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The relation between price setting in markets and asymmetries of systems of measurement of goods

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ABSTRACT

Markets, in an increasingly globalized world, have still dissimilar systems of measurement of goods due to different historical developmental paths of nations. A problem in economics is *whether* and *how* these asymmetries of systems of measurement of goods affect the prices in markets. The present study confronts this problem here by analyzing some prices of goods in U.S. and Italian economies that apply different systems of measurement of mass and liquid (*i.e.*, United States Customary System *vs.* Metric System). The inductive study analyses the prices of milk, per gallon and liter, and the prices of a consumption bundle of fresh vegetables and fruit, per pound and kg, between the USA and Italy. The statistical evidence seems in general to support the hypothesis that differences of prices per same quantity and/or volume of good can be also explained by asymmetries in systems of measurement adopted in markets. In particular, results show that markets with basic units of measurement of mass and/or liquid having more quantity of good, *e.g.* kg rather than pound (0.4535kg) and/or gallon (3.78 Liter) rather than liter, induce lower levels of average price per same quantity, *ceteris paribus*. These findings may be due to *relativity* of cognitive processes of decision makers, which apply frugal way of reasoning in price setting, based on satisficing behaviour and bounded rationality, by associating a legal basic unit of measurement of mass and/or liquid to an official monetary unit. Hence, this study shows that basic units of measurement of goods with more quantity seem to generate lower average prices in markets and, as a consequence, higher benefits for consumers. The main aim of this article is therefore to clarify and to generalize whenever possible, the relation between dissimilar systems of measurement of goods and price setting in markets of different countries.

1. Overview of the problem

Different theoretical frameworks in the economic literature explain the decision making of economic subjects with respect to prices (Oxenfeldt, 1973; Tellis, 1986; Morris & Calantone, 1990; Noble & Gruca, 1999; Litsios, 2013; Rather, Durai, & Ramachandran, 2015). In general, research of market prices considers a rational behavior of economic agents, though some inconsistencies between economic theory and real price setting are present in decision making process (Hall & Hitch, 1939). Many studies to pricing are mainly based on descriptive approaches of pricing practices or normative frameworks to offer instructions on rational price-setting behavior of economic subjects (Ingenbleek, 2007; Iyer, Xiao, Sharma, & Nicholson, 2015). Normative models of pricing require detailed information of demand and supply of goods as well as accurate

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projections of cost and demand function for supporting appropriate decisions (Dutta, Bergen, Levy, Ritson, & Zbaracki, 2002; Lancioni, 2005). As a matter of fact, managers do not develop elaborate pricing plans for their products and deviate from optimal behavior during their decisions of price setting due to the lack of information (*c.f.,* Iyer et al., 2015; Lancioni, 2005; Ingenbleek, 2007; Urbany, 2001; Liozu, 2013).

This growing body of economic and managerial literature has also analyzed different factors affecting price setting of decision makers (*cf.,* Forman and Hunt, 2005, Gärling, Gamble, & Juliusson, 2007; Voeth and Herbst, 2006). However, a comprehensive framework and critical analysis on *how* asymmetries of systems of measurement of goods affect the price setting in markets are unknown.

This paper confronts the problem here by developing a theoretical framework, which endeavors to explain with an inductive study the relation between different systems of measurement of goods and price setting in markets. The main aim of this article is therefore to clarify and to generalize whenever possible, this relationship concerning one of contributing factors that can affect dissimilar prices per same quantity of good across markets of different countries.

2. Theoretical background

Markets generate a continuous trade of goods, based on their quality, quantity and price, to support fruitful patterns of economic growth and innovation of inter-related nations (Coccia, 2005, 2007, 2009, 2010b, 2012).[1] Economic and managerial literature has analyzed various aspects of pricing, such as price planning (Lancioni, 2005; Liozu & Hinterhuber, 2014), supply chain pricing (Voeth & Herbst, 2006), pricing in international markets (Forman & Hunt, 2005), pricing of integrated solutions (Sharma & Iyer, 2011) and so on. Some studies have focused on value-based pricing to explain the influences of managers and other decision makers on price setting (Lancioni, Schau, & Smith, 2005; Hinterhuber, 2004; Liozu & Hinterhuber, 2013). Moreover, the globalization of markets is increasing the access of consumers to foreign markets, either through travels or Internet. Consumers compare, as a consequence, prices of a foreign currency with a familiar domestic one (Lin & Fang, 2013). Shafir, Diamond, & Tversky (1997) suggest that people in these business transactions rely on nominal rather than real value of money (*cf.,* Raghubir & Srivastava, 2002). In general, the perception of price change is often based on general beliefs rather than hard facts (Janiszewski & Lichtenstein, 1999). In particular, socioeconomic changes of environments affect general beliefs of consumers: *i.e.*, the perception of current prices and the memory of previous prices may be distorted to adapt to new environments and beliefs (Christandl, Fetchenhauer, & Hoelzl, 2011). This vast literature has analyzed manifold factors of price settings, however, in economics and managerial sciences, the relationship between asymmetries of systems of measurement of goods and price setting in markets is unknown.

In order to analyze and explain this problem, it is important to clarify that prices of goods in markets are determined considering a *legal base unit of measurement* of capacity or volume (*e.g.,* gallon, liter …), of mass (*e.g.,* pound, kilogram, …), etc. The different systems of measurement of goods between several European countries and the USA are as follows.

3. Asymmetries of systems of measurement in markets: Metric System *vs.* United States Customary System

3.1. The Metric System

The official system of measurement in several European countries and in almost every country in the world is the International System of Units (SI) or Metric System (Bureau International des Poids et Mesures, 2006). The Metric System is an internationally agreed decimal system of measurement based on the metre-kilogram-second system of units. This system was first developed for commercial use and later also applied in scientific and engineering fields. The basic unit of mass is the kilogram (symbol: kg): the International Prototype of the Kilogram (IPK),[2] defined at the first General Conference on Weights and Measures, has a mass equal to 1.000025 Liter of water at 4 °C (Davis, 2003). Instead, the gram (1/1000th of a kilogram) is the mass of one cubic centimeter of water at the melting point of water.

The liquid capacity in the Metric System is the liter: symbols are L or l. The liter is equal to 1 cubic decimeter (dm^3), 1000 cm^3 (cm^3) or 1/1000 m^3. A cubic decimeter (or liter) occupies a volume of $10 \times 10 \times 10$ cm and is equal to one-thousandth of a cubic metre (Bureau International des Poids et Mesures, 2006; Giacomo, 1980).

3.2. United States Customary System

The system of measurement applied in the United States of America is the U.S. Customary System, developed from English units, which were in use in the British Empire before American independence (Owen, 1966). The basic unit of

[1] *Cf. also* Coccia (2008, 2009c, 2012a, 2012b, 2012c, 2013, 2014a, 2014b), Cavallo et al. (2014), Cavallo, Ferrari, and Coccia M (2015) Coccia and Wang (2015), Calabrese *et al.* (2005).

[2] The International Prototype of the Kilogram (IPK) is of cylindrical form, with diameter and height of about 39 mm, and is made of an alloy of 90% platinum and 10% iridium. Initially, the IPK had two official copies; over the years, one official copy has been replaced and four others have been added, so that there are now six official copies (Bureau International des Poids et Mesures, 2015).

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