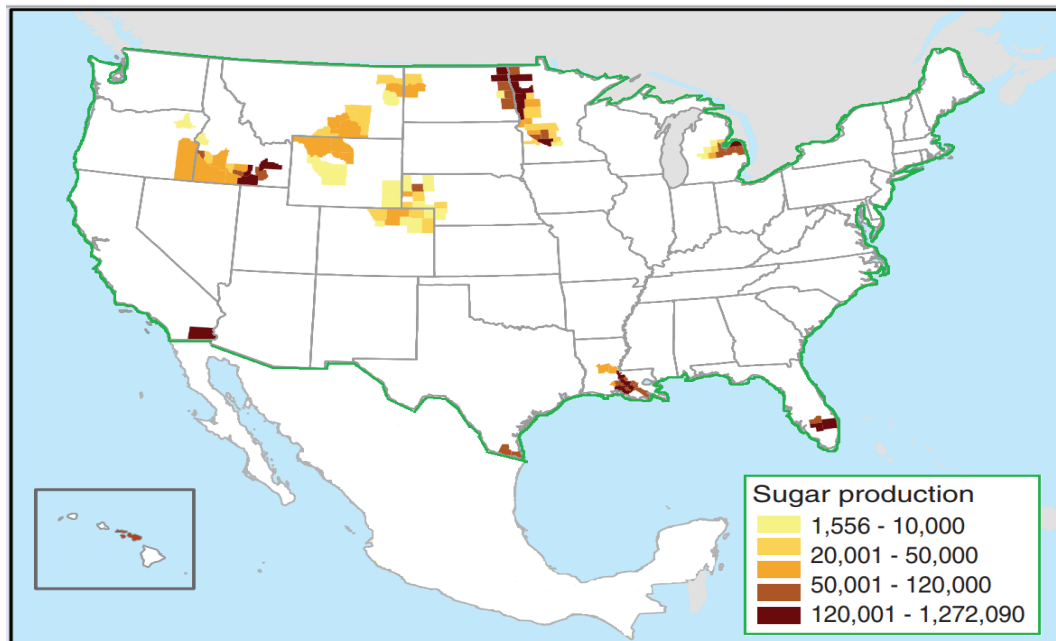
Source: (USDA, 2018). Sugar is produced in five US regions encompassing 14 States. The leading sugar producing region is the Red.

The fact that sugar is expensive in the world has facilitated the emergence of alternative profitable substances. The five years during which two major price increases took place in the middle of the second half of the twentieth century, namely in 1975 and 1980, created turbulence for sugar production. From the 1960s to today, retail sugar prices have increased six times. This has rapidly expanded the market share of sugar-like products. This enlargement was clearly observed during those years in developed countries such as the US and Japan where the demand for sugar increased, but imports decreased (Kıymaz, 2002; White, 2014). The main reason for the reduction in imports was the existence of a "very successful, small pressure group which prevented imports" (Tullock, 1989). Problems regarding political instability and sugar cane production areas, as well as government interventions, caused a reduction in sugar supplies and an increase in prices. As a result, the current problems have primarily affected food and beverage producers and led them to seek new solutions. Within this context, the production of HFCS emerged in the US. In this respect, a new field of use for corn was established because it is the most grown crop in the US (Pomeranz, 2016; White, 2014).

Essentially, the process of obtaining sweet substances from the starch of products such as corn, potatoes, and wheat dates back to the beginning of the 1800s.

In 1811, the conversion of starch into a sweet substance by heating it with diluted acid was carried out by Russian chemist G.S.C. Kirchoff. In 1831, the US, the country that produces the most syrup from starch today, established the first American plant that produced syrup from starch. However, until the 1970s, the production of starch-based sweeteners was carried out at an insignificant level. However, at the end of the 1970s and in the early 1980s, the use of processed food products, especially by US beverage companies, increased significantly, causing this field of production to grow significantly. Due to the fact that corn is the most important cereal product grown in the US, syrup production from corn starch has become particularly common. The increase in HFCS production is almost certainly in parallel with the increase in population and consumption (BeMiller & Whistler, 2009; Taubes, 2007; Bracking, 2009).

After the year 2000, HFCS production in the US increased the market share in the sugar sector by more than 45% with an average production of 8.5 million tons. Japan and Canada followed the US in terms of production amount. HFCS production in the world is around 12.5 million tons. In Turkey, at the end of 2010, it was approximately 400 thousand tons. The European Union (EU) is the third largest sugar producer and the second largest consumer in the world. The use of HFCS in the EU has been limited due to the quotas of an average of 2% (EU Sugar Policy, 2018; Karaoğlu, 2011).

As can be seen in Figure 3, sugar production in the US exceeded eight million metric tons in the year 2000. US domestic producers have been protected from low world prices even during times when sugar production increased and world prices dropped with methods such as price supports, import restrictions, and production controls. When the prices around the world were high, the US government removed production limits. However, the US sugar regulations have caused domestic prices to rise further and more significantly than those in the rest of the world. The consumption of sugar in the US peaked in the mid-1970s, exceeding nine million metric tons. In the late 1970s, however, consumption decreased, and this decrease continued throughout the 1980s. The main reason for this was the beverage sector's shift to HFCS. In addition, domestic consumption increased during the 1990s and early 2000s due to the increases in the bakery, confection, and other food industries (Wiltgen, 2007).

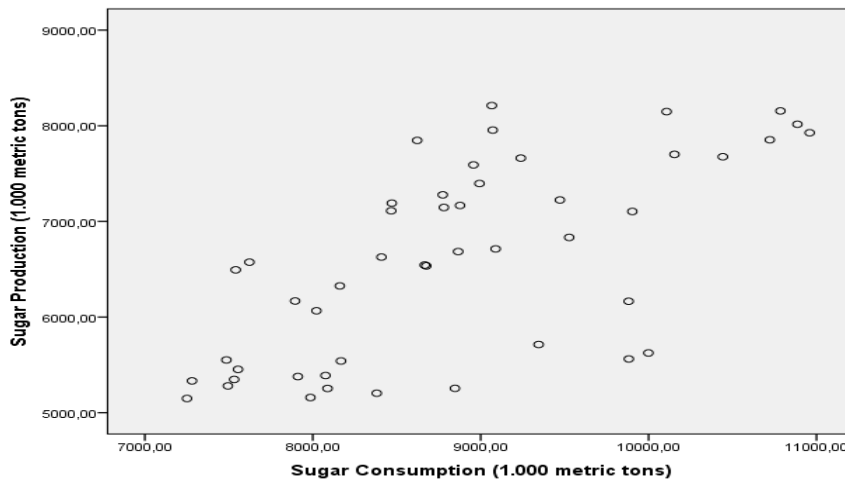**Figure 3.** Sugar production and consumption in the US
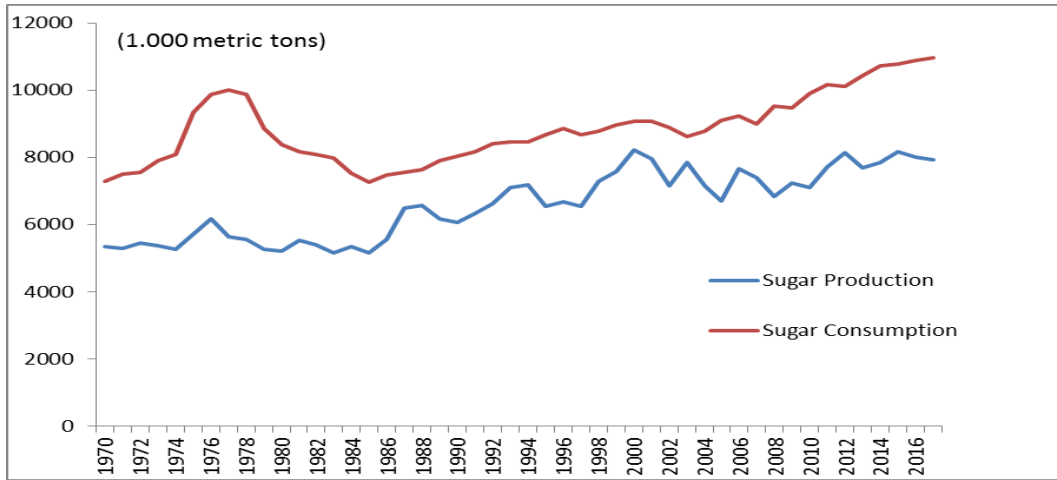
Source: USDA-Economic Research Service. The amount of sugar production and sugar consumed in pounds and short tons were converted into metric tons. One metric ton (or ton) equals 1,000 kilograms or a unit of weight equal to approximately 2,204.6 pounds. One short ton [US] equals 0.907 metric tons. The data is compiled by the authors and can be quoted with reference to it.

