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Global Takeoff of New Products: Culture, Wealth, or Vanishing Differences?

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The authors study the takeoff of 16 new products across 31 countries (430 categories) to analyze how and why takeoff varies across products and countries. They test the effect of 12 hypothesized drivers of takeoff using a parametric hazard model. The authors find that the average time to takeoff varies substantially between developed and developing countries, between work and fun products, across cultural clusters, and over calendar time. Products take off fastest in Japan and Norway, followed by other Nordic countries, the United States, and some countries of Midwestern Europe. Takeoff is driven by culture and wealth plus product class, product vintage, and prior takeoff. Most importantly, time to takeoff is shortening over time and takeoff is converging across countries. The authors discuss the implications of these findings.

Key words: diffusion of innovations; global marketing; consumer innovativeness; marketing metrics; new products; hazard model; product life cycles
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Introduction

Markets are becoming increasingly global with faster introductions of new products and more intense global competition than ever before. In this environment, firms need to know how new products diffuse across countries, which markets are most innovative, and in which markets they should first introduce new products. We use the term *product* broadly to refer to both goods and services.

Recently, studies have introduced and validated a new metric to measure how quickly a market adopts a new product,i.e., the takeoff of new products (see Agarwal and Bayus 2002, Chandrasekaran and Tellis 2007, Golder and Tellis 1997, Tellis et al. 2003). Takeoff marks the turning point between introduction and growth stages of the product life cycle. When used consistently across countries, this metric provides a valid means by which to compare and analyze the innovativeness of countries. However, the existing literature on takeoff suffers from the following limitations.

First, prior studies analyze takeoff of new products primarily in the United States and Western Europe. Hence, they exclude some of the largest economies (Japan, China, and India) and many of the fastest-growing economies of the world (China, India, South Korea, Brazil, and Venezuela). This limited focus on industrialized countries is seen as symptomatic of much of the prior research on product diffusion with several calls for broader sampling for new insights into the phenomenon (Dekimpe et al. 2000, Hauser et al. 2006)

Second, researchers disagree about what causes differences across countries. Takeoff has been portrayed to be primarily a cultural phenomenon with *wealth* not being a significant driver (Tellis et al. 2003). Yet, some studies cite wealth to be the primary driver of new product diffusion (Dekimpe et al. 2000, Stremersch and Tellis 2004, Talukdar et al. 2002).

Third, researchers have disagreed about which countries have the most innovative consumer markets and are thus the best launch pads for a new product. The international strategy literature has long held that the United States is the preeminent origin for new products and fads (Chandy and Tellis 2000, Wells 1968). Within Europe, Tellis et al. (2003) find Scandinavian countries to be the most innovative. In contrast, Putsis et al. (1997) find Latin-European countries to be the most innovative while Lynn and Gelb (1996) find Mid-European countries to be the most innovative.

Fourth, researchers have debated whether diffusion speed is accelerating over time. While Bayus (1992) found no systematic evidence of accelerating diffusion rates over time, Van den Bulte (2000) finds evidence for accelerating diffusion. Golder and Tellis (1997) find time-to-takeoff to be declining for post War categories as compared to pre-War categories. However, neither Golder and Tellis (1997) nor Tellis et al. (2003) find a significant effect for the year of introduction in hazard models after controlling for other variables.

Fifth, debates in other disciplines have focused on whether countries are converging in terms of economic development (Barro and Sala-i-Martin 1992, Sala-i-Martin 1996) or culture (Dorfman and House 2004). There has been no effort made in marketing to determine whether there is convergence or divergence across countries over time in their ability to adopt new products.

This paper seeks to address these issues. In particular, it seeks answers to four specific questions: First, how does time-to-takeoff vary across the major developed and developing economies of Asia, Europe, North America, South America, and Africa? Second, what drives the variation in time-to-takeoff across countries: Is economics at all relevant? Third, are differences in time-to-takeoff constant or varying over time? Fourth, is takeoff converging or diverging across countries? We examine these issues by studying a heterogeneous sample of 16 categories across 31 countries.

The subsequent sections of the paper describe the theory, method, results, implications, and limitations of the study.

Theory: Culture's Consequences or Wealth of Nations

This section explores why time-to-takeoff of new products may vary across countries. Time-to-takeoff can differ across countries due to one of two broad drivers: *culture* or *economics*.

Culture can be thought of as shared beliefs, attitudes, norms, roles, and values among speakers of a particular language who live in a specific historical period and geographical region (Triandis 1995). Major changes in climate and ecology, historical events, population migration, or cultural diffusion may slowly affect culture (Triandis 1995). However, national cultures are generally thought to be stable over time (Dorfman and House 2004, Hofstede 2001, Yeniyurt and Townsend 2003). Cross-cultural researchers have documented various dimensions of national culture. We identify four dimensions that are likely to affect the time-to-takeoff of new products: *in-group collectivism*, *power distance*, *religiosity*, and *uncertainty avoidance*. The specific roles of in-group collectivism and religiosity have not been addressed in the prior literature on takeoff or diffusion. In the interests of parsimony, Table 1 briefly outlines the hypotheses for these variables.

Economics can be thought of as differences in opportunities and wealth that limit consumers' ability to purchase new products. We identify four economic variables that are likely to affect time-to-takeoff of new products: *economic development*, *economic disparity*, *information access*, and *trade openness*. Table 1 briefly outlines the hypotheses for these variables.

Based on prior research, four control variables are likely to affect the time-to-takeoff of new products: *product class*, *prior takeoffs*, *product vintage*, and *population density*. The rationale for these variables is also in Table 1. We distinguish between two important types of products: work and fun. Work products primarily reduce physical labor, such as dishwashers and dryers. Prior research has also referred to them as time-saving household durables (Horsky 1990), appliances (Golder and Tellis 1997), or white goods (Tellis et al. 2003) Fun products are those that primarily help provide entertainment or information, such as the DVD player. Prior research refers to such products as amusement enhancing household durables (Horsky 1990), electronic products (Golder and Tellis 1997), or brown goods (Tellis et al. 2003).

Method

This section describes the sampling, sources, measures, and model for the analysis.

Sample

Two criteria guide our selection of products. One, they should include a mix of both work and fun products. Two, they should include a mix of products studied in prior research and others not studied before. Based on these criteria and data availability, we collect market penetration across 16 products. Of these, the work products are microwave oven, dishwasher, freezer, tumble dryer, and washing machine. The fun products are CD player, cellular phone, personal computer, video camera, video tape recorder, MP3 player, DVD player, digital camera, hand-held computer, broadband, and Internet.

Two criteria guide our selection of the sample of countries. First, the sample should be representative of major cultures and populations of the world. Second, the sample should include major economies of the world. Using these criteria, we obtain data on 40 countries. Since we had very little data for some countries, to avoid data-specific biases we retain countries where we have data for at least 10 categories. As a result, we had to drop Argentina, Australia, Colombia, Hong Kong, Malaysia, New Zealand, Singapore, South Africa, and Turkey.

In total, we collect market penetration data for 430 product × country combinations. On each such combination we have time series data ranging from 4 to 55 years. This is probably the largest data set assembled for the study of the diffusion of new products across countries.

