A non-linear causal network of marketing channel system structure

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ABSTRACT

This article takes a systems perspective to study marketing channel system structure dynamics and their interactions with economic system dynamics. A novel, non-linear method from ecology is used to establish a causal network of mostly bi-directional causal forcing between economic variables and marketing channel system structure. This resulting causal network facilitates a comprehensive understanding of a marketing channel system. The study finds a highly endogenous and non-linearly interrelated subsystem encompassing online/offline retail channel structure, retail/wholesale channel structure, the ratio of import to consumption and the competitive dynamics of the economic system. Surprisingly, marketing channel system structure is rather resilient to changes in economic growth. In contrast, changes in retail/wholesale channel structure affect economic growth. The results may help to caution marketing managers changing their marketing channel structures too routinely. Moreover, the identified causal network presents a starting point for further empirical marketing channel system analyses. Implications particularly affect future empirical marketing channel system studies based on linear structural models.

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1. Introduction

The purpose of this article is to explore macro-level deterministic causal links between economic forces and the dynamics of marketing channel system structure using a systems-based co-prediction time series method from ecology.

Over the last decades, marketers have witnessed macro-level economic developments with the potential to affect marketing channels: economic growth and decline, globalization of consumption, increasing competition, and the rise of the internet. But marketing channels also link together forming a macro-level marketing channel system (Bucklin, 1966; Sharma and Dominguez, 1992). Such a marketing channel system then interacts with the economic system; therefore marketing channel system dynamics may not only be a consequence of but also an antecedent to economic system dynamics (Jaffe and Yi, 2007; Layton, 2007; Olsen and Granzin, 1990). Knowledge about these macro-level system interactions and specifically about the direction and strength of the causal forcing between system variables benefits many different actors: a marketing channel manager will better assess and attribute observed changes in the channel structure to either own activity or to system forces as "the task environment of a decision maker at one level is often dominated

by the attributes of the marketing system at the next higher level" (Layton, 2007, p. 233). A foreign investor entering a rapidly developing market will want to assess how national marketing channel structure will develop depending on its surrounding system (Olsen and Granzin, 1990). A CEO of a major marketing channel member will want to formulate a broad vision on what role to play in an economic system and even what changes in macro-level system states are attainable by own or concerted action (Webster and Lusch, 2013).

Surprisingly, marketing channel research has seldom investigated Marketing Channel Systems and the respective interactions with economic systems from a macro-level perspective (Jaffe and Yi, 2007; Olsen and Granzin, 1990; Wilkinson, 1990; Yi and Jaffe, 2007). On the macro-level of a system, marketing channel system structure may be affected by changes in economic growth, consumption patterns, or internationalization (Jaffe and Yi, 2007; Layton, 2007; Sharma and Dominguez, 1992). However, channel system structure may in turn also affect economic development (Kaynak, 1980, Klein, 1986). Consequently, a marketing channel system structure will potentially form bi-directional relationships with an economic system, but no extant empirical studies consider these intricate interrelations adequately (Olsen and Granzin, 1990; Wilkinson, 1990; Wilkinson and Young, 2013). This apparent gap is not exclusive to marketing channel research but is one facet of a more general marketing science neglect of macro-level marketing system interactions (Hibbert and Wilkinson, 1994; Layton, 2007; Wilkie and Moore, 1999), which in turn may be one of the causes of the current fundamental crisis within the field of marketing (Webster and Lusch, 2013). Consequently, calls for

theoretical and empirical research taking a systems view to study marketing phenomena grow louder (e.g. Wilkie and Moore, 1999; Wilkinson and Young, 2013).

Systems however, are complex and create major obstacles to conduct empirical research, for example with time series data. Complex systems depend on interactions of often weak causal forces (McCann et al., 1998), are state-dependent, and show nonlinear and endogenous behavior, such as thresholds or tipping points (e.g. Hsieh et al., 2005; May et al., 2008; Scheffer et al., 2009; Sugihara et al., 1996). Therefore, time series data from complex systems may show at times a positive, a negative, or no correlation, even if the time series are entirely generated from a set of deterministic causal rules (Hibbert and Wilkinson, 1994; Lorenz, 1963; Sugihara et al., 2012). Still, the notion of correlation and linear statistics is deeply embedded in economic and business science thinking, often obscuring the true underlying forces at work and hindering insight and discovery into complex systems (May et al., 2008). Therefore, conducting empirical research on marketing channel system dynamics will need an adequate method capable of addressing complex dynamic causation, endogeneity, and non-linearity between system variables.

