The persistence of market leadership: evidence from Japan

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Abstract

This paper explores the persistence of market leadership in Japanese manufacturing industries over the period 1975–2004. By applying survival data techniques, we examine how long market leadership persists, and describe the differences in the duration of market leadership between industries. According to our results, about half of market leaders are found to maintain their leadership positions for ten years. Market leadership tends to persist in concentrated and cartelized industries, whereas it is less likely to persist in growing, R&D-intensive, and import-intensive industries.

Keywords: Market leadership, persistence, survival data technique.

JEL Classification Codes: L10, L60, M21.

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1. Introduction

Market leaders are widely regarded as enjoying more market power and competitive advantages than their rivals. Market leaders indeed maintain their leadership positions over a long period of time in some industries. In contrast, the turnover of market leaders is often observed in other industries. What causes the difference in the persistence of market leadership between industries? This paper explores the persistence of market leadership, using data on Japanese manufacturing industries over the period 1975–2004. By applying survival data techniques, we describe the difference in the duration of market leadership between industries.

Until now, the persistence of market leadership has been addressed by some scholars. Whether market leadership is persistent or not is one issue that has attracted some attention in the field of industrial organization.[1] According to Sutton (2007), there are two rival views. One view is that market leadership tends to persist for a long time, which is associated with Chandler's (1990) argument.[2] Another view, whose origin goes back to Joseph Schumpeter, is that market leadership is rather transitory.

In fact, there are different patterns in industrial dynamics among sectors, which is well-known as "Schumpeterian" legacy (e.g., Malerba, 2004). In some industries, such as electronics and pharmaceuticals, a number of new firms play a major role of creative destruction, and the speed of technological changes is fairly rapid. In other industries, such as textiles, and iron and steel, there are large barriers to en-

[1] In the field of industrial organization, the stability of market leadership as a measure of mobility has also been addressed by some scholars, and industry differences in the stability have been investigated in some empirical studies. For example, Joskow (1960) examined the stability of market leadership by means of the rank correlation coefficient. Mueller (1986) also examined the stability of market leadership by using data at two points in time. Kato and Honjo (2006) investigated the market share instability of leading firms as a measure of market mobility.

[2] For a detailed discussion on Chandler's (1990) argument, see Teece (1993).

try, and a few large firms dominate the markets. Therefore, whether market leadership is persistent seems to depend on industry-specific characteristics.

On the other hand, obtaining or sustaining leadership positions may be a key managerial goal for many companies to exploit competitive advantages, which may cause the superior performance of firms. In addition, as noted by Geroski and Toker (1996, p.141), many managers are concerned with their rank at the top of the markets they operate in. Therefore, the findings from research on the persistence of market leadership might provide some insight into the management strategy of firms.

Furthermore, as is often argued, Japanese domestic markets appear to have special characteristics. For example, several types of cartels, such as recession cartels, rationalization cartels, and export-import cartels, have been exempted from the application of Antimonopoly Act, in order to protect domestic industries by avoiding overt competition under the rapid macroeconomic growth.[3] The industries where cartels were legally sanctioned may still have a historical legacy, even if the cartels are not exempted from the application of Antimonopoly Act today. The historical background may influence competition between firms. In this respect, research that focuses on Japanese industries might be of some interest to the discussion of competition policy.

The remainder of the paper is organized as follows. Section 2 describes the data employed in the analysis. Section 3 explains the

[3]Cartels exempted from the application of Antimonopoly Act were abundant until the early 1990s, but most of them had been abolished by 1999. However, only a few, such as special legislation cartels for several service industries, are still sanctioned today. According to the *JFTC Annual Reports* (*Nenji Hokoku*), the total number of legally sanctioned cartels peaked in 1966 at 1079. In particular, legally sanctioned cartels were seen in industries, such as textiles, clothing, nonferrous metals, printing and publishing, stone, clay and glass, steel products, and food products. For additional discussion on legally sanctioned cartels, see, for example, the *JFTC Annual Reports*, Caves and Uekusa (1976), Goto and Suzumura (1999), and Porter et al. (2000).

method used in the analysis. Section 4 discusses industry differences in the persistence of market leadership. The empirical results are presented in Section 5. The final section includes some concluding remarks.

