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New Product Diffusion Acceleration: Measurement and Analysis

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Abstract

It is a popular contention that products launched today diffuse faster than products launched in the past. However, the evidence of diffusion acceleration is rather scant, and the methodology used in previous studies has several weaknesses. Also, little is known about why such acceleration would have occurred. This study investigates changes in diffusion speed in the United States over a period of 74 years (1923–1996) using data on 31 electrical household durables. This study defines diffusion speed as the time it takes to go from one penetration level to a higher level, and it measures speed using the slope coefficient of the logistic diffusion model. This metric relates unambiguously both to speed as just defined and to the empirical growth rate, a measure of instantaneous penetration growth. The data are analyzed using a single-stage hierarchical modeling approach for all products simultaneously in which parameters capturing the adoption ceilings are estimated jointly with diffusion speed parameters. The variance in diffusion speed across and within products is represented separately but analyzed simultaneously.

The focus of this study is on description and explanation rather than forecasting or normative prescription. There are three main findings.

1. On average, there has been an increase in diffusion speed that is statistically significant and rather sizable. For the set of 31 consumer durables, the average value of the slope parameter in the logistic model's hazard function was roughly 0.48, increasing with 0.09 about every 10 years. It took an innovation reaching 5% household penetration in 1946 an estimated 13.8 years to go from 10% to 90% of its estimated maximum adoption ceiling. For an innovation reaching 5% penetration in 1980, that time would have been halved to 6.9 years. This corresponds to a compound growth rate in diffusion speed of roughly 2% between 1946 and 1980.

2. Economic conditions and demographic change are related to diffusion speed. Whether the innovation is an expensive item also has a sizable effect. Finally, products that required large investments in complementary infrastructure (radio, black and white television, color television, cellular telephone) and products for which multiple competing standards were available early on (PCs and VCRs) diffused faster than other products once 5% household penetration had been achieved.

3. Almost all the variance in diffusion speed among the products in this study can be explained by (1) the systematic increase in purchasing power and variations in the business cycle (unemployment), (2) demographic changes, and (3) the changing nature of the products studied (e.g., products with competing standards appear only late in the data set). After controlling for these factors, no systematic trend in diffusion speed remains unaccounted for.

These findings are of interest to researchers attempting to identify patterns of difference and similarity among the diffusion paths of many innovations, either by jointly modeling the diffusion of multiple products (as in this study) or by retrospective meta-analysis. The finding that purchasing power, demographics, and the nature of the products capture nearly all the variance is of particular interest. Specifically, one does not need to invoke unobserved changes in tastes and values, as some researchers have done, to account for long-term changes in the speed at which households adopt new products. The findings also suggest that new product diffusion modelers should attempt to control not only for marketing mix variables but also for broader environmental factors. The hierarchical model structure and the findings on the systematic variance in diffusion speed across products are also of interest to forecasting applications when very little or no data are available.

(*Diffusion*; *New Product Research*; *Empirical Generalizations*; *Hierarchical Models*; *Multilevel Analysis*)

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