

Sugar Production, Consumption, and Consumer Expenditure Analysis

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ABSTRACT

The paper examines, firstly, the connection among sugar production, sugar consumption and population number. Secondly, it highlights the relationship between sugar consumption and the weight of sugar and confectionery consumer expenditure in the food and non-alcoholic beverages consumer expenditure category as well as in disposable income. Two matrices of countries were proposed based on the sugar consumption and the weight of sugar and confectionery consumer expenditure in the food and non-alcoholic beverages consumer expenditure category and in disposable income levels. Thirdly, an analysis of sugar production, sugar consumption and population number dynamics of four most relevant countries was made, along with testing the correlation among sugar production, sugar consumption, and population number growth/decrease rates

Keywords: Correlation, Cultural Model, Decrease Rate, Disposable Income, Dynamics, Growth Rate, Matrix of Countries, Median, Population Number, Sugar and Confectionery, Sugarbeet, Sugarcane

INTRODUCTION

Sugar is one of the best-known food products and it is consumed daily by many living organisms, including the human being. It is widespread in nature, and it can be found in animals' blood, raw food such as honey, vegetables, fruits, seeds, etc. (Clarke, 1993) as well as in processed food, for instance sugar confectionery, alcoholic and non-alcoholic beverages, e.g. unfermented sugar in wine (Vlahović, Potrebić & Jeločnik, 2012), apple juice (Gupta, Singh & Thakur, 2009), etc.

Sugar is mainly produced from sugarcane and sugarbeet, but in smaller quantities also from palm, millet, sorghum, maple, dates, carob, grapes, etc. (Yudkin, 2013).

Sugarcane was used to produce sugar around 2500 years ago in India and China. It seems that its origins are in India and New Guinea and was brought in Europe and other regions by Alexander the Great in 325 BC (James, 2004).

Sugarcane is grown in tropical and subtropical regions between about 35° latitude north and 35° latitude south of the equator, in

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countries such as India, China, Brazil, Pakistan, the United States, Thailand, Mexico, Argentina, Jamaica, Cuba, Puerto Rico, South Africa, Egypt, Australia, etc. (Yadav, Jain & Rai, 2011). Its main components are water (70-72%), fibers (12.5-17.5%) and sugars (11-14%) such as sucrose, dextrose and fructose (Panda, 2011).

There are different sugarcane varieties, but some modern sugarcane varieties with improved characteristics (disease resistance) obtained by hybridization are predominantly used (Ramdoyal & Badaloo, 2002).

Nowadays, sugarcane is used not only to produce sugar, but also to obtain biomass for energy, along with sorghum and maize, due to its high photosynthetic efficiency (Johnson & Batidzirai, 2012).

Sugarbeet cultivation has grown in importance since 1747, when sucrose was discovered in sugarbeet by the German chemist Andreas Marggraf. Thereafter, other scientists have developed new methods to extract the sugar from sugarbeet and have extended them at an industrial level. The main components of sugarbeet are water (75%), sucrose (17.5%), pectin (2.4%), and cellulose (1.2%) (Asadi, 2007; Organisation for Economic Co-operation and Development, 2006).

Sugarbeet grows in temperate zones and it can adapt to cold and warm climates (in 2007 the tropical sugarbeet was introduced in India). Therefore, it is cultivated in countries such as European Union states, the United States, Russia, Ukraine, Turkey, China, Israel, Japan, Morocco, Pakistan, Iran, Egypt, India, etc. (Asadi, 2007; El Bassam, 2010).

The residues from the sugar industry which processes the sugarbeet are destined for animal feed, yeast, amino acid and ethanol production, etc., and also to be transformed into biogas so as to cover the sugar factories and/or countries' energy needs (Ortner, Drosch, Stoyanova & Bochmann, 2013).

However, there are countries that have appropriate climatic conditions for the cultivation of both sugarcane and sugarbeet, for instance Spain, Pakistan, Morocco, Iran, Egypt, the United States, etc. (Asadi, 2007).

Both conventional and organic agriculture is used for sugarcane and sugarbeet production. The first organic production of sugarcane was started in Mauritius, Madagascar, India, the Philippines, Argentina, etc. and, in the case of sugarbeet, in Chile, Sweden, Switzerland, United Kingdom, Denmark, etc. (Cheesman, 2004).

Depending on the refining process, sugar contains between 96% and 99% sucrose, which is also its chemical name (Belitz, Grosch & Schieberle 2004; Davidson, 2014). Sucrose is a non-reducing disaccharide which is made up of fructose and glucose (dextrose), two reducing monosaccharides (Edwards, 2000).

There are different types of sugar according to refining grade (raw and refined sugar), color (white and brown sugar), consistency (solid and liquid sugar), crystal size (preserving, granulated, caster, icing, candy, and barley sugar), etc. (Belitz, Grosch & Schieberle 2004; Davidson, 2014; Sizer & Whitney, 2014).

For humans, if its consumption exceeds some limits, sugar represents an important factor which causes diseases such as type 2 diabetes, obesity, cardiovascular disease, colon cancer, metabolic syndrome, coronary heart disease, hyperlipidemia, atherosclerosis, gum disease, etc. and increases the risk of Crohn's disease, breast cancer, etc. (Cruise, 2009; Grimes, 2009; Leiper, Rushworth & Rhodes, 2010; Raben & Hermansen, 2006; Sherwood, Senso, Fleming, & Roeder, 2013; Sizer, Whitney & Piché, 2012; Stylianopoulos, 2009).

The importance of sugar for mankind is given by that fact that it is produced in numerous countries (at least 85 states) and it is consumed by people in any country, irrespective of religion, age, gender, social class, etc.

Taking into account the above aspects, the present paper has two main goals. The first goal is to identify some correlations among sugar production, sugar consumption, population number, and the weight of sugar and confectionery consumer expenditure in the food and non-alcoholic beverages consumer expenditure category and in disposable income, by analyzing statistical data from 112 countries.

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