2. Data

The data set employed in this paper comes from the *Survey of Concentration Ratio on Production and Shipment* (*Seisan Shukka Shuchudo Chosa*) (hereafter, the *CRPS*), which has been annually surveyed for the purpose of monitoring market structure by the Fair Trade Commission of Japan (JFTC).[4] The *CRPS* covers a large number of industries, and industries surveyed are classified at the roughly six-digit Standard Industrial Classification (SIC) level. This source includes data on the production and shipment of the ten leading firms and industry concentration in each industry over the period from 1975 to 2004.

Our data sets consist of manufacturing industries obtained from the *CRPS*. Using the *CRPS*, we calculated the market shares of firms, and identified the ranks in the ten leading firms in each industry. In the analyses, we employed data on concentration and market shares based not on shipment but on production because the sample size obtainable is fairly larger than based on shipment.[5] In addition, the measurement units for concentration and market shares vary across industries—some are measured by unit volume and others by the value

[4] There are several data sources detailing market shares in Japan, including *Market Share in Japan*, *Statistics Monthly* (*Tokei Geppo*), and the *Handbook of Market Shares*, which are published annually by Yano Research Institute Ltd., Toyo Keizai Inc., and Nihon Keizai Shimbun Inc., respectively. In this paper, the *CRPS* was employed because the data source includes a greater number of industries over a long period of time than the other sources.

[5] Although we also examined the persistence of market leadership using data based on shipment, the results were almost consistent with those using data based on production. In this paper, therefore, we report only the estimation results using data based on production.

in the *CRPS*. In this paper, we simply calculated concentration and market shares without conversion into unit volume, because of the lack of appropriate deflators.

To obtain the duration of market leadership, we need the starting points of observations. First, we used 1975 as a starting point, since the *CRPS* covers data on market shares from 1975. Then, we used two additional starting points every 5 years from 1975. That is, the starting points of observations are 1975, 1980, and 1985. Using these starting points, we construct data sets to measure the duration of market leadership over the periods 1975–2004, 1980–2004, and 1985–2004. It is generally recognized that the Japanese economy has experienced a period of low growth since the first oil shock of 1973–1974. The observation period corresponds to the phases of low growth, although including Japan's so-called "bubble economy."

However, several problems arose when the *CRPS* was used to construct the data sets on market shares. First, the industrial classification in the *CRPC* did not stay consistent during the observation period. In other words, some industries were changed or eliminated when we tracked market leaders over time. To deal with such cases, we attempt to apply survival data techniques that will be explained later. Even if observations are censored in some industries, those industries can be included in the sample. In doing so, we may be able to avoid a sample selection bias. Then, mergers and acquisitions (M&As) or spin-offs occurred in several industries during the observation period.[6] If one of the two leading firms merges with another firm within an industry, the industry is regarded as censored at the point.[7] On the other hand, if the firm merges with another firm out of the industry, the firm is regarded as the same as before. When M&As or spin-offs among a company group occurred, the firm is also regarded

[6]Although every effort was made to find M&A during the observation period, the possibility may remain that there are some unobservable small-sized M&A or spin-offs.

[7]In our data sets, nine industries were censored through this procedure. The results were generally consistent with those including the censored industries.

as the same as before.[8] Fortunately, there were few M&As involving leading firms in Japanese manufacturing industries until the late 1990s. In that sense, we can say that Japanese manufacturing industries are preferable settings than those in other developed countries for studying the persistence of market leadership.

For the other sources of data, we used the *Data Report (1) of Linked Input-Output Tables* (hereafter, the *IO Tables*), which is compiled by the Management and Coordination Agency, to obtain data on advertising intensity and import intensity. In addition, data on research and development (R&D) intensity was taken from the values estimated by Goto and Suzuki (1989). R&D intensity was measured as R&D expenditures divided by value added at the roughly three-digit SIC level. Information on cartels exempted from the application of the Antimonopoly Act was obtained from the *JFTC Annual Reports* (*Nenji Hokoku*).

As a result, our data sets consisted of 376, 405, and 467 industries for the periods 1975–2004, 1980–2004, and 1985–2004, respectively. Table 1 describes the numbers of observations in the data sets by the two-digit SIC level. Since, as already mentioned, observations were censored in some industries, market leaders can be observed until censored in those industries. To take into account the censored observations, we apply survival data techniques. By apply survival data techniques, we will describe the difference in the duration of market leadership between industries.

