

A (Bumpy) Ride on Innovation Escalator: Historical Trends of Product Innovativeness

Stav Rosenzweig, The Hebrew University of Jerusalem, ISRAEL
David Mazursky, The Hebrew University of Jerusalem, ISRAEL

We suggest that product innovativeness levels are affected by historical trends of market integration and the extent of reliance upon previously existing technologies. Two studies, destined to enable a synopsis of economic and perceptual aspects of product innovativeness over time, indicate that market integration negatively affects product innovativeness, and that both very high and very low levels of reliance upon preexisting technology negatively affect product innovativeness.

Is it possible to trace changes in product innovativeness over time? Are trends associated with globalization related to such changes? The present study synthesizes theories from the fields of history, marketing, and economics, and suggests that global trends of market integration can account for changes in product innovativeness levels over time.

THEORY AND HYPOTHESES

Drawing from previous research regarding changes over time in processes close to product innovativeness, such as changes in Product Life Cycles, diffusion patterns and technological changes over time (e.g., Bayus 1994; Sood and Tellis 2005; Van den Bulte 2000), we propose that two key categories are accountable for changes in product innovativeness levels over time: Reliance upon Preexisting Technologies; and macro economic changes, such as market integration processes.

Market Integration

Following economical and historical studies (e.g., Acemoglu, Johnson and Robinson 2005; Chase-Dunn, Kawano and Brewer 2000), we conceptualize the world as a complex economical and social network within which product innovativeness is affected by global trends of market integration. Economists and historians agree that during the 20th century (the focus of the present research), market integration was a growing trend until WWI, and that integration processes were noticeably enhanced only after WWII (Chase-Dunn Kawano and Brewer 2000; Mazlish 1998; Mazlish and Buultjens 1993).

*While it might be assumed that economically challenging conditions, such as World Wars causing financial crises and markets disintegration, impose difficulties on innovation processes, studies from various disciplines suggest otherwise. In *A Study of History*, Toynbee (1965) suggests that challenging environmental, economical or social conditions (as opposed to comfortable ones), which impose considerable challenges, stimulate individuals and societies to utilize their creative and innovative capabilities in order to overcome the challenges and improve their position through innovation. Similarly, marketing studies suggest challenging conditions positively affect creative thinking and innovation (e.g., Moreau and Dahl 2005; Välikangas and Gibbert 2005). Hence, we hypothesize that challenging conditions, such as closed and disintegrated markets causing economic constraints, positively affect product innovativeness; and conversely, the relaxation of challenging conditions in the form of integrated markets negatively affect product innovativeness.*

Reliance upon Preexisting Technology

The more markets are integrated, the higher the accessibility to knowledge and ability of firms to rely upon preexisting technology (RPT), which presents clear benefits for firms, such as risk minimization and maximizing chances for further adoption and further improvement (Arthur 1989; Pae and Lehmann 2003; Tauber 1974). Nonetheless, it seems that the higher the RPT the smaller the probability of surprising the market with a highly innovative product. We hypothesize an inverted U-shaped relationship between RPT and product innovativeness: A heavy reliance negatively affects product innovativeness; still, no/hardly any reliance also negatively affects product innovativeness due to high uniqueness, though low meaningfulness (as dimensions of innovativeness (Sethi, Smith and Park 2001)).

We test our hypotheses in two studies designed to enable a synopsis of economic and perceptual examination of product innovativeness.

STUDY 1 - ECONOMIC VALUE

To test our hypotheses we use patent data, which includes patent citations - references on the front page of a patent entry, stating the previous patents which the current patent builds upon (Jaffe, Trajtenberg and Fogarty 2002), signifying the importance of the cited patent (Hall, Jaffe and Trajtenberg 2002), as well as its economic value (Trajtenberg 1990). Our data consists of 287,880 patents issued in the US between 1975 and 1990, in technological categories relevant to consumer products. We use a regression model, with citations received by later patents (as a measure of innovation) as the dependant variable, and Trade Openness (as a measure of market integration) and citations made to previous patents (as a measure of RPT) as explanatory variables. Constructs and measures are exhibited in Table 1. Results indicate an inverted U-shaped relationship between RPT and product innovativeness, where very low or very high levels of RPT negatively affect product innovativeness. Furthermore, the relaxation of challenging conditions in the form of market integration seems to negatively affect level of innovativeness other than for product categories of communications and computation, which are positively affected by market integration.

STUDY 2 – PERCEIVED VALUE

We sample 52 products introduced to the market 1960-1999 listed in popular magazines as successes or failures. Data regarding each sampled product was obtained using a historical analysis (Golder 2000; Golder and Tellis 1993;

Sood and Tellis 2005) and evaluated by four experts for innovativeness and RPT levels, as perceived by the market at the time of launch. Market integration was measured by Trade Openness as in Study 1. We used a regression model to test our hypotheses. Similar to Study 1, RPT demonstrates an inverted U-shaped relationship with product innovativeness, and Trade Openness (interacting with non-computation related products) negatively affects product innovativeness.

DISCUSSION

An important advantage of Study 2 is that the level of innovation is determined using subjective consumers' perceptions, as historically recorded at the time of product introduction. These are later incorporated in an empirical analysis, complementing the findings of Study 1, which provides an economic measure of innovation, with a substantially larger data set.

Both studies indicate the effects of macro level variables on product innovativeness. Trends of market integration and the relaxation of the challenging conditions negatively affect product innovativeness, and one can demonstrate, despite an increase in the number of innovations, a decrease in product innovativeness levels in recent decades in categories not inherently related to the integration process.

Thus far entrepreneurs considered mainly micro-level variables when deciding whether to invest in an innovative product. Our findings imply that macro-level considerations, such as market integration, should be

TABLE 1
CONSTRUCTS AND MEASURES – STUDY 1

Construct	Measured by	Measure	Adapted from	Source
Innovation	Mean citations received, aggregated by year and product category	$\frac{\sum_{i=1}^{n_i} (1 + C_{Received_i}) - n_i}{n_i}$	Trajtenberg 1990	NBER patent data
Market Integration	Trade Openness	$\left(\frac{IMPORT + EXPORT}{GDP} \right)_{t-1}$	World Bank; Tellis, Stremersch and Yim 2003	WDI of The World Bank
Reliance upon Preexisting Technology	Mean citations made, aggregated by year and product category	$\frac{\sum_{i=1}^{n_i} (1 + C_{Made_i}) - n_i}{n_i}$	Trajtenberg's 1990 innovation measure, see also Hall, Jaffe and Trajtenberg 2002	NBER patent data & USPTO

NOTE: All data refers to the US

taken into account as well. In addition, while RPT may be tempting, firms and entrepreneurs should consider its innovativeness-hindering potential.

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