Table 1 Hypotheses for Effect of Independent Variables

Variable	Definition	Rationale	Hypothesized effect on time-to-takeoff
Cultural variables			
In-group collectivism	Degree to which individuals express pride, loyalty, and cohesiveness in their organizations or families (Gelfand et al. 2004)	Pressure of norms, duties, and priorities of the group may discourage individuals, slowing the adoption of new products (Triandis 1995, Yeniyurt and Townsend 2003)	H1: New products take off slower in countries that are high on collectivism than in countries that are low on collectivism
Power distance	Extent to which the less powerful members of organizations and institutions accept unequal distribution of power (Hofstede 2001, Carl et al. 2004)	Better communication and lower barriers between segments may encourage the faster adoption of new products (Carl et al. 2004)	H2: New products take off faster in countries that are low on power distance than in countries that are high on power distance
Religiosity	Extent to which individuals rely on a faith-based, nonscientific body of knowledge to govern their daily lifestyle and practices	Emphasize on spiritual benefits over material possessions and conflict between mainstream religious beliefs and acceptance of scientific principles, experimentation, and learning may slow adoption of new products (Miller and Hoffmann 1995, Hossain and Onyango 2004)	H3: New products take off slower in countries that are high on religiosity than in countries that are low on religiosity
Uncertainty avoidance	Extent of reliance on traditions, rules, and rituals to reduce anxiety about the future (Sully de Luque and Javidan 2004)	Societies with high levels of uncertainty avoidance look toward technology to ward off uncertainty (Sully de Luque and Javidan 2004). This might create an environment that encourages the faster adoption of new high technology products	H4: New products take off faster in countries that are high on uncertainty avoidance than in countries that are low on uncertainty avoidance
Economic variables			
Economic development	Absolute level of economic development in a country	Greater wealth enables faster adoption of new products early on when prices and risks are high (Golder and Tellis 1998, Rogers 1995)	H5A: New products take off faster in countries with a higher level of economic development than in countries with a lower level of economic development
Economic disparity	Extent to which a country's wealth is concentrated in a few people	High economic disparity may reduce number and size of segments who can afford a new product (Tellis et al. 2003, Talukdar et al. 2002, Van den Bulte and Stremersch 2004)	H5B: New products take off slower in countries that have a higher level of economic disparity than in countries with a lower level of economic disparity
Information access	Two aspects of information access are availability of mass media and mobility	Greater availability of mass media can disseminate information about new products (Gatignon and Robertson 1985, Horsky and Simon 1983, Talukdar et al. 2002). Greater mobility can enhance interpersonal communication and spread information about new products (Gatignon et al. 1989, Tellis et al. 2003)	H6: New products take off faster in countries that have a higher level of information access than countries with a lower level of information access
Trade openness	Extent of linkages across countries for import or export of new products	Trade openness encourages technology flows and awareness about and availability of new products, encouraging the faster adoption of new products (Perkins and Neumayer 2004, Talukdar et al. 2002, Tellis et al. 2003)	H7: New products take off faster in countries that have a higher level of trade openness than countries with a lower level of trade openness
Control variables			
Product class	Work products reduce physical labor and are mostly associated with work (e.g., dishwasher), while fun products are mostly associated with information and entertainment (e.g., DVD players)	Wider appeal, visibility, and discussion as well as faster instant gratification of fun products encourage their faster adoption (Bowden and Offer 1994, Horsky 1990, Tellis et al. 2003)	H8: Fun products take off faster than work products
Product vintage	Year of first ever commercialization of the product	Greater trade liberalization, media penetration, demographic changes, and technology improvements encourage availability, awareness, and appeal of new products (Sood and Tellis 2005, Wacziarg and Welch 2003, Van den Bulte 2000)	H9: Products of recent vintage take off faster than products of older vintage

Table 1 (Continued.)

Variable	Definition	Rationale	Hypothesized effect on time-to-takeoff
Control variables			
Prior takeoffs	Number of prior takeoffs in neighboring countries	Imports from, travel to, and learning from a country where a new product has already taken off may encourage faster takeoff in a neighboring country (Ganesh et al. 1997, Kumar et al. 1998)	H10: New products take off faster when there are a higher number of prior takeoffs in neighboring countries
Population density	Number of persons per unit of area	Greater density of population encourages better communication among segments, which may encourage faster takeoff	H11: New products take off faster in countries that have a higher population density than countries that have a lower population density

Sources

We collect this data from a variety of sources including a search of secondary data over hundreds of hours (*Historical Statistics of Japan*, *Historical Statistics of Canada*, *Electrical Merchandising*, *Merchandising*, *Merchandising Week*, and *Dealerscope* journals for United States and Organisation for Economic Co-Operation and Development (OECD) statistics), purchase from syndicated sources (Euromonitor Global Marketing Information Database, World Development Indicators Online, Fast Facts Database), and private collections (Tellis et al. 2003).

Measures

This section describes the measures for market penetration, year of commercialization, year of takeoff, the independent variables, and the control variables.

Market Penetration. For market penetration, we use the measure (where available) of possession of durables per 100 households. For four categories (DVD player, digital camera, MP3 player, and handheld computer) where only sales data is available for most countries, we used the following formula to obtain market penetration:

$$Penetration_t = Penetration_{t-1} + (Sales_t - Sales_{t-r}) \\ /NumberofHouseholds * 100, \qquad (1)$$

where r is the average replacement time for the category. We use an average replacement cycle of four years for DVD player, MP3 player, and handheld computer and five years for digital camera. We checked robustness of these assumptions by varying r by plus or minus one year. The year of takeoff varies insignificantly with the changes.[1]

Year of Commercialization. There are two inherent problems in identifying the exact year of introduction of products in countries. One, this date is not explicitly published in journal articles while various data sources provide conflicting dates. Two, most databases include a product only when it has achieved nontrivial sales. Hence, there is an inherent survivor bias. Following Agarwal and Bayus (2002), we use the word commercialization to reflect the fact that databases seem to include a product only when it has become available to the mass market or achieved some minimal level of sales or penetration.

We use a combination of rules to obtain reasonable estimates of the approximate year of commercialization that best reflects individual categories. For work products, we look for the earliest year of commercialization for *each country* from the data published in the various sources viz. Euromonitor Inc. journals and databases, various issues of *Merchandising*, *Merchandising Week*, and *Dealerscope*, published dates in Agarwal and Bayus (2002), Golder and Tellis (2004, 1997), Talukdar et al. (2002), and by examining our own data.

In the case of telecommunication products (cellular phone, Internet, and broadband), the year of commercialization is dependent on the national regulatory policies and, hence, we use varying dates made available from reliable secondary sources. For cellular phone, we use the date of first adoption of cellular technologies reported in Gruber (2005) and reports on the OECD Web site (http://www.oecd.org) for the European Union countries and secondary reports by market research firms on the ISI Emerging Markets Database for emerging markets. For the Internet, we use the date of the initial National Science Foundation Network connection by OECD countries as obtained from OECD reports[2] and dates of the first Internet services launch for emerging markets from the ITU

[1] We also use this formula to obtain market penetration data for work products from historical manufacturing statistics on Canada and Japan. We use accepted measures of replacement (Hunger 1996) for five observations.

[2] Information Infrastructure Convergence and Pricing: The Internet, Organisation for Economic Co-Operation and Development, Committee for Information, Computer and Communications Policy, Paris 1996.

database and by market research firms on the ISI Emerging Markets Database. For broadband, we look for the earliest commercial launch of either the cable or the DSL service in each country, as reported in the reports in the OECD Web site[3] and the ISI Emerging Markets Database.

For four fun products (personal computer, CD player, VCR, and video camera), the data as well as reports and published dates in secondary sources reflect a common date for North America, Europe, Japan, and South Korea. We use the earliest year of commercialization based on our data and published sources (Talukdar et al. 2002) for each remaining individual country. For products introduced after 1990 (i.e., DVD player, digital camera, MP3 player, and hand-held computer), where validation from secondary reports is not as yet available and the data-derived years of commercialization seem similar across countries, we use a common year of commercialization across all countries. We further validate each of these dates by checking that penetration in the year of commercialization has not exceeded 0.25%, which is a stricter rule than the 0.5% rule recommended by Tellis et al. (2003).

