

“Quantitative Analysis on Competition, Innovation and Productivity

- Analysis on Dynamics and Performance of Market Structure -”

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Economic analysis of competition policy is mainly focused on profit ratio and competitive market conditions at industry and firm level. An analysis related to such rate of excess profit and market power of firms provides important suggestions for studying how competition policy functions to secure the static conditions for the market competition. When considering competition policy in dynamic context in relation to its economic impact such as the relationship to economic growth, however, the study of relationship among competition, productivity, and innovation becomes crucial. It will be demonstrated whether a competitive situation in the market affects a mid-to-long term rate of economic growth (potential rate of growth), by examining the relationship to the growth rate of Total Factor Productivity (TFP).

The Herfindahl–Hirschman Index, a static indicator of market structure, is often referred to when enforcing a competition policy, having a solid foundation in the theory of industrial organisation. On the other hand, the share fluctuation index puts emphasis on the dynamics of market structure as a new aspect and has a high potentiality to be a major indicator for competition policy, but it has no theoretical basis.

This research investigated the relationship among competition, innovation, and productivity by focusing on the dynamics of market structure. A theoretical model based on the product life cycle (hereinafter referred to as ‘PLC’) was utilised for the theoretical framework with respect to the dynamics of market structure. It was observed that the dynamics of market structure is affected by the PLC within the process from its birth to maturity in the marketplace. Accordingly, interpretation of indicators in relation to the dynamics of market structure such as the share fluctuation index demands an understanding of the PLC of the relevant market. Specifically, when a new market is being created with the birth of new product, the number of players in the market will increase due to new entrants, but the number of the market participants will decrease in tandem with a lower growth rate of the market thereafter (Klepper and Graddy, 1990). This means that the share fluctuation index will go up during the earlier stage of the PLC and go down in its latter stage even under market competition. Taking these characteristics of the

PLC as a given, the share fluctuation index needs to be analysed.

This research first calculated the share fluctuation index on a detailed item classification basis by utilising individual data of the Census of Manufactures from mid 1980's to 2003, and then undertook quantitative analysis on its relationship with the stage of the PLC for each product. This research also analysed the determinants of the share fluctuation index as well as its characteristics.

In order to determine the stage of the PLC for each product, it is essential to specify the timing of entry into the market for each product. To satisfy this requirement, we prepared two sets of data; 'detailed item data' and 'continued item data', utilising respectively new product classification and continued product classification of the item classification (six-digit detailed classification) in the Census of Manufactures.

An analysis with the continued item data by dividing them into the first half and latter period of product life, reported that the share fluctuation index at the earlier stage of the PLC was larger than that of the latter stable-growth period. In addition, the state of market share fluctuations in the 'declining phase' (the process a product disappears from the market) could be determined, depending upon kinds of product. It was also revealed that the market share fluctuations at the 'declining phase' of the PLC is larger compared with that of the stable-growth period. Thus, it is evident that one must consider the stage of the PLC of each product when evaluating competitive market conditions with the share fluctuation index.

Next, we conducted a regression analysis on such determinants of the share fluctuation index including the stage of the PLC as the growth rate of the market and the number of market participants, and we devised the 'theoretical' share fluctuation index for each product at the different stages of the PLC with the results. In the case that the actual share fluctuation index is lower than this theoretical indicator by a wide margin, there is a high possibility of existence of some problems on market competition.

By utilising the analytical framework of Klepper and Graddy in 1990 from the detailed item data, this study also listed products which have a large deviation from the theoretical share fluctuation index among products at the time of the launch where there exists particularly a high possibility of leading some issues on competition policy.

Furthermore, this research specified a future agenda in this field of study as follows. With regard to the data, the industrial statistic data from 1985 to 2003 is subject to the analysis in this study, which is rather short to fully capture the stage

of the PLC for each product.

On the one hand, static indicators of market structure such as Herfindahl–Hirschman Index and concentration index of shipment value have been conventionally represented as tools to provide situations of market competition, and on the other hand, the share fluctuation index is unique in its ability to show dynamic situations of market competition. As can be seen in the market of Internet browsers, the market seems oligopolistic statically, but the fact that the main player in the browser market has changed from Netscape to Microsoft represents dynamic fluctuations. Thus, in the IT industry where the network effect plays quite a significant role, static indicators of market structure are considered insufficient to grasp the landscape of the market competition.

As seen above, the share fluctuation index is highly expected in its ability to reveal another aspect of market competition, unlike any other previous indicators. However, there are still some difficulties in its application. Basically, a share fluctuation for each company becomes relatively small in a market with many participants where competition is statically active, making the indicator itself less relevant.

Accordingly, it is necessary to adjust the index by controlling these factors when using the share fluctuation index as an index for market competition.

In addition, theories on the dynamics of market competition are required to be developed in order to study the fluctuation of market share further in the future. Although a theoretical model proposed for this project by incorporating the PLC is one of the newer studies, this model assumes perfect competition, and it has not directly brought up the issues of inefficiency of a dynamic market. Development of a theoretical model explicitly addressing market inefficiencies in dynamic competition lags far behind that of the static market. Both theoretical and empirical research is further required for effective application of the share fluctuation index.

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