Small Grant Proposal, NBER Productivity, Innovation and Entrepreneurship Program

Title: The Unoriginal Sin of Movie Sequel: Impact of Globalization on the Movie Industry.

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The movie industry has become less innovative in recent years. By industry estimates, the numbers of "truly original" movie is only about 30% in recent years. One big contributor was the proliferation of movie sequels. For example, only 6.5% of the wide-release movies were sequels in 1995, this number of sequels has grown to 17% in 2016. Similarly, the box-office share of sequels in the US market has increased from 10% to 30% in the same period. Most of this large increase happened in a relatively short period of time. From 2000 to 2005, the US box-office share of sequels had increased from about 9.5% to 27%.

Previous studies have attempted in answering why movie studios invest heavily in movie sequels. For example, sequels enjoy positive spillover in goodwill from their predecessors. As a result, they perform well and are more predictable in the box office than original movies. However, understanding the advantages of sequels over original movies is not enough to explain the dramatic rise in sequels over such a short period of time. In this project, we take a fresh look, and aim to establish a link between the proliferation of movie sequels and digitization of movie.

The digitization of movies can affect the types of movies being produced through two channels. First, digitization has led to the growth of certain genre of movies, in particular the action/adventure movies. This genre of movies are more attractive in the 3-D format, yielding higher ticket prices and larger returns to investment. Digitization has contributed to the adoption of 3-D technology in the movie industry worldwide. According to the Motion Picture Association of America, the global digital 3-D screens have been increasing at an annual rate of 15-20% in the past 5 years. They already account for 81% of all digital screens in the US, and 59% globally. To the extent that the action/adventure movies are more easily serialized, digitization has contributed to the rise of sequels and the decline of "innovativeness" in the movie industry.

Secondly, digitization reduces trade cost. The emergence of digital cinemas, such as the acceptance of Digital Cinema Initiatives as the international standard for digital film formatting, together with the replacement of bulky metal film canisters with easy-to-transport hard drives, has significantly reduced the duplication and delivery cost of a movie. Husak (2004) estimates that the

reduction in trade costs is 3.5% of the total cost to create and distribute a movie. Lowering trade costs can lead movie studios to prioritize on producing movie sequels to satisfy the exporting demand. Movie sequels, in particular of the action/adventure genre, typically have a lower culture barrier, as they do not require a deep understanding of the western culture. For instance, 3-D screens account for 89% of all digital screens in Asia, significantly higher than the global average. Movie studios prioritize in investment in movie sequels to satisfy export demand. The resulting increases in competitive pressure in the movie industry can indirectly lower marginal returns of those independent and original movies and lead them to suffer in the box-office worldwide.

To quantify the impact of digitization and globalization on the types of movies produced, we need estimates on the demand elasticity of production budget across types and across countries. We plan to estimate a structural nested logit model of movie demand on box-office data from a large number of countries. In particular, we intend to estimate the unobserved movie quality in all the major movie markets. Then, using an instrumental variable approach, we can estimate a quality production function using movie production budgets. This first step estimation is fairly standard in the literature. Our innovation is in the second step, where we estimate the fixed cost of entry into each country, taking into account of movie budget decisions and country entry decisions. One particular challenge is to incorporate movie studios' different expectations of qualities in different countries, based on cultural barriers and movie spillovers, into the entry and budget decisions. In addition, a movie's budget decision depends on the number of countries it is expected to enter, and the entry decision is discrete in nature. Therefore, an additional challenge is that the profit function may not be globally concave and the standard optimization algorithms cannot be applicable.

The NBER grant would help our project in two fundamental ways. First, while movie box-office data of most countries are readily available, the movie data in some major markets, such as China, are sparse. For example, boxofficemojo.com, a popular movie data website, only started collecting data in the Chinese market after 2007, missing the critical years of 2000 to 2005. Even for the years available, the data is often missing months and movie titles. The grant can help us in obtaining the missing data from various media companies, such as the Entgroup of China. Second, the aforementioned technical challenges can dramatically increase the computational complexity and time. We would like to use the grant to purchase the necessary equipment and hire research assistants in completing the computation procedure.