[8] Moreover, there were some cases that the company name of market leaders was changed during the observation period. We tracked the company records by using several sources, such as *A List of Changed Company Names of Japanese Corporations* compiled by Chisato Yuki and the Economic Research Institute, Japan Society of the Promotion of Machine Industry.

3. Method

In this paper, we use a nonparametric method proposed by Kaplan and Meier (1958) to examine the persistence of market leadership.[9] Let $t_j (j = 1, 2, \ldots, m)$ denote the time at which the event occurs. If all the times in the sample are ordered such that $t_1 \leq t_2, \ldots, \leq t_m$, then the Kaplan-Meier estimator, $\hat{S}(t)$, which is a standard method to estimate the survival function, is given by

$$\hat{S}(t) = \prod_{j|t_j \leq t} \left(1 - \frac{d_j}{n_j}\right), \tag{1}$$

where d_j is the number of individuals who experience the event at time t_j, and n_j is the number of individuals who have not yet experienced the event at that time and therefore still "at risk" of experiencing it (including those censored at t_j). In the case of this paper, d_j indicates the number of industries in which the identity of the first-ranked firm changed at time t_j.[10] Also, n_j indicates the number of industries in which the identity of the first-ranked firm has not yet changed at t_j and therefore still at risk of experiencing the turnover of the market leader.

In addition, we test the equality of the survival function across groups, using the log-rank test. Let n_{ij} denote the number of individuals at risk in group $i(= 1, \ldots, r)$ at time t_j. Under the null hypothesis of no difference in survival among the r groups, the expected number of events in group i at time t_j is $e_{ij} = n_{ij}d_j/n_j$. The test statistic is calculated by

$$\mathbf{u}' = \sum_{j=1}^{k} W(t_j) \left(d_{1j} - e_{1j} \quad \cdots \quad d_{rj} - e_{rj}\right) \tag{2}$$

where $W(t_j)$ is a positive weight function defined as zero if $n_{ij} = 0$.

[9] For more discussion on nonparametric methods, see, for example, Klein and Moeschberger (2003), Cleves et al. (2004), and Rabe-Hesketh and Everitt (2007).

[10] Because the rankings of market shares are reported annually, t is measured by year.

The variance matrix $\mathbf{V}(\sim r \times r)$ has elements

$$V_{il} = \sum_{j=1}^{k} \frac{W(t_j)^2 n_{ij} d_j (n_j - d_j)}{n_j(n_j - 1)} \left(\delta_{il} - \frac{n_{ij}}{n_j} \right) \tag{3}$$

where where $l = 1, \ldots, r$, and $\delta_{il} = 1$ if $i = l$ and 0 otherwise.

The test statistic, $\mathbf{u}'\mathbf{V}^{-1}\mathbf{u}$, is distributed as χ^2 with $r-1$ degrees of freedom under the null hypothesis. In the case of the log-rank test, $W(t_j) = 1$ if $n_{ij} > 0$.

Using the Kaplan-Meier method, we estimate the survival functions for the duration of market leadership. Using the log-rank test, we also show the differences in the duration of market leadership between industries. Before calculating the survival estimates based on the Kaplan-Meier method, we consider industry differences in the persistence of market leadership. In the following section, we discuss how the persistence of market leadership varies between industries.

4. Industry differences

4.1. Hirshman-Herfindahl index (HHI)

In the field of industrial organization, many scholars have argued that collusion is more likely in concentrated industries. Also, some studies have found that the stability of market shares tends to occur in concentrated industries.[11] Therefore, the persistence of market leadership may occur in concentrated industries rather than in unconcentrated industries. According to the Chandlerian view, however, there is the possibility that market leadership may persist, regardless of the initial market share gaps between the market leader and lower-ranked firms. In fact, Chandler (1990) found considerable stability in the rankings of leading firms in several developed countries. From this viewpoint,

[11] For example, Fraas and Greer (1977) found that collusion is more likely in concentrated industries. Shepherd (1970) also argued that successful collusion would tend to hold market shares virtually constant. Kato and Honjo (2006) found that the market shares of leading firms are more stable in highly concentrated industries.

there may be no significant differences in the persistence of market leadership between low and high concentrated industries.