A correlation analysis was performed to examine the relationship between sugar production and consumption, and the Pearson correlation coefficient was obtained. Accordingly, a positive correlation of 66.2% was determined between production and consumption (r = 0.622, p <0.001).

|		Sugar Consumption (Thousand tons)
Sugar Production (Thousand tons)	r	.662[**]
	p	.000
	N	48

**. Correlation is significant at the 0.01 level (2-tailed).

Chart 1. Sugar production and consumption in the US

The positive dispersion relation between the two variables is shown above with the aid of a scatterplot (Chart 1). As a result, an increase in sugar consumption due to the increase in population and income also spurred an increase in sugar production (Barry et al., 1990).

Figure 4. Sugar imports and HFCS production in the US
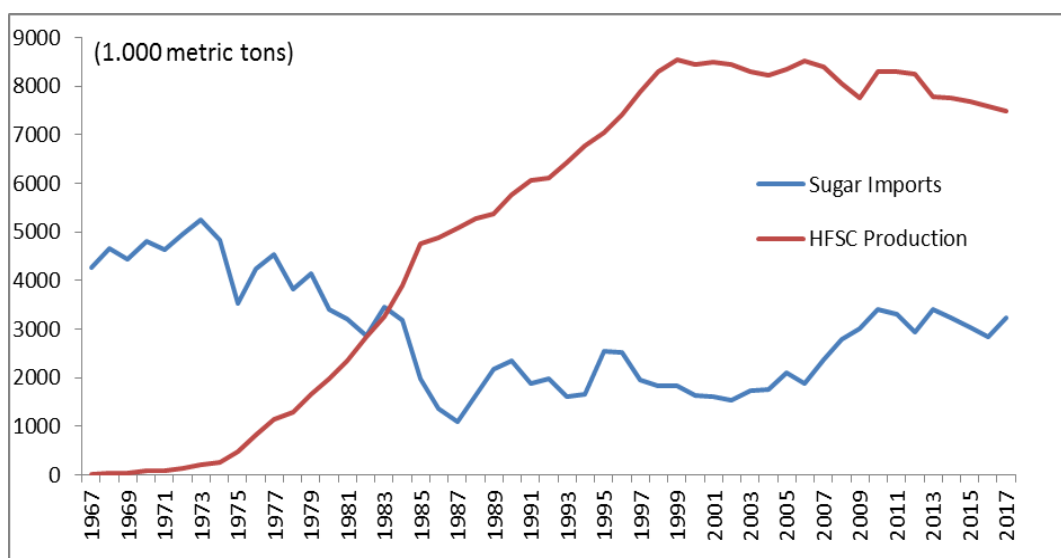
Source: USDA-Economic Research Service. The amounts of sugar imports and HFCS production in pounds and short tons were converted to metric ton. One metric ton (or ton) equals 1,000 kilograms or a unit of weight equal to approximately 2,204.6 pounds. One short ton [US] equals 0.907 metric tons. The data is compiled by the authors and can be quoted with reference to it.

Sugar imports in the US have been declining rapidly since 1975. The greatest decline in imports since 1967 was in 1982 at 2.8 million tons. Imports of sugar dropped to the lowest level of one million tons in 1987 (Figure 4). The main reason for the decline in sugar imports was the increase in HFCS production. HFCS has been systematically taking the place of sugar since the 1970s, which has caused sugar imports to decline. This is considered to be important in terms of the balance of foreign trade (Jurenas, 2004; Schmitz & Christian, 1993). The rapid adoption of HFCS, especially in the 1980s, led to the rapid transformation of the US sugar industry. This made HFCS a strategic product compared to refined sugar because it can be used in a wide range of products in place of sugar, the convenience of its use in soft drinks, and its lower production costs (Barry et al., 1990). That is why almost half of the caloric sweeteners in the US are produced from corn syrup (Mitchell, 2005).

Although the relative decline in HFCS production after the year 2000 is considered to be true, this is mainly related to the use of corn for increased ethanol production. In addition, as health-conscious consumers moved toward fresh and

unprocessed foods, the industry demand decreased. Despite all of this, efforts to substitute HFCS for more expensive sugar were rapidly put in place (IBISWorld, 2017; McConnell, 2017). The correlation analysis results of the present study also support the existing findings.

.		HFCS Production
Sugar Imports (Thousand tons)	r	-,763**
	p	,000
	N	51

A negative significant correlation was found between sugar imports and HFSC at 76.3% (r0-0.763; p <0.001). When HFSC production increased by one unit, sugar imports fell by 0.763 units. The existence of the negative dispersion relation between the variables appears in the scatterplot as follows (Chart 2).

Chart 2. Sugar imports and HFC production in the US
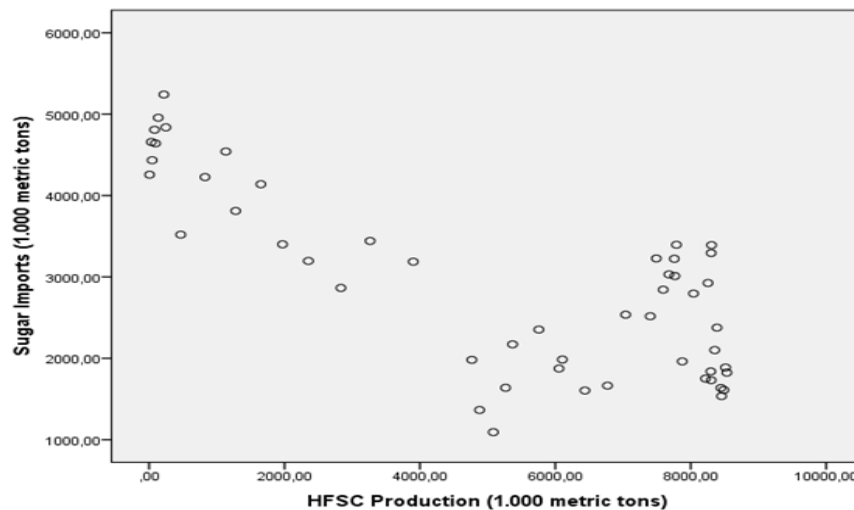
When assessed in general terms, the reasons for sugar costs being high in the US, in addition to the influence of environmental factors since the climatic conditions are not well-suited for sugarcane cultivation in the US, are mainly due to federal sugar regulations. These regulations include tariffs, import quotas, and purchasing programs to protect domestic sugar producers against global competitors. Although these regulations create a relatively stable price level regarding the world market prices, they always create higher prices. For instance, in 2013, the price of refined sugar in the US was 66.02 cents/pound compared to 22.84 cents/pound in the world markets. At the same time, the price of HFCS was 38.64 cents/pound, almost half the price of sugar in the US. This is the main reason the consumption or use of HFCS in the sweetener sector has increased so much today. The market share of HFCS was only 5% in 1975 but rose to 44% in 1989, and, today, this percentage is nearly 50%. Nevertheless, non-official figures

emphasize that the HFCS use rates are well above this level (Ma et al., 2014; Schmitz & Christian, 1993).