Year of Takeoff. The literature contains many measures of takeoff. Agarwal and Bayus (2002) define takeoff as the central partition between a pretakeoff and posttakeoff period, determined by a percentage change in sales. Garber et al. (2004) and Goldenberg et al. (2001) define takeoff at the point when market penetration is 16%. Golder and Tellis (1997) define takeoff as the first year in which a new product's sales growth rate relative to the prior year's sales crosses a threshold based on sales levels. Tellis et al. (2003) define takeoff as the first year a new product's sales growth rate relative to the prior year's sales crosses a threshold based on penetration levels.

For a cross-country study such as ours, the measure of takeoff proposed by Tellis et al. (2003), while appropriate, is also very demanding, as it requires both sales and market penetration data. We have early sales data only for a subset of categories for which we have market penetration data. Rather than sacrifice the breadth of products and countries for which we have market penetration data (430 combinations), we use a measure of takeoff that is similar in form to that of Garber et al. (2004) and Goldenberg et al. (2001) but similar in substance to that of Tellis et al. (2003). Golder and Tellis (2004, 1997) find that the average penetration at takeoff is 1.7%. Interestingly, this latter finding is similar to Roger's (1995) estimate that innovators make up 2.5% of the population and Mahajan et al.'s (1990) upper bound of 2.8% for innovators. So, we use the heuristic that the year of takeoff is the first year the market penetration reaches 2%. The key issue for subsequent analysis is that we use the same rule consistently across countries. In essence, our measure of takeoff reduces our definition of takeoff to an instrumental one. Thus, an alternate interpretation of all our results is how quickly and why do new products reach a 2% market penetration in various countries. Time-to-takeoff is the difference between the year of takeoff and the year of commercialization in a country.

Independent Variables. One measure for economic development is the real Gross Domestic Product per capita (Laspeyres) measured in U.S. dollar terms from the Penn World Tables (Heston et al. 2002). This is obtained by adding up consumption, investment, government and exports, and subtracting imports in any given year. It is a fixed-base index where the reference year is 1996. Since this data is available only up to 2000, we calculate GDP per capita for the years 2001 to 2004 using average growth rate figures from the United Nations Development Programme Human Development report. We use a related measure for economic development, which is the electric power consumption in Kilowatt Hour per capita (production of power plants and combined heat and power plants less distribution losses, and own use by heat and power plant). Our measures for information access include radio receivers in use for broadcasts to the general public per 1,000 people, television sets per 1,000 people, telephone main lines (lines connecting a customer's equipment to the public-switched telephone network) per 1,000 people, and vehicles (including cars, buses, and freight vehicles but not two wheelers) per 1,000 people.

We have multiple items to measure the extent of trade openness—trade (the sum of exports and imports of goods and services) as a percentage of GDP, trade in goods (the sum of merchandise exports and imports) as a percentage of GDP, gross foreign direct investment (the sum of the absolute values of inflows and outflows of foreign direct investment recorded in the balance of payments financial account) recorded as a percentage of GDP, and gross private capital flows (sum of the absolute values of direct, portfolio, and other investment inflows and outflows recorded in the balance of payments financial account) recorded as a percentage of GDP. We derive all these measures from World Development Indicators Online, a database provided on subscription basis by the World Bank.

We use the Gini Index as a measure of economic disparity that exists in the population; we derive this from the Deninger and Squire (1996) database. This database gives multiple Gini coefficients, and hence

[3] The Development of Broadband Access in OECD Countries, Directorate for Science, Technology and Industry Committee for Information, Computer and Communications Policy, 2001.

we consider only those coefficients that are considered "acceptable" and are measured at the national level. For some countries (Austria, Egypt, and Morocco) where acceptable estimates are not obtainable from the database, we use measures derived from the CIA World Factbook (2003). We use people per square kilometer as a measure for population density from the World Population Prospects: The 2000 Revision, United Nations Population Division/Department of Economic and Social Affairs.

We measure dimensions of culture (collectivism, power distance, and uncertainty avoidance) using the *societal practices* scores reported in the Global Leadership and Organizational Behavior Effectiveness (hereby referred to as GLOBE) research program (House et al. 2004). This is a long-term program designed to conceptualize, operationalize, test, and validate a cross-level integrated theory of the relationship between culture and societal, organizational, and leadership effectiveness. The cultural dimensions proposed in this project are similar in spirit but vary operationally from the traditional indices used in cross-cultural research such as Hofstede's indices (Hofstede 2001). The GLOBE dimensions are better-defined and suffer less from confounds in meaning and interpretation than the Hofstede measures (House and Javidan 2004). The GLOBE dimensions are constructed based on responses to questionnaires by 17,000 managers in 62 cultures to two types of questions—managerial reports of actual practices in their societies or their organizations, and managerial reports of what should be the practices and/or values in their societies or organizations. The values are expressed in response to questionnaire items in the form of judgments of *what should be*. We, however, use actual practices as measured by indicators assessing *what is* or *what are* common behaviors, institutional practices, proscriptions, and prescriptions. House et al. (2004) note that the practices' approach to the assessment of culture grows out of a psychological/behavioral tradition in which it is assumed that shared values are enacted in behaviors, policies, and practices. Hence, we believe that actual practices reflect the behavior of the people and are more useful in explaining time-to-takeoff than the values measures.

Religiosity or religiousness has been measured in prior literature through the use of variables such as church attendance, frequency of prayer, belief in God, belief in the authority of the Bible, and self-appraised level of religiousness (Hossain and Onyango 2004, Lindridge 2005, Wilkes et al. 1986). Because we require a measure that is suitable across countries, some of whom have many different religions, we construct a unified measure of religiosity using two items which we obtain from the World Values Survey from the site http://www.worldvaluessurvey.org/. This survey is a large investigation of sociocultural and political change carried out by an international network of social scientists in several waves since 1981. For the first measure, we use the responses to the question "How often do you attend religious service?" in the World Values Survey. The responses can range from "less than once per week" to "never." In some religions, such as Hinduism, worship can be done within the home and attendance in religious services may not be necessary (Lindridge 2005). Hence, we also consider a second item from the World Values Survey involving a response to the question "How important is God to your life?" The responses can range from "not at all" to "very." We take the average of (1) the percentage of respondents in the sample answering either "less than once per week" or "weekly" to the first question on the attendance of religious service, and (2) the percentage of respondents in the sample answering either "very" or "9" to the second question on the importance of God to construct a unified measure of religiosity.[4]

Control Variables. We use the year of first-ever commercialization of the product category in any country as a measure of product vintage. We measure prior takeoffs as the number of takeoffs in the prior or same year in countries in the same region as a target country. We consider countries within Asia, Europe, North America, South America, and Africa to belong to the same region.

Model

We model takeoff as a time-dependent binary event. We face two issues with our data. One, there are a number of censored observations. Two, the probability of takeoff may increase with the length of time a product has not taken off. Hence, we use a hazard function to model takeoff. The time-to-takeoff from commercialization of a product in a country T is a random variable with a probability density $f(t)$ and a cumulative density $F(t)$. The likelihood that a product takes off, given that it has not taken off in the interval $[0, T]$, is

$$h(t) = f(t)/(1 - F(t)). \tag{2}$$

We can use a nonparametric method to model the effects of covariates on the hazard, or parametric methods such as the accelerated failure time approach to model the effects of independent variables on time-to-event, i.e., takeoff. In the accelerated failure time approach, the hazard of takeoff is of the form

$$h_i(t, X_i) = \exp^{aX_i} h_0(\exp^{aX_i} t), \tag{3}$$

[4] For Thailand, the World Values Survey does not give measures that can be used to construct religiosity. We have taken the corresponding measures for Vietnam as a surrogate for Thailand, as it has geographical and religious proximity.

i.e., the impact of independent variables on the hazard for the ith observation is to accelerate or decelerate time-to-takeoff as compared to the baseline hazard (see Srinivasan et al. 2004 for a detailed description of this approach). An easier way of estimating this model is to write it as follows:

$$Y = X\beta + \sigma\varepsilon, \tag{4}$$

where Y is the vector of the log of time-to-takeoff, X is the matrix of covariates, β is a vector of unknown regression parameters, σ is an unknown scale parameter, and ϵ is a vector of errors, assumed to come from a known distribution such as normal, log-gamma, logistic, or extreme value forms leading to the log-normal, gamma, log-logistic, or the Weibull/exponential distributions for T, respectively. We use PROC LIFEREG in SAS to estimate this model (Allison 1995). The estimation is done via maximum likelihood.