4.2. Industry growth

Industry growth is fairly important in explaining the persistence of market leadership, due to its disturbance effect on firms' behavior. Higher growth in market demand may provide potential entrants more opportunities for new entry.[12] At the same time, it may provide lower-ranked firms more opportunities to displace market leadership positions, and also accelerate the disequilibration among industry's incumbents. In this respect, industry growth is predicted to have a turbulent effect on the stability of market leadership positions. To test whether industry growth is associated with the turnover of market leaders, the full sample was grouped into the low growth and high growth subsamples. In this paper, industry growth was measured as the difference of the logarithm of industry's output between the starting point and the time when market leadership change occurred or the industry was censored, which is divided by the number of observation years.

4.3. Demand fluctuation

Market demand is considered to be turbulent in declining industries as well as in growing industries. As already discussed, there may be new entries and more opportunities to overtake top-ranked firms for lower-ranked firms in growing industries. In declining industries, as Ghemawat and Nalebuff (1990) suggests, larger firms may reduce the capacity first due to their lower marginal revenue than smaller firms. In fact, some studies (e.g., Davies and Geroski, 1997; Kato and Honjo, 2006) found that both positive and negative growth in demand

[12] In fact, a number of studies have found that high industry growth is associated with a high entry rate. See, for example, Geroski and Schwalbach (1991).

brings greater instability of leading firms.[13] In these respects, market leadership is predicted to be less persistent in industries with greater demand fluctuations.

4.4. Advertising intensity

In addition, we examine whether the survival functions differ between low advertising-intensive and high advertising-intensive industries. As is often argued, advertising encourages product differentiation, which has been viewed as an entry or mobility barrier. In practice, some studies (e.g., Sakakibara and Porter, 2001) found that advertising has a negative effect on the mobility of leading firms. Conversely, other studies (e.g., Eckard, 1987; Das et al., 1993) have suggested that advertising does not reduce mobility in an industry. In this respect, more advertising may lead to the turnover of market leaders.

4.5. R&D intensity

We also examine whether the survival functions differ between low R&D-intensive and high R&D-intensive industries. As pointed out by many studies (e.g., Dosi et al. 1997; Malerba and Orsenigo, 1997; von Tunzelmann and Acha, 2005), there appears to be quite distinct patterns in industrial dynamics between low R&D-intensive and high R&D-intensive industries. Also, there appears to be different life-cycle patterns between those industries (e.g., Gort and Klepper, 1982; Klepper, 1997). In addition, Davies and Geroski (1997, p.389) concluded that R&D plays an important role in affecting the turnover of market leaders. In these respects, market leadership may be less likely to persist in high R&D-intensive industries.

[13] In addition, Symeonidis (2003) found that collusion is more likely in moderate growing industries.

4.6. Import intensity

In addition to domestic market conditions, international competition would have some influence on the turnover of market leaders. In practice, some studies have provided empirical evidence on the significant effects of international competition on industrial mobility. For example, Baldwin and Caves (1998) found that international competition increases the turnover of firms in Canadian manufacturing industries. Baldwin (1995) also suggested that import pressure increases the mobility of industries. Therefore, market leadership may be less persistent in import-intensive industries.

4.7. Presence of legal cartels

In Japan, as already mentioned, several cartels, such as recession cartels, rationalization cartels, export-import cartels, small and medium-sized business cartels, and industry-specific cartels, were exempted from the application of Antimonopoly Act. These legally sanctioned cartels allow cartel members cooperative arrangements at production, price, investment, capacity, and so on. In the case of export-import cartels, for example, a trade association restricts the activities of cartel members in the industry. In practice, legally sanctioned cartels have been seen in some industries, and they may restrict competition between firms. The industries where cartels were legally sanctioned before may still have a historical legacy, even though legally sanctioned cartels have been already abolished today. Moreover, Bradburd and Over (1982) suggested that once an industry cooperative equilibrium is allowed to form, it will tend to persist, even if industry concentration subsequently declines substantially. In these respects, market leaders in industries that experienced legally sanctioned cartels may tend to maintain their positions, compared with the others, because of the lack of competition through cooperative arrangements.[14]

5. Empirical results

5.1. Full sample estimates

We first estimate the survival functions for the persistence of market leadership using the Kaplan-Meier method. In (a), (b), and (c) of Figure 1, the Kaplan-Meier survival estimates for the full sample are shown when the starting points are 1975, 1980, and 1985, respectively. As shown in Figure 1, about half of market leaders maintained their leadership positions for ten years, regardless of starting points. Further, about 30% of market leaders in 1975 maintained their leadership positions throughout the observation period. In other words, while market leadership positions are fairly stable over long periods in some industries, they are less stable in other industries. What causes the differences in the persistence of market leadership between industries will be examined in the following subsection.