This article takes a systems perspective and empirically disentangles reciprocal causal links between and within the marketing channel system and the economic system. The study focuses on dynamics in structures that characterize a marketing channel system (Wilkinson, 1990). In particular we study changes in the relative importance of wholesalers compared to retailers, and the relative importance of online retailers compared to offline retailers. In Section 2 ("Marketing Channel Systems") we consider several economic system variables potentially forcing changes in the marketing channel system structure. To empirically establish causal forcing links and their direction and strength, we draw from ecology and use convergent cross mapping (CCM; Sugihara et al., 2012): a non-parametric, non-linear co-prediction method, specifically developed to uncover deterministic causal forcing between two time series variables from complex ecological systems. Section 3 ("Detecting Causal Links in Dynamic Systems") explains how CCM detects deterministic forcing between pairs of time-series variables and how to interpret CCM results in the research context of this article. In Section 4 ("Empirical Study") CCM detects a complex marketing channel system and interactions with several economic indicators from U.S. national level economic data. The detected complex system is then contrasted with and build into the limited extant knowledge on marketing channel system structure in Section 5 ("Discussion"), putting studied economic variables into a comprehensive perspective relative to the whole marketing channel system. Implications concern extant and further studies on marketing channel system structure from the predominant perspective of linear models as well as marketing managers' actions within a dynamic marketing channel system.

2. Marketing Channel Systems

2.1. A systems view of marketing channel structure

Marketing channels enable exchange of information and products between manufacturers and customers. This exchange may happen through one or several middlemen. Channels form by channel actors' interaction. Customers structure the channels with their needs in terms of place and time of consumption and firms react with their channel management, evolving channel designs to ever higher efficiency (Coughlan et al., 2006; Frazier, 1999; Jindal et al., 2007; Sharma and Dominguez, 1992; Van Bruggen et al., 2010). Marketing channel research recognized from the beginning on that all marketing channels together form a marketing channel system (Bucklin, 1966). A Marketing channel system is characterized for example by the retailer/

wholesaler ratio (Bucklin, 1970; Sharma and Dominguez, 1992), or nowadays by the online/offline retailers ratio (Van Bruggen et al., 2010; Verhoef et al., 2007). In general, characterizing a marketing channel system relates to marketing channel system structure (Jaffe and Yi, 2007; Wilkinson, 1990; Yi and Jaffe, 2007).

A marketing channel system, just like a general marketing system, encompasses several layers, from micro-level to macro-level. While the higher system levels usually emerge in part from the sum of the lower levels, these higher system levels in return dominate the conditions of individual entities on lower system levels (Fisk, 1969; Kotler, 1980; Layton, 2007; Webster and Lusch, 2013). In addition, higher levels of a marketing channel system also force and are forced by other economic or social systems (Wilkinson, 1990; Wilkinson and Young, 2013). Therefore, in order to understand marketing channel system structure it seems prudent to study marketing channels from a systems perspective in general, and the interacting macro-level forces between systems in particular. Surprisingly, only very few extant studies have undertaken efforts to do so empirically (Jaffe and Yi, 2007; Olsen and Granzin, 1990; Wilkinson, 1990; Yi and Jaffe, 2007). Summing up, marketing channels perform a crucial task in a marketing system and in an economic system. Thereby, marketing channels form a system themselves, characterized by a system structure, such as the relative importance of retail and wholesale or online and offline retails. Forces from the macro-system levels force conditions for individual entities on micro-levels, thus calling for macro-level research on marketing channel system structure and its interactions with other macro-level system forces.

2.2. Economic system forces interacting with marketing channel structure

On the macro-level of a system, a broader economic context shapes the marketing channel system structure (e.g. Jaffe and Yi, 2007; Kaynak and Hudanah, 1987; Mallen, 1975; Wadinambiaratchi, 1965). For example, retail revenues (Arndt, 1979; Wadinambiaratchi, 1965) and wholesale revenues (Mallen, 1973, 1975) both depend on economic development. If however retailers and wholesalers depend on economic development in a different way, then economic development ultimately impacts a marketing channel system structure. In addition to economic development, competition and changing numbers of market participants are possibly interrelated to marketing channel system structure (Frazier and Shervani, 1992; Jindal et al., 2007; Van Bruggen et al., 2010). Another major driver is evolution in consumption behavior, such as the proportion of service consumption to goods consumption (Zeithaml and Bitner, 2003), or the internationalization of consumer markets (Layton, 2007). Finally, technological change, especially in information technology, changes interaction patterns and consequently may change marketing channel system structure as well (Ganesan et al., 2009; MacMillan, 2002; Wallace et al., 2004). However, channel system structure will in turn also affect economic development (Kaynak, 1980; Klein, 1986). Consequently, a marketing channel system and an economic system will form bi-directional, endogenous interrelations (Olsen and Granzin, 1990; Wilkinson, 1990; Wilkinson and Young, 2013). Such endogeneous interrelations pose a challenge to empirical studies on marketing channel system structure.

3. Detecting causal links in dynamic systems

3.1. Bidirectional causal forcing

In a traditional correlation based statistical setup it is often not possible to answer empirically whether a marketing channel system structure is ultimately and causally linked to an indicator