5. The Plague of the Age and Its Effects on Health

In step with the significant increase in HFCS production, the consumption of HFCS has increased in a similar way. The number one HFCS producer in the world is the US. Additionally, the US is the second largest HFCS consumer in the world after India (Barry et al., 1990; Korves, 2011). Thus, the most relevant questions are what is HFCS exactly and what does it do?

HFCS, known as the plague of the age, is different from normal sugar (Wellness Tips, 2007) because it is not a natural substance but an industrial food product. It is a chemical compound extracted from corn stalks through a secret process. HFCS contains harmful and toxic substances including mercury because chlorine alkaline, which is used to extract the corn extract, contains mercury. Cane sugar or beet sugar, namely sucrose, consists of two sugar molecules, 50% glucose and 50% fructose. The enzymes in the human digestive system break down sucrose into glucose and fructose and absorb it into the body. These rates, however, are not 50-50 in HFCS. The fructose ratio is around 80-90%, which makes HFCS something different from a nutrient. What it is, though, is unknown (Hyman, 2011; Pleunie, 2017).

Corn syrup is used as a thickener, sweetener, and moisturizer, especially in commercial foods. With the addition of corn syrup, products are able to maintain their freshness for long periods of time (Varzakas et al., 2012); they are more durable than traditional products, undesirable crystallization is inhibited, disadvantages such as adhesion and deterioration in packaging are eliminated, and products become easier to store and move. The most important advantage of HFCS is that it is 1.8 times sweeter than sugar and is produced 50% cheaper (Brown, 2019; Pleunie, 2017).

The fact that HFCS performs the same function as normal sugar makes it possible to commercially substitute the two substances and consumers hardly notice the difference. It is critical that HFCS does not have a different flavor when replacing sugar. Therefore, in the US and Canada, almost all non-alcoholic beverage and syrup producers have shifted from sugar to HFCS (Varzakas et al., 2012).

It is clear that the increase in HFCS production has contributed significantly to the US economy. The added value of HFCS production in last 20 years is 2.0% of the annual average of gross domestic product (GDP). It is estimated that this ratio will increase to 3% in the next 10 years. However, the increase in chronic health expenditures along with the increase in HFCS production is more striking. In 1998, expenditures on chronic health issues reached 9% of the GDP in the US. By 2018, this share increased to 14% (IBISWorld, 2017; Statista, 2018). Therefore, the economic gain obtained from HFCS production can turn into chronic diseases and

social costs resulting from the consumption of HFCS. As supported by the current findings, considered together, these costs surpass the economic gain.

The term chronic diseases is used for diseases that require long-term care and are very difficult if not impossible to recover from (Dalal, 2000). Such diseases are caused by a number of factors such as genetics, the environment, psychology, and nutrition. The share of HFCS in nutritional-based chronic diseases is prominent. Fructose, a stronger sweetener than glucose, is absorbed very quickly by blood circulation, unlike sugar. After it reaches the liver, it is converted into triglycerides, namely fat. This is the main cause of liver damage and fatty liver. HFCS has also been proven to cause many other illnesses including tooth decay, diabetes, heart disease, cancer, dementia and obesity. Thus, HFCS is a subject that should be carefully evaluated in terms of its costs on health (Hyman, 2011; Lustig, 2013).

In the US, the share of healthcare in the economy is increasingly growing, which means a greater economic activity compared to other sectors. For example, sectors such as the education, transportation and agriculture develop in line with economic growth, yet health care costs grow at a higher rate than the average (KFF, 2012). To illustrate, total health expenditures in the 1970s were around $74 billion, and health expenditures per capita were only $355; however, in 2016, total health expenditures reached $3.3 trillion and health expenditures per capita increased to $10,000. In other words, while the share of health services in economic activities was 6.9% in the 1970s, it reached the very high level of 17.9% in 2016. As Figure 5 shows, chronic health expenditure per capita, which was $266 in the 1970s, rose to $7.176 in 2016 (HealthData.gov, 2018; Peterson, 2018). The increase in chronic health expenditures in parallel to the increase in the consumption of HFCS is striking.

Figure 5. HFCS consumption and chronic health expenditures in the US
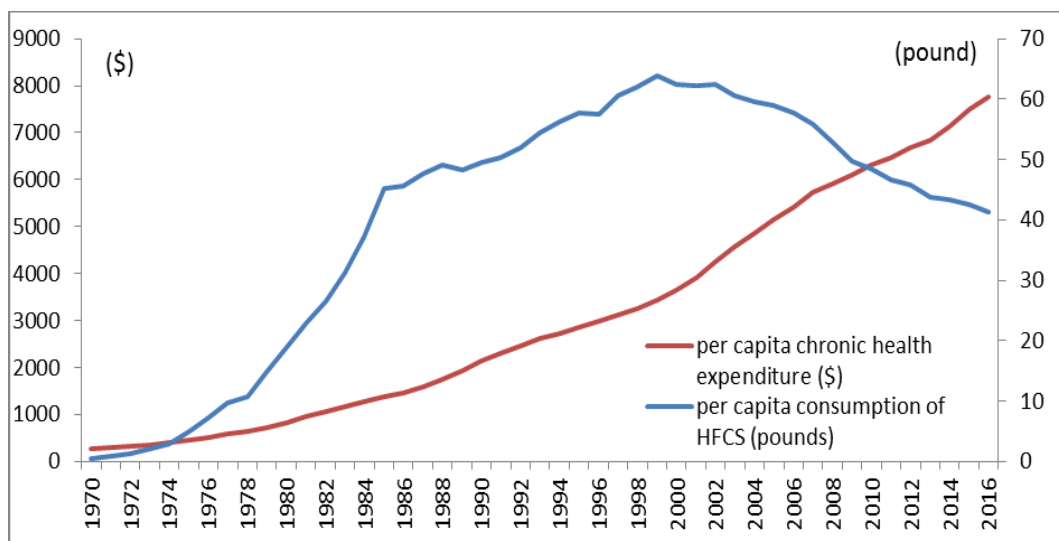
Source: USDA Economic Research Service (Per capita consumption of HFCS in the US from 1970 to 2016 -in pounds). Health expenditures (HealthData.gov/U.S. Chronic Disease Indicators -CDI).

Health Expenditures (Tracker Peterson Kaiser-health system tracker). The data is compiled by the authors and can be quoted with reference to it.

The results of the correlation analysis were also supportive of the current findings.

