



Superstars and the long tail: The impact of technology on market structure in media industries

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ABSTRACT

Technological change has transformed creative media industries. Digitization lowers the costs of recording, storage, reproduction and distribution, while computer-based editing facilitates quality enhancement and special effects. Digital technology has altered the distribution of sales in ways that remain poorly understood: while some commentators have highlighted the growth of the “long tail”, others find digitization has raised the importance of “superstars”. This paper develops a theoretical model of differentiated goods with endogenous quality to investigate the impact of digitization on the distribution of firms. It finds that supply-side factors can generate superstars and long tail outcomes, and that coexistence of both phenomena can be explained by either a fall in fixed costs for basic products or a decline in market size.

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1. Introduction

Digitization has transformed creative media industries, with a range of impacts on the cost structure of production and supply. In the production of recorded music and video content, digitization has lowered the costs of recording, storage and reproduction. Computer-based editing has made higher quality production possible at lower cost and facilitated new special effects superior to those previously available. Distribution on physical media has shifted to cheaper, more compact, higher quality formats—from vinyl and tape to CD for music; from VHS to DVD and Blu-ray for video—while electronic distribution over cable and the internet has greatly reduced distribution costs by eliminating the transportation of physical media altogether. Digitization of television signals has permitted many more channels to be shown for a given capacity of radio spectrum or cable infrastructure, and allowed images to be broadcast in higher definition. Online stores have entered retail markets: with lower fixed costs than

traditional outlets these are able to stock a far larger number of products, making a potentially vast range of varieties available to consumers.

Technological developments have also affected the demand side of creative media industries. New formats and modes of distribution, such as e-books, movie downloads, and mobile television, have expanded demand in some areas by offering consumers new ways of enjoying media products. Internet and electronic distribution have enabled retailers to serve harder-to-reach customers who struggle to access high street stores, and to supply national and global markets rather than just the local area. However, recent developments have not always been beneficial for producers: in the music industry, where the ease of copying and storing digital music has facilitated widespread file-sharing and piracy, commercial sales have fallen dramatically.

Digital technology has altered the distribution of sales in creative media industries in ways that remain poorly understood. Some commentators have highlighted a shift towards niche products and the growth of the “long tail”. Anderson (2004, 2006) reports that online music distributors stock many more albums than a typical high street outlet, with even relatively unpopular tracks achieving a

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handful of downloads each month, and also notes the decline in sales levels for the top music albums in the early 2000s. Other authors report a more mixed picture, finding in addition to the long tail the presence of “superstar” effects as conceived by Rosen (1981), which found that the shift from live to recorded music increased returns to top artists. In a study of (legal) online music downloads, Page and Garland (2009) find a “hit-heavy, skinny-tail” distribution, with more than three-quarters of the total inventory of tracks remaining unsold. Similarly, Elberse and Oberholzer-Gee (2007) find that in the US home video market (DVD and VHS), sellers offer more products but many of these achieve few sales, while amongst best-sellers there is greater concentration on a small number of titles.

This paper investigates theoretically the impact of digitization on the distribution of firms in creative media industries. The goal is to characterize the distribution of products supplied under free entry conditions where products are differentiated both horizontally and vertically. To do this I develop a model that captures key features of creative media industries, and use this to study the effects of technological changes that lower distribution costs, fixed costs, and the cost of enhancing product quality. Specifically, I adapt the “pyramid” spatial model developed by Von Ungern-Sternberg (1991) and simplified by Brito (2003), in which competition is symmetric between products, in contrast to the “near neighbor” form of the more familiar Salop (1979) framework. The equilibrium number and mix of heterogeneous products is then determined by a free entry condition.

Market structure is characterized in the following way. Superstar outcomes occur when there is greater investment in the quality of top-selling or “premium” products (e.g. higher expenditure on blockbuster movies), and or these products achieve higher individual sales, either in absolute terms or as a share of the market. In other words, superstar phenomena are associated with “bigger hits”. The long tail refers to an increase in the number of niche or “basic” products that are sold; for this to be more than an empty tail, basic products must also account for an increased share of total sales.

The main insight of the paper is that both superstar and long tail outcomes can be explained by supply-side factors. Moreover, in some situations the two phenomena can coexist, consistent with the empirical findings described above. Results show that a reduction in fixed costs for basic products generates both a long tail, increasing the number and share of niche products sold, and superstar effects, raising the quality of premium products and the sales of each one. A decline in market size also generates both types of effects. By contrast a reduction in the cost of enhancing quality is one-sided, raising investment in premium products—a superstar effect—but not a long tail.

This research contributes to a small but growing literature on long tail effects. Brynjolfsson et al. (2011) focus on consumer search, examining how a reduction in search costs affects concentration in product sales. In a theoretical model of consumer search behavior lower search costs result in a less concentrated sales distribution, a result which they observe empirically in sales data from a multi-chan-

nel retailing company. Fleder and Hosanagar (2009) use analytical modeling and simulation to examine the effect of recommender systems on sales diversity. They find that while these systems may increase individual-level diversity, they tend to push consumers towards the same products, decreasing aggregate diversity. Tucker and Zhang (2011) assess the effect of popularity information on consumer choice, under the hypothesis that the same level of popularity implies higher quality for narrow-appeal products (niches) than for broad-appeal products that would be expected to attract a large number of customers. Using data from a website listing wedding service vendors, the authors find that niche vendors receive more clicks than equally popular broad-appeal vendors, softening the concentration bias of popularity-based recommendations.

In focusing on search costs and recommender systems, this literature emphasizes demand-side technological drivers of long tail effects. By contrast, this paper emphasizes supply-side factors, in particular the role of technology in altering exogenous and endogenous fixed costs.

The paper is structured as follows. Section 2 develops a model of differentiated products with endogenous quality and free entry, initially with identical cost functions. This is extended to heterogeneous products in Section 3: here firms choose between the production of basic and premium goods, which have different production technologies. Using this framework, the impact of developments linked to digitization on industry structure and outcomes are examined. Section 4 concludes. An appendix contains longer proofs.

2. A model of horizontal differentiation with endogenous quality

2.1. Modeling approach

In modeling the impact of digitization in creative media industries, I wish to capture the following features and developments:

- Horizontal differentiation: media content is a highly diverse product class; consumers are heterogeneous in their individual preferences and most desire some variety of products. The impact of digitization on the number of product types supplied is central to the analysis.
- Fixed costs: content production costs are almost entirely fixed, with a large “first copy” cost. Retailing also incurs some fixed costs, e.g. buildings and display space. Digitization lowers fixed production costs with cheaper video hardware, storage and editing, while internet retailing greatly reduces the fixed costs of stocking a range of products compared with traditional stores.
- Quality and endogenous fixed costs: while being fixed in relation to the number of consumers, production costs typically increase with higher quality, thus fixed costs are at least partially endogenous. Digitization lowers the cost of quality enhancement, due to e.g. digital processing, high definition, computer-based editing and movie special effects.

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