When we estimate the survival functions for the persistence of market leadership using the Kaplan-Meier method, some of market leaders maintain their leadership positions throughout the observation period. In fact, the largest observed analysis time is censored in 2004, and the survival estimates do not go to zero in Figure 1. Thus, if we calculate the duration of market leadership based on the mean survival time, the duration is underestimated. Therefore, we attempt to extend the survival function from the largest observed time to zero using an exponential function, in order to identify the duration of market leadership.

Figure 2 shows an exponentially extended survival function for

[14] Most cartels legally sanctioned were classified into export-import cartels. As argued by Sakakibara and Porter (2001), they have not necessarily restricted or tempered domestic competition, unlike other types of cartels. In practice, we also examined whether the duration of market leadership differs between cartelized industries and other industries, using data on only export-import cartels. The result was generally consistent with that with any legal sanctioned cartels.

the full sample. In Figure 2, we calculated the mean duration of market leadership under the entire curve estimated. The estimated durations of market leadership are 19.9, 19.4, and 16.4 years, when the starting points are 1975, 1980, and 1985, respectively.

5.2. Subsample estimates

To describe whether the persistence of market leadership varies across industries with different characteristics, we provide the Kaplan-Meier survival estimates according to industry-specific characteristics. The definition and summary statistics for covariates are shown in Tables 2 and 3. We divide the full sample into two subsamples, based on the median value of the industry-specific covariates except for a binary variable. Figures 3–9 show the Kaplan-Meier survival estimates according to industry-specific characteristics. These estimates are shown when the starting points are 1975, 1980, and 1985, respectively. Furthermore, we show the log-rank test for the equality of the survival estimates between the two subsamples ($r = 2$).

Based on the Hirshman-Herfindahl index (HHI) at starting points, the full sample were grouped into low HHI and high HHI subsamples.[15] As shown in Figure 3, there were clear differences in the persistence of market leadership between low and high HHI industries. The log-rank test indicates that the estimated survival functions dif-

[15]The full sample was also equally divided into two subsamples, based on the market shares of the first-ranked firms at the starting points. If a first-ranked firm has fairly high market share, which typically refers to "dominant firm," and the firm possesses long-run market power over its rivals, then market leadership may be more likely to persist in such an industry. Obviously, market leaders with low market shares were more likely to be displaced from their leading positions. As Sutton (2007) discussed, the market share gap between the first-ranked and second-ranked firms may also affect the persistence of leadership. Even though a first-ranked firm is overtaken by a lower-ranked firm, the overtaking firm is not always the second-ranked firms. The market share gap accounts for only the difference between the two leading firms, whereas the Hirshman-Herfindahl index (HHI) takes into consideration the market share distribution among any firms within a market. In fact, when we divided the sample into two subsamples based on the market share gap between the two leading firms, the result was generally consistent with that using the HHI.

fer significantly between the two subsamples. This result may suggest that differential competitive advantages between firms do not always persist in all industries, although the Chandlerian view states that differential competitive advantages between firms at the initial point can be sustained over long periods. Rather, the sustainability of differential competitive advantages may reflect differences in the contexts in which firms operate, that is, industry-specific conditions.[16]

Then, as shown in (a) of Figure 4, the survival estimates differ greatly between low and high growth industries, and its equality is rejected by the log-rank test. This indicates that market leaders are likely to be overtaken by lower-ranked firms in high growth industries. However, while there were significant differences in the survival estimates between the two subsamples when the starting point is 1975, we did not find significant differences between those industries when the starting points are 1980 and 1985. As is often argued (e.g., Odagiri, 1992), Japanese firms tended to pursue long-term growth under the system of lifetime employment and internal promotion, and even fringe firms tended to expand their businesses to grow in periods of stable economic growth. These tendencies are likely to lead to fierce competition for market shares between firms. On the other hand, there is the possibility that competition for market shares was overall limited in periods of low economic growth. For these reasons, the effects of industry growth on the persistence of leadership may differ between starting points.