		Per capita Chronic Health Expenditures
Per capita Consumption of HFCS	r	.620**
	p	.000
	N	47

There was a significant positive correlation of 62% between per capita HFCS consumption and per capita chronic health expenditures (r = 0.620, p <0.001). It may be seen that, when per capita HFCS consumption increased by one unit, per capita health spending increased by 0.62 units. The display with the help of the scatterplot is as follows (Chart 3).

Chart 3. HFCS consumption and chronic health expenditures in the US
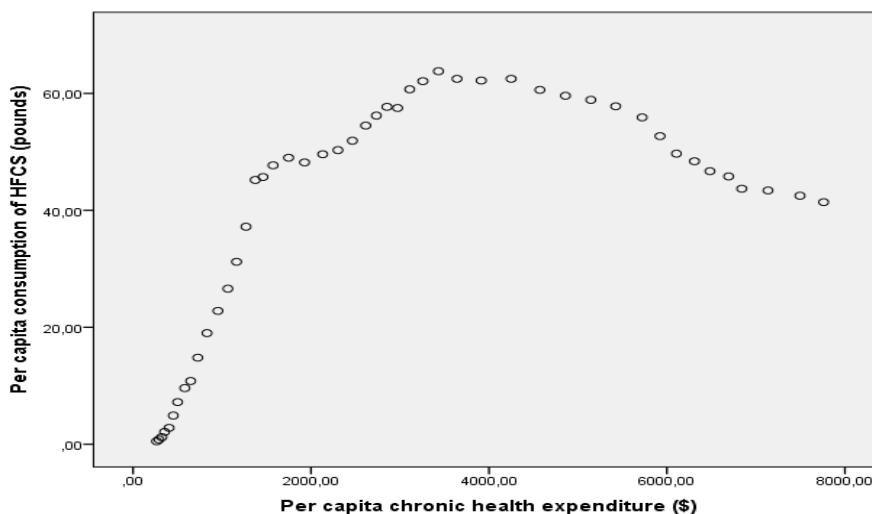
As one of the largest industries in the US, healthcare is steadily growing to meet the needs of an increasing population with an increasing life expectancy. The increase in chronic health expenditures in this growth is noteworthy (PAHO, 2001). Around 325 million adults in the US are struggling with chronic health problems. Seven out of 10 of the deaths in recent years were due to chronic diseases. (i) Lung and heart diseases, (ii) cancer, (iii) hypertension, (iv) Alzheimer's (v), and diabetes and obesity stand out as the most common chronic diseases in the US. The two most important are heart disease and cancer, which account for almost 46% of death cases. Three-quarters of the country's health expenditures are spent on chronic diseases. The annual cost of total cardiovascular disease is more than $400 billion. Cancer care costs are more than $200 billion, and the annual cost of diabetes is $245

billion. Obesity is a serious health problem in the US with more than 94 million people categorized as obese. The cost of obesity-related medical costs exceeds $180 billion annually. This leads to additional costs in terms of labor economics. Economy productivity is decreasing as people are allocating a significant part of their time to treatment (CDC, 2017; Fahey, 2017; Napalkov, 2009)

The harmful effects of HFCS, which turns chronic diseases into epidemics, have also been proven by studies. In a study conducted with rats, it was found that the body weight of male rats consuming HFCS increased more than the rats given the same amount of sugared water. The same situation was observed in female rats as well. Animals that consumed HFCS gained 48% more weight than those who did not consume it. According to Professor Bart Hoebel, the results were very surprising. Even when the rats were fed a high-fat diet, it was not possible to observe this result. It can be said that the consumption of HFCS may contribute to the incidence of obesity when these results are adapted to humans (Bocarsly et al., 2010; Ma et al., 2014).

In another study, in which pregnant rats were used, the status of the mother and the developing fetus was examined after the rats were fed on HFCS. The effects of fructose, which is found widely in fruit juices, carbonated beverages, and ready-to-eat foods, on the embryo and fetuses were investigated. It was found that the consumption of HFCS-supplemented foods negatively affected maternal metabolic parameters as well as the placenta and fetal development in the pregnancy period. The risk of postnatal illness was also found to increase (Ardebili, 2015).

In another study, the brains of HFCS-consuming rats showed signs of slowing down. The memories and learning abilities of the rats were found to diminish. In the long term, consuming HFCS negatively affected the ability of the brain to acquire and remember information (Agrawal & Pinilla, 2012). According to Goldman (2009), the mercury used in the creation of HFCS is a dangerous material. Even low dose microgram exposures in the womb were found to damage the brains of unborn children (Opalinski, 2012).

Many studies to date have shown that the consumption unnatural of sugar can cause pancreatic cancer. In a study conducted by the Nurses' Health Study in the US, during an 18-year follow-up, out of the 88.802 women that participated, 180 people were found to have pancreatic cancer. According to this study, tea sugar (sucrose) was not found to be associated with pancreatic cancer. However, corn syrup-rich diets significantly increased the likelihood of pancreatic cancer in a statistically significant manner. In the study titled Multiethnic Cohort, 434 out of 162,000 subjects who were followed for eight years were found to have pancreatic cancer. As a result of the analysis, abundant amounts of fructose in HFCS were found to cause pancreatic cancer. Researchers at the University of Los Angeles found that fructose accelerated the proliferation of cancer cells. In a study conducted on pancreas cell tumors, it was seen that fructose was used as an energy source by cancer cells and caused pancreatic cancer by disturbing glucose metabolism (Bulut, 2017; Michaud et al., 2002).

In another study a drink containing glucose fructose was given to healthy subjects and patients with pancreatic cancer. As a result, the fructose concentration which was 1.9+/-0.4 mM in the healthy volunteers before drinking increased to 16.3+/-1.2 mM in only 15 minutes. Fructose levels were also significantly higher in the volunteers with pancreatic cancer compared to the others (5.7+/-2.5 mM). This suggests that glucose fructose intake may have a significant effect on many other diseases, including pancreatic cancer (Hui et al., 2009).

HFCS (high fructose corn syrup) is mostly produced from corn. A significant proportion of sugar (fructose) in processed liquids and solid foods comes from corn, which is a genetically modified organism (GMO), just like the soya bean plant. Corn is a plant that can easily become infected by harmful microorganisms such as bacteria, fungi, viruses, and parasites. Aflatoxin, a fungus toxic that can cause liver cancer, is common in corn. This is also the reason why HFCS is claimed to be responsible for digestive infections and various types of cancer (Erk, 2017).

HFCS consumption causes elevated blood cholesterol levels and blood clots. HFCS inhibits the action of white blood cells that protect the body against infections. In a study conducted on patients with renal insufficiency, the uric acid ratio in the blood of the patients who consumed corn syrup was extremely high. No such adverse effects were found in the subjects that were fed with the equivalent amount of glucose or lactose (milk sugar) (Karaca, 2017).

The introduction of HFCS in 1980, and sweeteners, namely aspartame, in 1991, and the consumption of GMO products such as corn and soya bean doubling has caused serious threats to human health, a primary cause of the huge increase in chronic health expenditures in the US between 2000 and 2010. Studies conducted during the same period on this subject have shown that the number and quality of sperm in males dropped dramatically, and the risk of obesity and autism increased. The connection between low-quality sperm and the ratios of miscarriages support the findings related to HFCS damage (Dittmann, 2012).