Results

First, we factor analyze some of the independent measures to achieve parsimony in the data. Second, we present descriptive statistics for initial insights into the phenomenon of takeoff. Third, we test for the hypothesized variation in time-to-takeoff using the hazard model. Fourth, we examine differences in time-to-takeoff across economic and cultural clusters. Fifth, we examine whether there is convergence in takeoff. Sixth, we test for the robustness of the results.

Factor Analysis of Economic Variables

The economic variables are highly correlated, suggesting the presence of underlying factors. In particular, Dekimpe et al. (2000) note in their review of global diffusion that constructs such as information access are often considered distinct from wealth but are actually highly related to wealth and are also used in some studies as describing the wealth of a country (Ganesh et al. 1997, Helsen et al. 1993). Our preview of the data leads us to agree with this view. Nevertheless, we test this point of view with a factor analysis of the measures relating to economic development, information access, and trade openness. We run an exploratory factor analysis of the measures using data from 1950 to 2004. We use the principal components approach and Varimax rotation of these dimensions. We obtain a two-factor solution from the exploratory factor analysis (see Table 2). Based on the loading of items, we call these factors wealth and openness. We use these two factors in the hazard model instead of the individual measures.

We do not run a separate factor analysis for cultural variables because the cultural variables already represent unique and distinct dimensions of culture (Hofstede 2001, House et al. 2004, Van den Bulte and Stremersch 2004).

Table 2 Factor Analysis of Economic Variables

	Wealth	Openness
Television sets per 1,000 people	**0.93**	*0.26*
GDP per capita	**0.91**	*0.31*
Vehicles per 1,000 people	**0.90**	*0.00*
Telephone mainlines per 1,000 people	**0.88**	*0.33*
Electricity consumption per capita	**0.86**	*0.23*
Radios per 1,000 people	**0.85**	*0.22*
Trade (% of GDP)	0.11	***0.91***
Trade in goods (% of GDP)	0.09	***0.90***
Gross private capital flows (% of GDP)	0.34	***0.74***
Gross foreign domestic investment (% of GDP)	*0.30*	***0.70***

Descriptive Statistics on Takeoff

We first examine our data for outliers by simultaneously examining the plots of time-to-takeoff across products and countries. We find one observation "(dishwasher in the United States)" to be an extreme outlier and delete it from our analysis.

Takeoff occurs in 80% of the 430 country × category combinations. Takeoff has occurred in all countries for very old and/or very useful categories (e.g., washing machine, Internet, cellular phone). Lack of takeoff may be due to the effect of the hypothesized explanatory variables censoring for younger categories in particular countries. The advantage of the hazard model is that it can estimate the effects of the independent variables on censored data.

Table 3 shows the mean time-to-takeoff across categories for each country. Countries vary widely in terms of the mean time-to-takeoff. What are the reasons for these differences? The next section seeks to answer this question.

Tests of Hypotheses via Hazard Model

We estimate the hazard model in Equation (4), assuming a Weibull baseline distribution (a subsequent subsection tests the robustness of this assumption). The dependent variable is the log of the time-to-takeoff. Note that except for the cultural variables product vintage and product class, all independent variables are time-specific. A positive sign for the estimated coefficient indicates that a higher level of the independent variable across countries is associated with a lengthening of the time-to-takeoff. We estimate the hazard model for 27 out of 31 countries in Table 3 (373 observations). We drop Belgium, Chile, Norway, and Vietnam because they were not included in the GLOBE study from which we obtain the measure for the cultural variables.

The results of the hazard model are in Table 4. To demonstrate the robustness of the results to multicollinearity, we present the results for each independent variable separately (bivariate analysis) and all together (multivariate analysis). As expected, product vintage has a coefficient which is both negative

Table 3 Mean Time-to-Takeoff Across Categories Within Countries

	Mean	Median	Std.	Total
Japan	5.4	4.5	3.3	14
Norway	5.7	5.0	2.4	15
Sweden	6.1	6.0	2.9	15
The Netherlands	6.1	4.5	3.7	16
Denmark	6.1	6.0	2.6	15
United States	6.2	5.5	3.4	14
Switzerland	6.3	6.0	3.4	15
Austria	6.4	6.0	3.3	15
Belgium	6.5	6.5	2.5	16
Canada	6.9	6.0	5.2	12
Finland	7.0	6.0	2.6	15
Germany	7.1	7.0	4.3	15
South Korea	7.2	7.0	3.3	12
Venezuela	7.3	7.0	4.5	12
United Kingdom	8.0	7.5	4.5	14
France	8.2	9.0	3.5	15
Italy	8.3	8.0	4.0	15
Spain	8.5	8.0	4.0	14
Chile	8.5	6.0	5.7	11
Mexico	8.7	9.0	3.7	11
Portugal	8.8	8.0	4.5	15
Greece	9.0	9.0	4.4	14
Brazil	9.3	7.0	4.9	11
Thailand	10.2	8.5	6.3	12
Egypt	12.1	10.0	5.3	13
Morocco	12.3	10.0	6.3	12
India	12.4	11.0	5.0	14
Philippines	12.6	9.0	7.1	13
Indonesia	13.6	14.0	6.2	15
Vietnam	13.9	15.0	5.6	14
China	13.9	13.5	6.1	16

and significantly different from zero. The result indicates that products that are commercialized later in time seem to take off faster than those earlier in time. For example, times-to-takeoff are shorter for successive communication products such as cellular phone (8.6 years), Internet (6.7 years), and broadband (an estimate of 3.4 years). Figure 1 provides additional support by indicating that time-to-takeoff has been declining over calendar time.

As hypothesized, prior takeoffs also have an effect that is negative and significantly different from zero. This result implies learning or diffusion effects between neighboring countries.

As hypothesized, work products are associated with a longer time-to-takeoff than fun products. Descriptive analysis suggests that the mean time-to-takeoff of fun products is 7 years while that for work products is almost double at 12 years (see Table 5), with much of the difference being attributed to developing countries.