On the other hand, as shown in Figure 5, we found considerable differences in the survival estimates between industries with low and high demand fluctuations, regardless of starting points. Also, the differences were statistically significant as verified in the log-rank test. This suggests that demand fluctuation is a fairly significant factor in explaining the turnover of market leaders, regardless of positive and negative growth. Our result is consistent with Davies and Geroski's

[16]For additional discussion on this point, see Nelson (1991).

(1997) and Kato and Honjo's (2006) findings.

We also examined whether the survival estimates differ between low and high advertising-intensive industries. As shown in Figure 6, the Kaplan-Meier estimates were almost similar between the two subsamples, regardless of which starting points were used. The log-rank test also did not reject the equality between subsamples.

In addition, the relationship between R&D intensity and the persistence of market leadership was examined. The result is shown in Figure 7, which indicates that market leaders tend to maintain their leadership positions in low R&D-intensive industries rather than in high R&D-intensive industries. This also concurs with Davies and Geroski's (1997) argument. As already mentioned, our result may relate to the presence of different patterns in industrial dynamics and life cycles between low and high R&D-intensive industries.[17]

We also examined differences in the survival estimates for the duration of market leadership between low and high import-intensive industries..[18] As shown in Figure 8, the survival estimates were significantly different between the low and high import intensity subsamples, although there were not significant differences in (c) of this figure. This may suggest that competition with foreign firms leads to fierce competition among domestic firms.

Moreover, we examined whether the survival estimates differ between industries with legally sanctioned cartels and other industries. In Figure 9, the survival estimates indicate that market leaders tend to maintain their positions in industries where cartels were legally

[17]On the other hand, Etro (2004) argued that market leaders have incentives to invest in R&D and, therefore, market leadership persists through innovations. In fact, market leaders may maintain their leadership positions through innovations. In this paper, however, we simply employ R&D intensity at the industry level than identifying who invests in R&D.

[18]We also examined whether there are differences in the survival functions between low export-intensive and high export-intensive industries. As Doi (2001) found, exports may have a significant effect on the turnover of market leaders. However, since we did not find any significant differences between the two subsamples, we do not report the results.

sanctioned. The log-rank test verified the inequality between the two subsamples. However, we cannot conclude that legally sanctioned cartels result in less competition, because there is the possibility that cartels were sanctioned in effectively uncompetitive industries. In fact, Porter et al. (2000) pointed out that cartels were common in uncompetitive industries. On the other hand, Porter et al. (2000) provided evidence that legal cartels were not a source of competitiveness, and rather they contributed to uncompetitiveness. In this respect, our empirical result may indicate that competition was limited over long periods in legally cartelized industries, and that thereby market leadership tended to persist in those industries.

Furthermore, we estimated the duration of market leadership by dividing the full sample into subsamples, based on the same criteria used above. The estimated mean duration by covariate is shown in Table 4. As shown in Table 4, market leaders in high HHI industries tend to stay at the top for twice periods than those in low HHI industries. Similarly, the results indicate that industry-specific characteristics, such as R&D intensity, import intensity, and the presence of legal cartels, affect the duration of market leadership. In particular, with respect to demand fluctuation, there are large differences in the duration of market leadership between the two subsamples.

5.3. Discussions

We have examined the persistence of market leadership in Japanese manufacturing industries, with a focus on industry differences in the duration of market leadership. We estimated the survival functions for the persistence of market leadership, using the Kaplan-Meier method. In the analyses, the survival functions were estimated by using both the full sample and the subsamples, respectively.

As repeatedly discussed, there were significant differences in the persistence of market leadership between industries. In Table 5, the duration of market leadership estimated using an exponentially extended survival function is shown by the two-digit SIC level. As shown in this table, the duration of market leadership tended to be fairly long in the food, paper and pulp, stone, clay and glass, and iron and steel sectors. In many of these sectors, indeed, market demand were fairly stable during the observation period.[19] Also, in some of these sectors, cartels were exempted from the application of Antimonopoly Act in the 1970s, 1980s, and the early of 1990s. In addition, R&D intensity of these sectors is much lower than its mean for the full sample.

On the contrary, market leadership tended to be less persistent in machinery industries, especially in the general machinery and precision machinery sectors. These sectors are R&D-intensive, and their growth rates were relatively higher than others. In addition, cartels are rarely found in those industries. As Porter et al. (2000) argued, indeed, there appears to be some cases where the industries with the turnover of market leaders have high competitiveness (e.g., cameras and robotics markets). In that sense, our empirical results may have some influence on public policy in assessing competition in Japanese industries.