Although there are a number of studies addressing the harms of HFCS in practice, there are also studies that claim that HFCS is not harmful, but a significant portion of these studies are supported by the US Corn Refiners Association. In addition, given that HFCS is made from genetically modified corn, the problems related to it are twice as bad. This can also explain how HFCS, a chemical substance, transforms chronic diseases into epidemics. Therefore, HFCS is a substance that needs to be vigorously avoided. As White puts it, experimental studies in the USA show that there is a significant causal relationship between glucose fructose consumption and chronic diseases (Esposito, 2016; White, 2013).

This result partly explains the explosion of chronic diseases in the US, where unprecedented levels of high blood pressure, obesity, diabetes (type II diabetes), and high cholesterol are observed. The US healthcare system is filled with health problems such as heart disease, stroke, kidney failure, gout, fatty liver, and reflux

disease (Lyons, 2010). The role of sweeteners, especially HFCS consumption, is obvious in the increase of these problems. A product like HFCS, which was not available before 1970 in the US and whose usage increased 1,000 percent over the last 30 years should be considered closely (BWI, 2007). These results need to be analyzed carefully in terms of public health. The new food technology applied to meet the growing population needs is offering unhealthy food. This may lead to future problems that cannot even be imagined (Ackerman, 2002).

6. Discussion

Sugar regulations in every country are different. For instance, the EU has legislated limitations on the quantity of the HFCS produced. Japan has also put quotas on HFCS production to protect the market share of sugar. However, in the US, current sugar policies are supported by HFCS producers because they benefit from high sugar prices (Bennett, 2010; Mitchell, 2005). HFCS is prohibited in France, the Netherlands, Austria, Ireland, Sweden, Greece, Portugal, Slovenia, Denmark, and the United Kingdom. The US dropped their 10% quota to 8%, while Turkey increased its quota from 10% to 15%. In Turkey, the government increased the starch-based sugar quota to 312,500 tons compared to 56 thousand tons in Germany, 53 thousand tons in Spain, and 32 thousand tons in Italy. Starch-based sugar consumption per capita in Europe is one kilogram, while in Turkey it is around six kilograms (Niemi, 2003; Yalçın, 2017).

The need for sugar in the world and in Turkey increases daily. Today, the Turkish sugar market is under pressure from powers including the International Monetary Fund (IMF), the World Bank and multinational corporation. These powers actualize the policies they want in target countries through local politicians. Governments make laws and make bureaucracy arrangements, and interest groups share rents. The Sugar Institution, a regulatory and supervisory authority founded in Turkey in 2001, is a clear example of this situation. The objective of this authority is to meet the domestic sugar demand in Turkey with domestic production. In addition, it aims to increase exportation and maintain price stability in sugar production. However, the price of sugar has become even more expensive with the establishment of this regulatory authority. Turkey became familiar with concepts including sugar importing, illegal sugar, HFCS production, and HFCS imports, which it had not done before (Draycott, 2007; Kaymakçı, 2018).

The share of HFCS in total sugar production is expressed as a "quota". The EU lifted its limits on sugar production and exports as of October 1, 2017, ending sugar quotas. European sugar producers can produce and export without restriction. Isoglucose production, however, seems to significantly increase market share in Europe, taking the place of sucrose, or sugar (Bache et al., 2014; European Commission, 2017).

Isoglucose. according to EU law, is glucose fructose syrup or high fructose corn syrup. The European starch industry is expected to increase the production of isoglucose to above the current production level of 757.000 tons. It is estimated that

the production of isoglucose will reach 986.000 tons by 2028 due to market demand (Figure 6). Intensive demands from food and beverage manufacturers (soft drinks, ice cream, etc.) are particularly significant in this increase (Starch-Europe, 2017; Statista, 2020).

Figure 6. Forecast volume of high fructose corn syrup produced in the European Union (EU 27) from 2015 to 2028
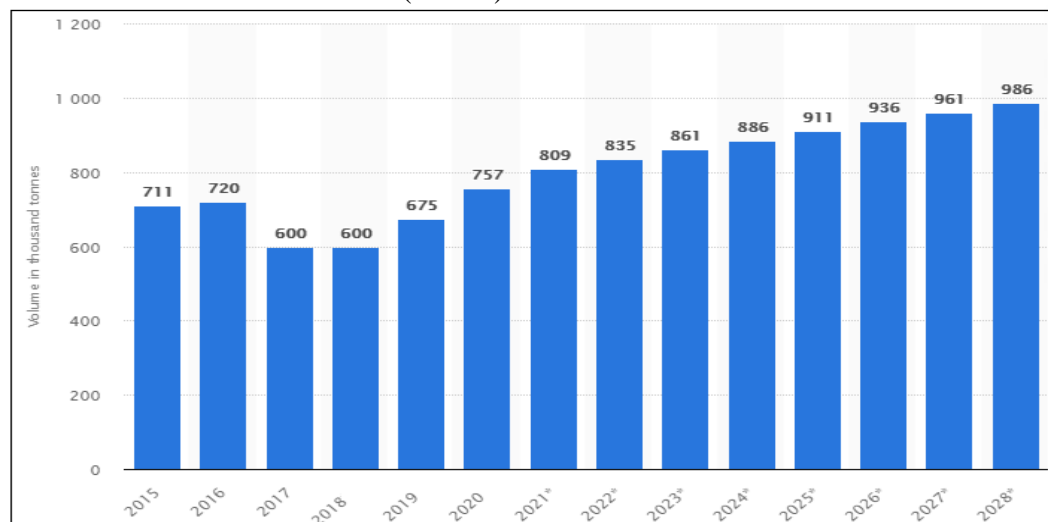

Source: (Statista, 2020).

The European Commission stated that it is tracking the consequences of abolishing quotas in the sugar and sweetener markets. Scientific evidence and policies are also being comprehensively investigated in terms of the possibility that high fructose causes excessive weight, obesity, and other health problems. The Commission has started to work towards this aim. In this process, it is necessary for all ingredients to be clearly stated on the labels of foodstuffs. By doing so, the aim is that consumers gain correct information about sugar content (European Parliament, 2017).

When statements are evaluated in terms of political economy, the concept of efficiency and productivity emerges in the literature. The main objective of the economy is to provide efficiency. Efficiency is to do the right job, that is, to produce sugar. Productivity, on the other hand, is to do the job correctly, in other words, to carry out production at the lowest cost. However, the concept of productivity does not include efficiency. What is important in productivity is low cost and high profits. HFCS production implies this. Health problems that may arise due to the use of HFCS may lead to a significant burden on the economy in the coming periods.

Furthermore, the third best policies makes it possible to better understand the HFCS problem. The third best policy depends on the amount of information available. It reveals the difference between a lack of information and a scarcity of

information. It deals with situations where certainty is missing. Thus, the third best policies are combined with the first and second best policies (Nar, 2013).