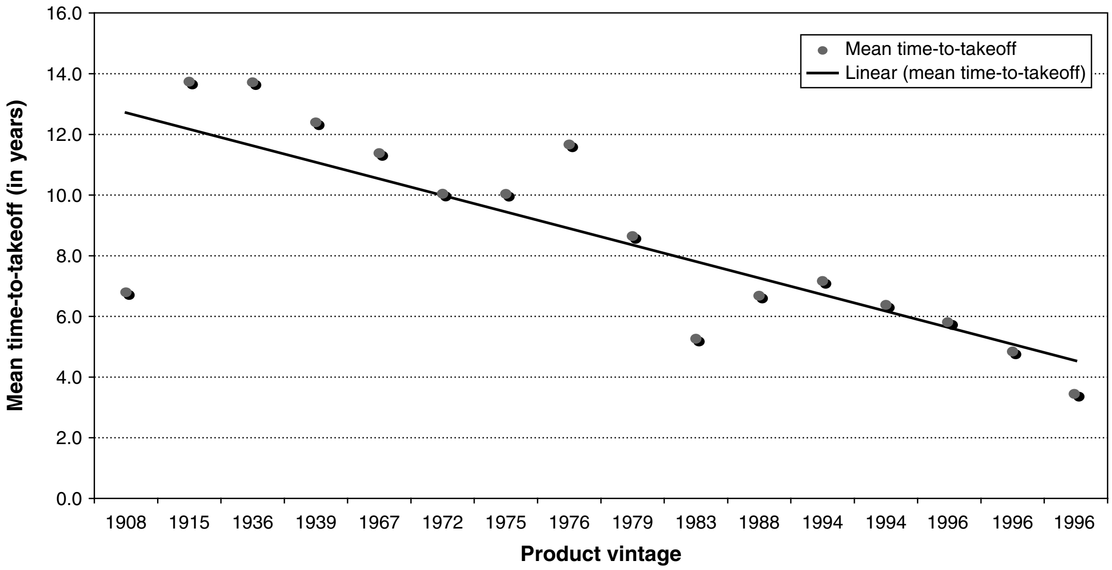
As hypothesized, a higher level of wealth is associated with a shorter time-to-takeoff (Table 4). The coefficient for economic disparity does not retain significance in the multivariate analysis, though it is positive and significantly different from zero in the bivariate analysis. The coefficients for openness and population density are not significantly different from zero in the bivariate analysis and these variables are not retained in the multivariate model. As hypothesized, a high level of collectivism is associated with a longer time-to-takeoff. A higher level of uncertainty avoidance is associated with a shorter time-to-takeoff in the bivariate analysis, as hypothesized, but the sign is different from that of the multivariate analysis. The coefficients for religiosity and power distance do not retain their significance in the multivariate analysis though they are significantly different from zero and in the correct direction in the bivariate analysis. The reason could be collinearity among the cultural variables.

The results from this analysis indicate that the effects of product class, prior takeoffs, product vintage, wealth, and collectivism are strong, robust, and in the expected direction. This model explains 27% of the variance. These results indicate that *both*

Table 4 Estimates of Hazard Model

	Bivariate analysis				Multivariate analysis		
Construct	Beta	*T*-stats	Significance levels	*R* square-like	Beta	*T*-stats	Significance levels
Product vintage	−0.01	−7.29	<0.0001	0.07	−0.005	−2.14	0.03
Prior takeoffs	−0.09	−10.15	<0.0001	0.10	−0.02	−2.05	0.04
Product class (work = 1)	0.51	7.29	<0.0001	0.07	0.20	2.01	0.04
Population density	0.00	1	0.44	0.00			
Wealth	−0.32	−12.79	<0.0001	0.17	−0.08	−1.90	0.06
Openness	0.01	0.40	0.73	0.00			
Economic disparity	0.02	3.94	<0.0001	0.02	0.00	−0.80	0.43
Uncertainty avoidance	−0.29	−4.81	<0.0001	0.03	0.20	2.95	0.00
In-group collectivism	0.41	11.52	<0.0001	0.16	0.33	4.01	<0.0001
Power distance	0.47	6.45	<0.0001	0.04	0.01	0.04	0.94
Religiosity	0.01	6.62	<0.0001	0.06	0.0	1.20	0.21
Log-likelihood						−286.79	
R square-like						0.27	

Figure 1 Mean Time-to-Takeoff Over Calendar Time



economics and culture determine differences in time-to-takeoff. To complement and enrich the above analysis, we consider how time-to-takeoff varies across cultural clusters of countries.

Differences in Time-to-Takeoff Across Cultural Clusters

Much research suggests the existence of distinct cultural clusters of countries (Gupta and Hanges 2004, Ronen and Shenkar 1985). Based on prior research, we identify eight cultural clusters (Ashkanasy et al. 2002, Gupta and Hanges 2004, Gupta et al. 2002, Jesuino 2002, Kabasakal and Bodur 2002, Szabo et al. 2002, Ronen and Shenkar 1985). Table 6 describes the cultural clusters and the logic for their classifications. Countries within these clusters exhibit similar culture because of geographic proximity, common language, common ethnicity, or shared history. Table 6 also compares the clusters on the five cultural variables used in the hazard model. For each variable, we present the mean and the standard deviation within a cluster. Note that except in the case of religiosity for Confucian Asia, the means are more than twice the values of the standard deviation within the cluster, justifying the grouping of these countries within a cluster. Also, the means are often significantly different from the mean for the rest of the countries, supporting inter-cluster classification of countries.

Table 7 shows the differences in mean time-to-takeoff across the eight distinct cultural clusters. Here again, the mean for each cluster is often significantly different from the mean of the rest of the countries. The results show distinct differences in mean time-to-takeoff between clusters, with low standard deviations within clusters for all products as well as separately for both work and fun products. The ANOVA and MANOVA tests indicate significant differences across the cultural clusters (for Wilks' Lambda and Pillai's Trace, Prob $> F = 0.003$). As further evidence of the strength of culture, note how Latin countries across both Europe and America have very similar mean times-to-takeoff despite being geographically separate.

Is the United Kingdom a member of the Anglo cluster or the Germanic cluster? As the founder of the British Empire and the motherland of the English language, it would seem to belong to the former. However, due to its proximity to Europe, its Germanic roots, and its ties to the "old economies" of Europe, we consider it part of the latter group. Japan also differs significantly in terms of time-to-takeoff from other Confucian Asian countries. However, Confucianism, while possessing a core set of values, is believed to be practiced in different Confucian societies in different ways (Hartfield 1989). The selective adaptation of

Table 5 Mean Time-to-Takeoff by Product Class and Economic Development

	All countries			Developed countries			Developing countries		
Product class	Mean (std. dev.)	Total	Percent taken off	Mean (std. dev.)	Total	Percent taken off	Mean (std. dev.)	Total	Percent taken off
Fun products	7.3 (3.9)	305	81	6.2 (3.2)	184	95	8.9 (4.5)	121	60
Work products	11.8 (6)	125	78	8.9 (4.4)	80	99	17.0 (5.1)	45	42

Table 6 Comparisons of Cultural Clusters

Cultural clusters	Nordic Europe	Anglo-America	Germanic Europe	Latin America	Latin Europe	Confucian Asia	Northern Africa	Southern Asia
Countries	Sweden, Denmark, Finland	Canada, United States	Austria, Germany, Switzerland, The Netherlands, United Kingdom	Brazil, Mexico, Venezuela	France, Italy, Portugal, Spain, Greece	China, Japan, South Korea	Egypt, Morocco	India, Indonesia, Philippines, Thailand
Logic for cluster	• Geographic proximity • Common Nordic history, religion, and languages	• Ethnic and linguistic similarities • Secular, with strong legal infrastructure	• Linguistic and religious similarities • Tradition of orderliness, standards, and rules	• Roman law heritage, common Spanish or Portuguese languages • Similar emphasis on family living, food, clothing, and lifestyle	• Shared history of Roman empire • Roman Catholic tradition and languages based on Latin • Paternalistic role of state • Similar emphasis on family living, food, clothing, and lifestyle	• Historical influence of China • Confucianism • Emphasis on hierarchy, diligence, self-sacrifice, and delayed gratification	• Influence of Arab invasion, Islamic legal and moral code, and the Arabic language • Geographical proximity to Northern Rim	• Peaceful coexistence of diverse religions, languages, customs, and cuisines • Similarity in values, such as morality, respect for elders and, conservation of resources
In-group collectivism	3.8* (0.3)	4.2* (0)	4.2* (0.4)	5.5** (0.3)	5.1 (0.5)	5.3 (0.6)	5.8** (0.2)	5.9** (0.3)
Power distance	4.5 (0.6)	4.85* (0)	4.9 (0.5)	5.3** (0.1)	5.4** (0.1)	5.2 (0.3)	5.4 (0.6)	5.4** (0.2)
Religiosity	8.4* (3.2)	47.8 (14)	18.1* (6.6)	64.7** (4.8)	29.1 (13.6)	11.3* (12.9)	69.5** (4.1)	57.8 (29.8)
Uncertainty avoidance	5.2** (0.2)	4.4 (0.3)	4.9** (0.3)	3.7* (0.4)	3.9* (0.4)	4.2 (0.7)	3.9 (0.3)	4.0* (0.1)

Note. Standard deviations in parentheses.
*Significantly lower than mean of rest of countries ($p < 0.10$ or $p < 0.05$); **significantly higher than mean of rest of countries.