Figure 7. Third best policy
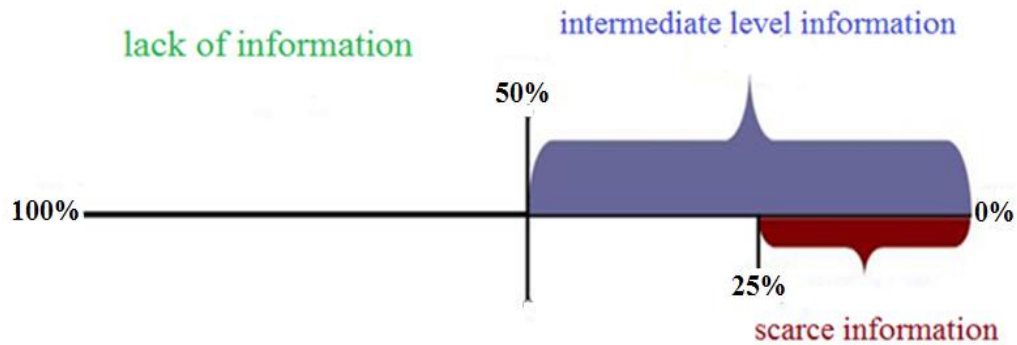
Source: (Nar, 2013). The Third Best Policy is a combination of first- and second-best policies. It reveals the difference between a lack of information and a scarcity of information.

According to the theory put forward by McGuire (1975), information is neither complete, as in the first best policy-market economy (100%), nor is it scarce (25%), as in the second best policy-public economy. The economy has an average information level (0-50%). Nevertheless, the information is raw and not compiled. The average information level provides information about the rest of the economy. When the issue of risks and probability estimates are added, the economy reaches effectiveness (Figure 7). Thus, the third best policy combines the first and second best policies. When not enough information is known about the rest of the economy, it is possible not to tax sugar and ignore externalities including the tax loss of the government. This theory shows that the analysis based on the third best of the rest of the economy may actually be useful.

The debate in the United States over whether HFCS may be unhealthy and harmful or not remains fierce. One of the main reasons for the decline in production today is that people are becoming more aware and reducing their consumption because what exactly this substance is still an unknown issue. In the European Union countries, HFCS is expected to play a larger role in the market in the coming period. The EU Commission has started to examine the effects on health, and these studies are still ongoing. Therefore, since there is not enough information about corn syrup (sweeteners), no enforcement of taxes on sugar, the supporting of sugar agriculture, the subsidizing of it, and the providing of cheap credit will be extremely useful in terms of the rest of the economy. In this way, tax and similar losses suffered by the government will be much less than the health costs that HFCS is expected to cause. Under the high-profit margin, the emergence of human costs will also be avoided.

7. Conclusion

The concept of public benefit has led to the birth of public regulatory authorities. However, these institutions have been made a part of corruption and irregularity with numerous laws. However, regulations must be prepared in accordance with the legislation and requirements of social, economic, and commercial life. The supervision of these institutions should be transparent. The relationship between the government and the regulator should be clearly defined. It is important to strengthen civil society organizations and the independent media for this purpose since most of the social facts are obtained from the media first hand, as stated by McChesney. Nonetheless, capitalist media communication systems are dominated by a handful of corporations and global oligarchs. The media should be protected from political supervision, and instead supervised by professional organizations and not allowed to engage in activities other than primary activities (trade, construction, energy, etc.)

This study of US sugar markets revealed that the US Agricultural Agency prefers to prioritize the interest of a handful of minorities instead of public interest. This confirms the above findings and opens the way for the wide use of the HFCS substance in economies. The regulations in this area in the EU are carried out by the Commission. By October 2017, various EU countries banned the production of HFCS while others restricted it with quotas. However, it is clear that other EU countries will not be able to resist such a profitable item in the future. In Turkey, when the relevant regulatory authority became operational, sugar production first decreased, and then a boom in HFCS production and imports was experienced.

According to Dr. Mark Hymana, director of the Cleveland Clinic Medical Center in the USA and one of the many doctors who opposes HFCS, this syrup represents fat, salt, chemicals, mercury, and dangerous and very low-quality food. It should definitely be avoided. However, the Corn Refiners Association has already targeted 700,000 medical doctors regarding the safety of the product. The US food industry accounts for 17% of the economy; in fact, this sector is so profitable that millions of dollars spent on convincing consumers and healthcare professionals of the benefits of this product.

In order to hide the truth, HFCS may be released to the market under misleading labels such as natural sugar, corn sugar, corn syrup, inulin, starch based sugar, iso-glucose, dahlia syrup, tapioca syrup, glucose syrup, crystalline fructose, agave syrup, and even fruit fructose. By doing so, the aim is to conceal the reality of HFCS which actually leads to chronic diseases such as type 2 diabetes, heart disease, metabolic syndrome, osteoporosis, and cancer, and turn the negative perception in society into a positive one (Wellness Tips, 2007). In addition, the production process of this material is also unknown. Just like Pepsi and Coca-Cola products, production details are confidential. HFCS producers have defended the use of mercury in the production process, stating that it is not harmful, which is interesting. Expressions such as "the fish we eat may also contain mercury" are

meaningless in such situations. Extreme profit has also blinded the eyes of the industry. Giving weight to sugar cultivation is important for creating healthy and sustainable generations. At this point, it is also important for consumers to choose more expensive sugar-based products instead of cheaper HFCS products that leave a bitter taste on the palate. Since it is not possible to eliminate the production of HFCS, the production of these substances should be limited to a minimum level. In addition, pregnant women, children, and people with health issues should be prevented from consuming this substance. In terms of this substance, which is said to have turned chronic diseases into epidemics, the economic benefits should be weighed against the social costs.

REFERENCES

Ackerman, J. (2002). Food: How altered? *National Geographic Magazine*. https: //www.nationalgeographic.com/environment/global-warming/food- how- altered/. Access: 22 May 2018.

Agrawal, R., & Pinilla, F.G. (2012). Metabolic syndrome in the brain: Deficiency in omega-3 fatty acid exacerbates dysfunctions in insulin receptor signall ing and cognition. *The Journal of Physiology*, *590*(10), 2485–2499. doi: 10.1113/ jphysiol.2012.230078.

Allen, F., & Gale, D. (2004). Financial intermediaries and markets. *Econometrica*, *72*(4),1023–1061. doi: 10.1111/J.1468-0262.2004.00525.X.

Ardebili, E.Y. (2015). Investigation of the effects of consumption high corn fruc- tose syrup on maternal and fetus of rats ruring gestation. *Post Graduate Thesis,* Hacettepe University. http://www. /11655/2021/6a06721c-d716- 4592-8a87-50fb5ba02d8b.pdf.

Bache, I., Bulmer, S., George, S., & Parker, O. (2014). *Politics in the European Union.* Oxford: Oxford University Press.

Baker, V., Gvakharia, M., Rone, H., Manalad, J., & Adamson. D. (2008). Econom ic cost for implementation of the U.S. Food & Drug Administration's Code of Federal Regulations. *American Society for Reproductive Medicine, 90*(3), 537–545.

Barry, R., Angelo, L., Buzzanell, P., & Gray, F. (1990). *Sugar: Background for 1990 farm legislation.* Economic Research Service. https://www.ers.usda. gov

BeMiller, J., &Whistler, R. (2009). *Starch: Chemistry and technology.* Macmillan Publishing, New York.

Bennett, R.M.(2010). *Food fights: International regimes and the politics of agricultural trade disputes.* Routledge.

Bocarsly, M.E., Powell, E.S., Avena, N.M., & Hoebel, B.G. (2010). High-fructose corn syrup causes characteristics of obesity in rats: Increased body weight, body fat and triglyceride levels. *Pharmacol Biochem Behavior,97*(1),101– 106. DOI:10.1016/ j.pbb.2010. 02.012.

Bracking, S. (2009). *Money and power: Great predators in the political economy of development.* Pluto Press.

Brown, A.C. (2019). *Understanding food: Principles and preparation.* Boston, MA: Cengage Learning.

Bulut, Y. (2017). NBŞ nişasta bazlı şeker ve kanser. *Star Gazetesi*. http://www. star.com.tr/yazar/nbs-nisasta-bazli-seker. Access:12 August 2017.

Burstein, P., & Linton, A. (2002). The impact of political parties, interest groups, and social movement organizations on public policy. *Social Forces, 81*(2), 380–408. DOI:10.1353/sof.2003.0004

BWI (Bread for the world institute). (2007). Healthy food, farms & families: Hunger 2007. *17th Annual Report on The State of World Hunger.*

CDC (Center for Disease Control and Prevention). (2017). *Chronic disease prevention and health promotion.* Atlanta-U.S. Department of Health & Human Services. https://www. cdc.gov/chronicdisease/index.htm. Access: 26 Nov 2017.

CFTC. (2018). *Reauthorization. agriculture, nutrition, forestry*. https://www.agri culture. senate.gov/issues/cftc. Access: 05 Jan 2018.

Congleton, R., & Hillman, A. (2015). *Companion to the political economy of rent seeking.* Cheltenham, Edward Elgar Publishing.

Dalal, A.K. (2000). Living with a chronic disease: Healing and psychological adjustment in indian society. *Psychology and Developing Societies,12*(1), 68–81.DOI:10.1177/097133360001200105.

Davis, C.,&Abraham, J. (2013).*Unhealthy pharmaceutical regulation:Innovation, Politics and promissory science.* New York: Palgrave Macmillan. ISBN: 978–0-230–00866–3

Demirgüç, K.A., & Detragiache, E. (2002). Does deposit insurance increase bank ing system stability? An empirical investigation. *Journal of Monetary Economics*, *49*(1),1373–1406. doi.org/10.1016/S0304-3932(02)00171-X

Dittmann, R. (2012). *Brighton baby a revolutionary organic approach to having an extraordinary child.* Balboa Press.

Draycott, P. (2007). *Sugar beet*. Blackwell Publishing Ltd.

Erk, O. (2017). *Sağlığını yeniden keşfet*. Ankara: Nobel Yayınevi.

Esposito, J. (2016). *Prescription for extreme health.* Health Plus Publishing.

EU Sugar Policy. (2018). *EU-mercosur negotiations round: Crunch time.* http:// sugarcane.org/global-policies/policies-in-the. Access: 09 Feb 2018.

European Commission. (2017). The end of the sugar production quotas in the EU. *European Commission Press Release*, *29 September*. Brussels. http://euro pa.eu/rapid/press-release_MEMO-17-3488. Access: 11 May 2018.

European Parliament. (2017). *Parliamentary questions*. http://www.europarl.euro pa.eu/sides/ Access:17 Apr 2018.

Fahey, D. (2017). *Cost and consequences of chronic disease management*. Open Presentation, National University of Ireland. http://slideplayer.com/slide/ 2801093/. Access: 19 Oct 2017.

Grossmann, M. (2012). Interest group influence on US policy change: An assessment based on policy history. *Interest Groups & Advocacy*, *1*(2), 171–192. doi:10.1057/iga.2012.9

HealthData.gov. U.S. (2018). *Department of health & human services*. https://ww w.health data.gov/. Access: 16 Jan 2018.

Herbst, M. (2013). The bank bailout cost US taxpayers nothing? Think again. *The Guardian*,Tue 28 May. https://www.theguardian.com/commentisfree/2013 /may/28/bank-bailout-cost-taxpayers. Access: 18 February 2018.

Hui, H., Huang, D., McArthur, D., Nissen, N., Boros, L., & Heaney, A.P. (2009). Direct spectrophotometric determination of serum fructose in pancreatic cancer patients. *Pancreas*, *38*(6), 706–712. DOI: 10.1097/MPA. 0b013e3 181a7c6

Hyman, M. (2011). *5 reasons high fructose corn syrup will kill you*. Cleveland Clinic Center. http://2011/05/13/5-reasons-high-fructose-corn-syrup-will-kill-you. Access: 27 Dec 2017.

IEG Vantage.(2018). *Sugar & cocoa-agribusiness intelligence*. https://agribusines

intelligence.informa.com/products-and-services/data-and-analysis/iegvanta ge/ sugar-cocoa. Access: 16 April 2018.

IBISWorld. (2017). High Fructose corn syrup production (US): Industry report. *Market Research Reports*. https://www.ibisworld.com/industry- trends/ specialize dmarket-research. Access: 18 March 2018.

IronTriangles.(2018). *Study notes*. https://www.tutor2u.net/politics/reference/iron triangles. Access: 08 March 2018.

Joskow, P.L., & Noll, R. (1981). Regulation in theory and practice: An overwiew In. G. Fromm (ed.), *Studies in public regulation* (p.1–66). Cambridge: The MIT Press.

Jurenas, R. (2004). Sugar policy issues. In. D.L. Sandrino (ed.), *Farm Economic issues* (p.130–152). Newyork: Nova Science Publishers,

Karaca, Y. (2017). NBŞ şeker mi zehir mi? *Yeni Mesaj Gazetesi*. http://www.ye nimesaj.com. Access:11 Feb 2018.

Karaoğlu, M. (2011). Yüksek früktoz mısır şurubu. *Gıda Mühendisliği Dergisi*, *14*(33),1–13. 938b20f9f210570_ek.pdf?dergi=45

Kaymakçı, M. (2018). Hangi şeker daha tehlikeli? Nişasta bazlı şeker. *E-Gazete*. https://www.yenivatan.at/hangi-seker. Access:14 Feb 2018.

Keeney, R.L. (1997). Estimating fatalities ınduced by the economic costs of regulations. *Journal of Risk and Uncertainty, 14*(1), 5–23. org/stable/4176 0838

KFF (Kaiser Family Foundation). (2012). How much does the U.S. spend on health and how has it changed? *Report,* Word Press. https://www.kff.org /health-costs/

Kıymaz, T. (2002). *Şeker politikalarında yeni yönelimler ve Türkiye'nin konumu*. DPT Yayınları. http://Tarim.Kalkinma.Gov.Tr/2016/02/Tkiymaz.

Korves, R. (2011). *High fructose corn syrup (HFCS) in the U.S. caloric sweetener supply*. Corn Refiners Association. http://www.cornnaturally.com.

Kothari, V. (2010). *Executive greed: Examining business failures that contributed to the economic crisis*. New York: Palgrave Macmillan.

Lakhani, H. (1980). Automobile fuel regulations: Direct benefit-cost analysis. *Applied Energy, 6*(4), 301–313. doi.org/10.1016/0306-2619(80)90020-3

Lambsdorff, J.G. (2002). Corruption and rent-seeking. *Public Choice*, *113*(1-2), 97–125. DOI: 10.1023/A:1020320327526

Landis, M. (1987). *The politics of chaos*. Susquehanna University Press.

Lee, M. (2002). The effect of sulfur regulations on the U.S. electric power industry: A generalized cost approach. *Energy Economics, 24*(5), 491–508. DOI:10.1016/S0140-9883(02)00011-7

Lust, H.C. (1927). *abridged reports of the interstate commerce commission and current digest of decisions under the interstate commerce act.* The Traffic Law Book Company.

Lustig, R. (2013). *Fat chance: Beating the odds against sugar, processed food, obesity,and disease*. Penguin Publishing.