Table 7 Mean Time-to-Takeoff Across Cultural Clusters

	Nordic Europe	Anglo-America	Germanic Europe	Latin America	Latin Europe	Confucian Asia	Confucian Asia w/o Japan	North Africa	Southern Asia
Average All products	6.4* (2.7)	6.54* (4.2)	6.8* (3.9)	8.4 (3.3)	8.6 (4.1)	9.0 (4.4)	11.0** (6.1)	12.2** (5.8)	12.3** (6.2)
Average Fun products	6.0* (2.4)	5.3* (2.2)	5.8* (3.2)	7.4 (2.7)	7.6 (3.3)	7.8 (4.0)	9.1** (4.1)	9.2** (3.7)	9.7** (4.5)
Average Work products	7.33* (3.3)	11.6 (2.4)	9.2* (3.8)	13 (3.3)	10.6* (5.0)	13.2 (2.7)	18.00** (3.8)	17.4** (5.0)	18.4** (4.9)

Note. Standard deviations in parentheses.
*Significantly lower than mean of rest of countries ($p < 0.10$ or $p < 0.05$); **significantly higher than mean of rest of countries.

Confucianism to the requirements of modernization is believed to lead to the divergent development of Japan, South Korea, and China. We give results of Confucian Asia both with and without Japan.

Table 7 also shows that fun products seem to take off faster than work products within every cultural cluster. Moreover, the differences across cultural clusters for work products are higher than the differences across the cultural clusters for work products. This result suggests work products are more culture-bound than fun products probably because the former relate to food and clothing habits which are immersed in cultural traditions. Such cultural products may take off rapidly in some countries where they match the culture (e.g., rice cooker in Japan or coffee maker in the United States) and slowly in other countries where they do not match the culture (e.g., coffee maker in China or rice cooker in Germany). On the other hand, fun products (e.g., cellular phones or cameras) are used in a similar manner all over the world. Hence, time-to-takeoff of fun products is likely to vary less dramatically across countries than work products.

Table 8 examines the impact of cultural clusters on time-to-takeoff via the hazard model. We include product vintage, prior takeoffs, and product class, which are not collinear with cultural clusters. We do not include the cultural and economic variables because they are highly collinear with cultural clusters. We find that countries in the Confucian Asia, Latin Europe, Latin America, North Africa, and Southern Asia clusters see significantly slower times-to-takeoff of products than those in the excluded Nordic cluster, which serves as a comparison group. The differences for Confucian Asia are stronger with Japan outside the cluster. The last columns of Table 8 show the impact of cultural clusters after controlling for the impact of wealth which tends to be collinear with the cultural clusters. Cultural clusters show how the cultural variables interplay to form a metacountry cultural unit of analysis.

Table 9 explores the effects of the hazard model separately by product class. For fun products, the effects of product vintage, prior takeoffs, wealth, and in-group collectivism are significantly different from

Table 8 Hazard Model Including Cultural Clusters

	Hazard model with Japan in Confucian Asia			Hazard model without Japan in Confucian Asia			Hazard model with wealth		
	Beta	*T*-stats	Significance levels	Beta	*T*-stats	Significance levels	Beta	*T*-stats	Significance levels
Product vintage	−0.01	−2.75	0.01	−0.01	−2.57	0.01	−0.004	−1.82	0.06
Prior takeoffs	−0.02	−1.79	0.07	−0.02	−1.92	0.05	−0.02	−1.76	0.08
Product class (Work = 1)	0.19	1.92	0.05	0.20	1.97	0.04	0.21	2.09	0.04
Anglo America	−0.03	−0.21	0.83	−0.03	−0.23	0.82	0.06	0.47	0.64
Germanic Europe	0.07	0.82	0.41	0.07	0.87	0.39	0.01	0.10	0.92
Latin Europe	0.27	3.12	0.00	0.27	3.21	0.00	0.18	1.94	0.05
Latin America	0.40	3.23	0.00	0.39	3.28	0.00	0.21	1.38	0.17
North Africa	0.77	5.00	<0.0001	0.75	5.09	<0.0001	0.53	2.97	0.00
Confucian Asia	0.50	4.29	<0.0001	0.68	5.20	<0.0001	0.33	2.50	0.01
Southern Asia	0.87	6.98	<0.0001	0.85	7.12	<0.0001	0.59	3.51	0.00
Nordic Europe									
Wealth							−0.12	−2.52	0.02
Log likelihood		−292.32			−266.44			−289.53	
R square-like		0.26			0.29			0.26	
Observations		373			359			373	

Table 9 Comparison of Hazard Model for Fun vs. Work Products

	Fun products			Work products		
Variables	Beta	T-stats	Significance levels	Beta	T-stat	Significance levels
Product vintage	−0.02	−4.7	<0.0001			
Prior takeoffs	−0.02	−2.7	0.01	−0.03	−0.89	0.38
Wealth	−0.09	−1.7	0.10	−0.02	−0.20	0.84
Openness	−0.05	−1.6	0.12			
Economic disparity	0.00	−0.5	0.64	−0.01	−0.67	0.51
In-group collectivism	0.27	2.9	0.00	0.48	2.96	0.00
Power distance	0.00	0.0	0.99	−0.02	−0.11	0.91
Religiosity	0.00	−0.1	0.93	0.01	1.90	0.06
Uncertainty avoidance	0.19	2.8	0.00	0.25	1.60	0.11
Observation	267				106	
Log likelihood	−177.41				−85.00	
R square-like	0.29				0.27	

zero and in the expected direction. Results for openness are also in the expected direction. For work products, however, only the effects of culture are significantly different from zero and in the expected direction. We find that not only high levels of in-group collectivism but also religiosity impact time-to-takeoff of work products. These results are consistent with those in Table 7 suggesting that work products are more culturally bound.

Convergence in the Year of Takeoff

Though our results indicate substantial differences in time-to-takeoff across countries, a key issue is whether takeoff patterns across countries are converging or diverging. We use the word convergence to refer to the decrease over time in the range of the years of takeoff across the same set of countries. Convergence in the year of takeoff may occur due to two reasons. First, there may be a convergence in the year of commercialization of new products across countries. We present some support for this in our analysis. Second, there may be a convergence in time-to-takeoff due to a convergence in the underlying drivers of takeoff. Indeed, economists have documented convergence in wealth across countries over time, with the improvement greatest in countries that were previously poor (Sala-i-Martin 1996). Most countries are enjoying better access to the media which facilitates the diffusion of new products, but the improvement is greatest in countries that were furthest behind. Most countries are also experiencing a greater similarity in culture due to increasing intercountry communication and travel, common education curriculum, use of English, exposure to Western practices, adoption of common cultural activities such as movies and music, and diffusion of Eastern religions and philosophies (such as yoga and Buddhism). Thus, cultural differences that caused divergence could be dissolving, albeit slowly (Dorfman and House 2004). Indeed, a fear of such a trend and the need to maintain cultural uniqueness may be seen in Europe (Dorfman and House 2004). To measure convergence, we take the time spread in years between the first and last country to show a takeoff in any single product category. We then plot this time spread across the year of first commercialization for the respective product category (product vintage). If convergence is occurring, then the curve should slope downward over time. If divergence is occurring, then the curve should slope upward over time. If neither is occurring, then the curve should be flat.