Lyons, F. (2010). *Fructose exposed: The sweet truth about America's expanding waistline and failing health.* Xulon Press.

Ma, L., Ahmed, E., & Fagan, J. (2014). *High-fructose corn syrup: Health and economic effects.* The State University of New Jersey. doi:10.7282/T3 G162S6

McConnell, M.J. (2017). *U.S. Sugar Production*. United States Department of Agriculture, USDA. https://www.ers.usda.gov/publications

Mesquit, E. (2017). *Political economy for public policy.* Princeton University.

Michaud, D.S., Liu, S., Giovannucci, E., Willett, W.C., Colditz, G.A., & Fuchs, C.S. (2002). Dietary sugar, glycemic load, and pancreatic cancer risk in a prospective study. *J Natl Cancer Inst*, *94*(17),1293–1300. PMID: 122088 94.

Milgrom, P., & Roberts, J. (1998). The internal politics of the firm. In. S. Bowles, M. Franzini & U. Pagano (eds.), *The politics and economics of power* (p.39–52). New York: Taylor & Francis Group.

Mitchell, D.O. (2005). Sugar policies: An opportunity for change. In. A. Aksoy & J.C. Beghin (eds.), *Global agricultural trade and developing countries* (p.141–160). Washington, DC.

Mueller, D. (2011). The importance of self-interest and public interest in politics. *Critical Review, 23*(3), 321–338. doi.org/10.1080/08913811.2011.635870

Napalkov, N.P. (2009). Prevention and control of non-communicable disease. In. B.P. Mansourian (ed.), *Global perspectives in health* (p.283–300). United Kingdom: Eolss Publisher.

Nar, M. (2013). *Kamu ekonomisi: Ekonomik etkinlik ve vergileme*. Ankara: Seçkin Yayıncılık.

Nar, M., & Nar, M.Ş. (2019). An updated assessment of the OECD's quality of life index. *Problemy Ekorozwoju–Problems of Sustainable Development*, *4*(1),7-18.

Niemi, E. (2003). *The EU sugar regime and forthcoming wto obligations*.Finland: MTT Economic Research.

OECD. (1998). *Sugar policy reform: Competition policy issues*. Committee for agriculture.

Opalinski, H.A.(2012). High fructose corn syrup, mercury, and autism is there a link?*Journal of the American Academy of Special EducationProfessionals, 1*(2), 113–129. https://files.eric.ed.gov/fulltext/ EJ1135692.

PAHO (Pan American Health Organization). (2001). *Investment in health: Social and economic returns*. Scientific and Technical Publication.

Pawłowski, A. (2009).The sustainable development revolution. *Problemy*

Ekorozwoju-Problems of Sustainable Development, 4(1), 65–76. https://Ssrn.Com/Abstract= 1481723.

Pawłowski, A. (2013). Sustainable development and globalization. *Problemy Ekorozwoju-Problems of Sustainable Development, 8*(2), 5–16. https://ssrn.com/ abstract=2292396.

Peltzman, S. (1976). Toward a more general theory of regulation. *Journal of Law Economics*, 19(2), 211–240. doi.org/10.1086/466865.

Peterson, K. (2018). *Health system tracker*. https://www.healthsystemtracker. Access: 08 Feb 2018.

Pleunie, H. (2017). Sweetness and satiety. In. B. Tepper & M. Yeomans (eds.), *Flavor, satiety and food intake* (p.57–88). John Wiley & Sons.

Pomeranz, J.L. (2016). *Food law for public health*. Oxford University Press.

Posner, R.A. (1999). *Natural monopoly and its regulation*. Publisher: Cato Inst.

Richardson, B. (2009). *Sugar: Refined power in a global regime*. Palgrave.

Schmitz, A., & Christian, D. (1993). The economics and politics of U.S sugar policy. In. S.V. Marks & K.E. Maskus (eds.), *The economics and politics of world sugar policies* (p.49–78). The University of Michigan Press.

Sever, Ç. (2015). Türkiye'de düzenleyici kurumların yapısı, işlevi ve dönüşümü. *AÜHFD*, 64(1), 195-236. DOI: 10.1501/Hukfak_0000001777.

Starch-Europe. (2017). *The end of EU sugar production quotas and its impact on sugar consumption in the EU*. https://starch.eu/blog/2017/06/20/starch-europe. Access: 20 June 2018.

Statista. (2018). *Health system: National health expenditure*. The Statistics and Studies Sources, (printed). https://www.statista.com.

Statista. (2020). *Forecast volume of high fructose corn syrup produced in the European Union (EU 27) from 2015 to 2028*. https://www.statista.com/ statistics.

Stigler, G.J. (1971). The theory of economic regulation. *The Bell Journal of Economics and Management Science*, 2(1), 3–21. DOI: 10.2307/3003160.

Taubes, G. (2007). *Good calories, bad calories: Challenging the conventional wisdom on diet, weight control, and disease*. Borzoi Book, New York.

Tullock, G. (1989). *The economics of special privilege and rent seeking*. Kluwer Academic Publishers.

Tullock, G., Seldon, A., & Brady, G.L. (2002). *Government failure: A primer in public choice*. Washington, DC: Cato Institute.

Tullock, G. (2007). Comment: Foreign policy and Regulation. In. P. Bernholz & R. Vaubel (eds.), *Political competition and economic requlation* (p.49-52). Routledge, New York.

USDA. (1996). *Agricultural outlook special supplement.*United States Department of Agriculture. Economic Research Service.

USDA. (2018). *Sugar and sweeteners outlook*. United States Department of Agriculture, Economic Research Service.

Valdez, S., & Molyneux, P. (2015). *An introduction to global financial markets*. Palgrave Macmillan.

Varzakas, T., Labropoulos, A., & Anestis, S. (2012). Syrup. In. T. Varzakas, A. Labropoulos, & S. Anestis (eds.), *Sweeteners: Nutritional aspects,*

applications, and production technology (p.147–175). CRC Press.

Walters, S.J.K. (1993). *Enterprise, government, and the public.* McGraw-Hill.

Wellness Tips. (2007). *High fructose corn syrup (glucose-fructose).* http://www. wellnesstips.ca/high%20fructose%20corn%20syrup.htm. Access:17 April 2017.

White, J.S. (2013). Challenging the fructose hypothesis: New perspectives on fructose consumption and metabolism. *Advances in Nutrition*, *4*(2), 246-256. doi.org/10.3945/an.112.003137.

White, J.S. (2014). Sucrose, HFCS, and fructose: History, manufacture, composition, applications, and production. In. J.M. Rippe (ed.), *Fructose, high fructose corn syrup, sucrose and health* (p.13–33*).* New York: Springer.

Wiltgen, T.J. (2007). An economic history of the United States sugar program. *Thesis.* Montana State University. https://scholarworks. montana.edu/ xmlui/han.

Winden, F. (2004). Interest group behavior and ınfluence. In. C. Rowley & F. Schneider (eds.), *The encyclopedia of public choice* (p.118–128). Kluwer Academic Publishers.

Yalçın, S. (2017). Açtırma bayramlık ağzımı. *Sözcü.* https://www.sozcu.com.tr/ 2017/yazarlar/soner-yalcin/. Access: 11 July 2017.

Yandle, B. (2001). Public choice and the environment. In. WF. Shughart & L. Razzolini (eds.), *The elgar companion to public choice* (p.590–610). Edward Elgar Publishing.