Since our measures require takeoff to have occurred, we do not include countries where takeoff has not occurred. In the interest of consistency, we also need to include the same set of countries in each category. As a result, for this analysis, we can consider only 14 product categories in 18 countries. The countries are Japan, United States, Canada, and 15 countries of Western Europe. We include all the products in our sample except MP3 players and hand-held computers (we have data only until 2003 for the former and not for all the countries for the latter). This sample covers 246 observations.

The results are in Figure 2(a) with the time spread between the first and last takeoff in a category on the Y axis and product vintage on the X axis. Figure 2(a) shows a dramatic, downward, almost linear plunge over time, indicating a strong convergence in takeoff. The time spread between the first and last takeoff drops from over 50 years in 1950 to 5 years in 2000. A regression of time spread on product vintage yields a coefficient that is negative and significantly different from zero (T stats of −5.1, $R^2 = 0.68$). Figure 2(b) shows the time spread in years between the first and last commercialization in a category on the Y axis and product vintage on the X axis. Again, there is a downward, almost linear plunge over time indicating convergence in commercialization. The bump around 1935 in both graphs could be due to negative effects of the Depression, though we can not draw any firm conclusions because of the small sample size.

Tests of Robustness

Apart from examining different distributional assumptions, we carry out tests of robustness on the baseline hazard and alternate measure of takeoff. An online appendix lists results of other tests of robustness.

Baseline Distribution. We considered several alternate baseline distributions such as the log-normal, log-logistic, exponential, Weibull, and gamma of the hazard model. To determine the best distribution function, we compare nonnested models using the

Figure 2(a) **Time Spread in Years Between First and Last Takeoff in a Category by Vintage**

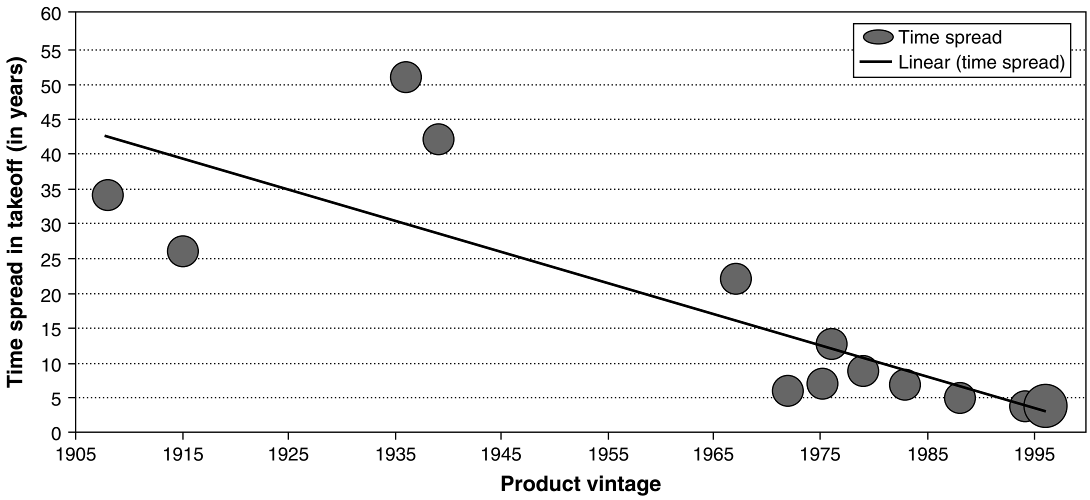
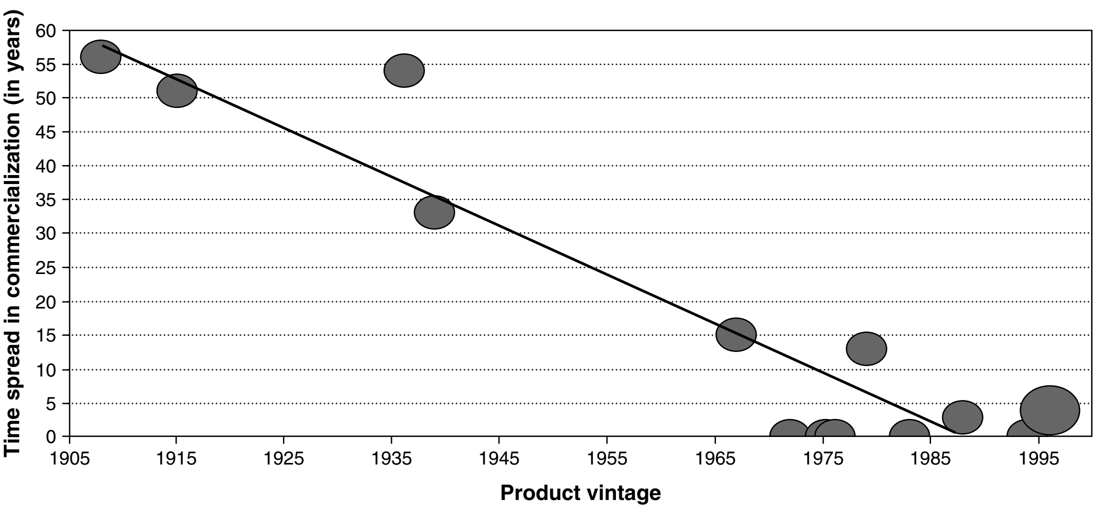


Figure 2(b) **Time Spread in Years Between First and Last Commercialization in a Category by Vintage**



SBC (Schwarz's Bayesian criterion), as suggested by Allison (1995), Srinivasan et al. (2004), and Pliner (2005). SBC is calculated using the formula $-2*\log$-likelihood$+k*$(# of parameters), where $k=\log(n)$ and n represents the number of observations. Lower values of SBC indicate better fit. We find that the Weibull model generally outperforms the other models using the SBC criteria, with an SBC value of 639 for the final model in Table 4.

Measure of Takeoff. Recall that we used an operational measure (achieving 2% penetration) to measure the year of takeoff because we did not have sales data for all categories. We evaluate the robustness of our results by two approaches.

First, for 193 product-country combinations in our original data set, we were able to collect both sales and penetration data. These include established categories such as work products, CD players and Personal Computers for developed countries (92 observations) and new categories such as DVD players, digital cameras, MP3 players, and hand-held computers where we have data for both developed and developing countries (101 observations). For all of these product-country combinations, we compare the year of takeoff as measured by our 2% penetration rule to the year of takeoff as measured by the rule proposed by Tellis et al. (2003), which uses sales and penetration data. We find that, overall, in 89% of the cases the absolute differences in the year of takeoff between the two rules are less than or equal to two years, while they match exactly in 36% of the cases (Table 10).

Second, for 160 product-country combinations among European countries, United States, and Japan, we use the Tellis et al. (2003) rule to examine the mean penetration at takeoff. We find that the mean penetration at takeoff is 1.8%, which adds further validity to using the 2% rule.

Table 10 **Absolute Difference Between 2% Penetration Rule and Penetration Threshold Rule**

	Abs diff = 0	Abs diff = 1	Abs diff = 2	Abs diff > 2	No. of countries
Total	69	72	31	21	193
Percent	36	37	16	11	
Cumulative percent	36	73	89	100	

Thus, our rule has the advantages of being simple, consistently applied across all categories and countries, and relatively similar to that proposed by Tellis et al. (2003). In the absence of adequate data, following this rule seems a good alternative to the option of dropping those categories for which we do not have adequate data.

Discussion

This section summarizes the key findings, discusses questions and implications of findings, and lists limitations of the study.

Summary

Our study leads to several new findings:

- Time-to-takeoff is getting shorter over calendar time. In addition, there is strong convergence in takeoff over calendar time among developed countries.
- Despite these two effects, differences across countries are quite strong.
  - Products take off fastest in Japan and Norway, followed by other Nordic countries, the United States, and some countries of Midwestern Europe.
  - Newly developed countries of Asia (e.g., South Korea) see faster times-to-takeoff of products than established, major European countries (e.g., France, Italy) with centuries of industrialization.
  - Latin countries across Europe and South America have similar times-to-takeoff.
  - Despite the recent and rapid increases in the GDP of emerging markets such as China, India, and the Philippines, these countries still lag behind other countries substantially in time-to-takeoff of new products.
- Takeoff is *not* a purely cultural phenomenon. Differences in both economics (wealth) and culture (in-group collectivism) account for differences in time-to-takeoff across countries and regions.
- The mean time-to-takeoff varies considerably between developing countries (11 years) and developed countries (7 years). The mean time-to-takeoff varies between 6 and 12 years across cultural clusters.
- Time-to-takeoff varies considerably between fun products (7 years) and work products (12 years).
  - Fun products take off substantially faster than work products within each cultural cluster.
  - Time-to-takeoff of fun products also shows smaller differences across cultural clusters than work products do.
  - Time-to-takeoff of fun products is driven by dynamic economic variables and takeoff for fun products is converging faster over time than work products.

Questions

These findings raise three important questions.

First, can time-to-takeoff serve as an indicator of the innovativeness of a country? Researchers across disciplines and global policymakers have long debated which countries rank high on innovativeness (The Task Force on the Future of American Innovation Report 2006). Prior research has measured this innovativeness either by input measures such as research and development and scientific talent (e.g., Furman et al. 2002) or by surveys of consumers (e.g., Steenkamp et al. 1999). However, an alternate viewpoint holds that innovativeness is better defined by the willingness and ability of consumers to acquire and use new products and technologies (Bhide 2006, Tellis et al. 2003). Based on hard data, such a measure of innovativeness is also less prone to self-report and cultural biases as is survey data. We find significant differences across countries in terms of the times-to-takeoff. These differences persist within classes of products and across time. Thus, they could serve as a metric of the innovativeness of the nation itself. However, when doing so, we need to keep in mind that the differences in time-to-takeoff and hence innovativeness are due to both wealth and national culture.

Second, why does Japan not fit in with the cultural cluster of Confucian Asia? Cultural clusters seem to explain differences in times-to-takeoff across countries with one notable exception: Japan. It has the shortest time-to-takeoff even though it is sometimes grouped in the Confucian cluster, which shows slower times-to-takeoff. We speculate that there is one explanation for this anomaly: consumerism. Consumerism has been defined by Stearns (2001) as a societal trait in which many people formulate their goals in life partly through acquiring goods that they clearly do not need for subsistence or for routine appearance. They derive some of their identity through this process of acquisition. Authors claim that consumerism has flourished in Japan due to a combination of factors: a major thrust by the government to promote product development and consumption, a strong native desire of the Japanese to produce and own the best products, investment in new products rather than land (which is scarce) as symbols of economic progress, and a broader admiration of Western (materialistic) values (Stearns 2001). In Japan, modern consumerism may have overwhelmed older Confucian values, leading to one of the most aggressive and dynamic markets for consumer goods.[5] Unfortunately, scales for this construct are unavailable across all countries, so we could not test this explanation.

Third, manufacturers have introduced few major new work products recently, whereas they have introduced a large number of fun products. So, are the distinctions between work and fun products indistinguishable from that between older and newer vintage products? An examination of Table 5 can address this issue. Note, more fun products than work products have taken off in developing countries, *even though* they have been introduced more recently. Thus, the distinction between fun and work products seems intrinsic to these product classes.

Implications

The study's findings have the following strategic and research implications.

First, researchers have debated the merits of a waterfall strategy (staggering the commercialization of new products across countries) versus a sprinkler strategy (simultaneously introducing the new products across countries). For instance, Chryssochoidis and Wong (1998) and Gielens and Dekimpe (2001) argue for a simultaneous launch to minimize product failure risk due to delayed rollouts and competitive environments. However, Kalish et al. (1995) argue that conditions such as long product life cycles, small size, or slow growth of a foreign market make a waterfall strategy more preferable. Mitra and Golder (2002) suggest that firms enter countries where they have greater economic and cultural knowledge based on operating in similar other countries. Tellis et al. (2003) argue that a waterfall strategy greatly reduces the scale of operation and exposure to risk of product failure, and increases senior management support when takeoff occurs quickly in the most innovative countries.

We believe that market strategy should depend considerably on the type of products. Because times-to-takeoff of fun products are more similar across countries and takeoff of fun products is converging faster over time than that for work products, they probably have a universal appeal across cultures. Hence, a sprinkler strategy might be feasible for fun products. However, work products are culturally bound and adopted in some cultures more readily than in others. In such categories, a waterfall strategy might be more profitable. By introducing first in countries or cultural clusters where the products are more conducive to the culture, product managers can lower risk, increase odds of success, win support of senior management, and use the confidence, revenues, and lessons gained from those countries and regions to market the product in less-accepting countries. In this respect, even small differences in time-to-takeoff of one to three years may represent enough real time differences to execute a waterfall strategy.

Second, should one choose a waterfall strategy, authors have debated about which countries are the best to introduce a new product first. We recommend one of two sets of strategies. If a manager wishes to launch a new product in an innovative and large market, the best countries would be Japan or the United States. However, if a manager wishes to test market in a small but highly innovative country, the best countries would be in the Nordic cluster, Switzerland or The Netherlands. In addition to these countries, South Korea also shows promise as a relatively small country with a relatively short time-to-takeoff of new products. For example, it leads the world in penetration of broadband and 3G technologies.

Third, in addition to country innovativeness, managers need to consider the economics of scale, especially between marketing to giants such as China and India and to small countries such as Norway. For example, cellular phone subscribers are growing by six million per month in India in 2006 (*The Economist*). The annualized sales of cellular firms in countries such as India and China would dwarf the entire population of most European countries. The issue of scale becomes especially critical in conjunction with population concentration. If one country's adopters are concentrated in a small, easily accessed portion of the country and yet another country's adopters are dispersed more widely, then the former may be a superior option to the latter. Hence, managers need to consider the slower takeoff in countries such as India and China relative to the effects of size and concentration in the markets.

Limitations and Further Research

Some limitations of the current study suggest areas for future research. First, due to data limitations, we use a heuristic of 2% to measure the point of takeoff. Second, we do not account for the role of important strategic variables such as price declines, quality improvements, competition within product markets, and firm entry strategies (Agarwal and Bayus 2002, Golder and Tellis 1997, Jain et al. 1991, Mahajan et al. 1995, Van den Bulte 2000). The current model only accounts for 27% of the variance. While this compares well with prior studies, it suggests the need to study other strategic or behavioral variables that may

[5] In the 1950s and 1960s, Japanese consumers referred to the three S's: senpuki, sentakuki, and suihanki (fan, washing machine, and electric rice cooker) or three Jingi (televisions, refrigerators, and washing machines) as major life goals. This was followed by the three C's in the late 1960s: ska, kura, kara terebi (car, air conditioner, and color television), and by the three J's in the late 1970s—jueru, jetto, jutaku—jewels, jetting, and a house (Stearns 2001).

explain time-to-takeoff. Third, there is multicollinearity among some variables. However, we partly mitigate this problem by considering wealth as a factor of related dimensions and partly by examining bivariate hazard results. Fourth, we investigate takeoff at the product market level. An extension of this study to brands and brand extensions will yield additional insights into the domain of branding and help understand the relative emphasis to be placed on building the brand versus growing the category (Keller and Lehmann 2006). Fifth, an analysis of the relationship between the observed metric of takeoff and metrics of financial performance at the firm level would add to a growing body of research on financial metrics (Gupta and Zeithaml 2006). Sixth, an extension of this study to products other than consumer durables and high-tech services and differences within a country will lead to a better intuition about the phenomenon of takeoff.

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