6. Conclusions

This paper explores the persistence of market leadership in Japanese manufacturing industries over the period 1975–2004. By applying survival data techniques, we examine how long market leadership persists, and describe the differences in the duration of market leadership between industries. According to our results, about half of market leaders are found to maintain their leadership positions for ten years. Market leadership tends to persist in concentrated and cartelized industries, whereas it is less likely to persist in growing, R&D-intensive, and import-intensive industries.

[19] For a detailed information on the annual growth rates by sector, see, for example, Porter and Sakakibara (2004, p.41).

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Figure 1: Kaplan-Meier survival functions: full sample

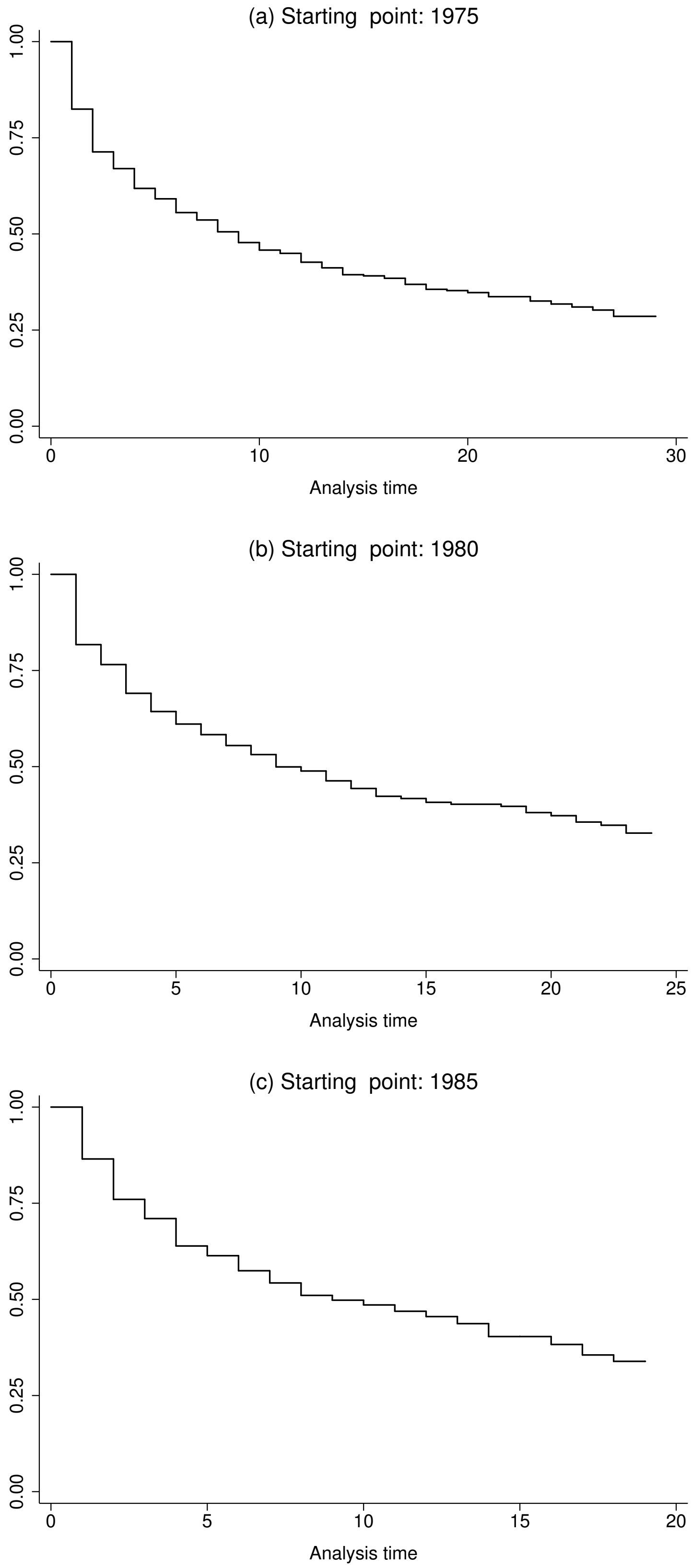


Figure 2: Exponentially extended survival functions: full sample

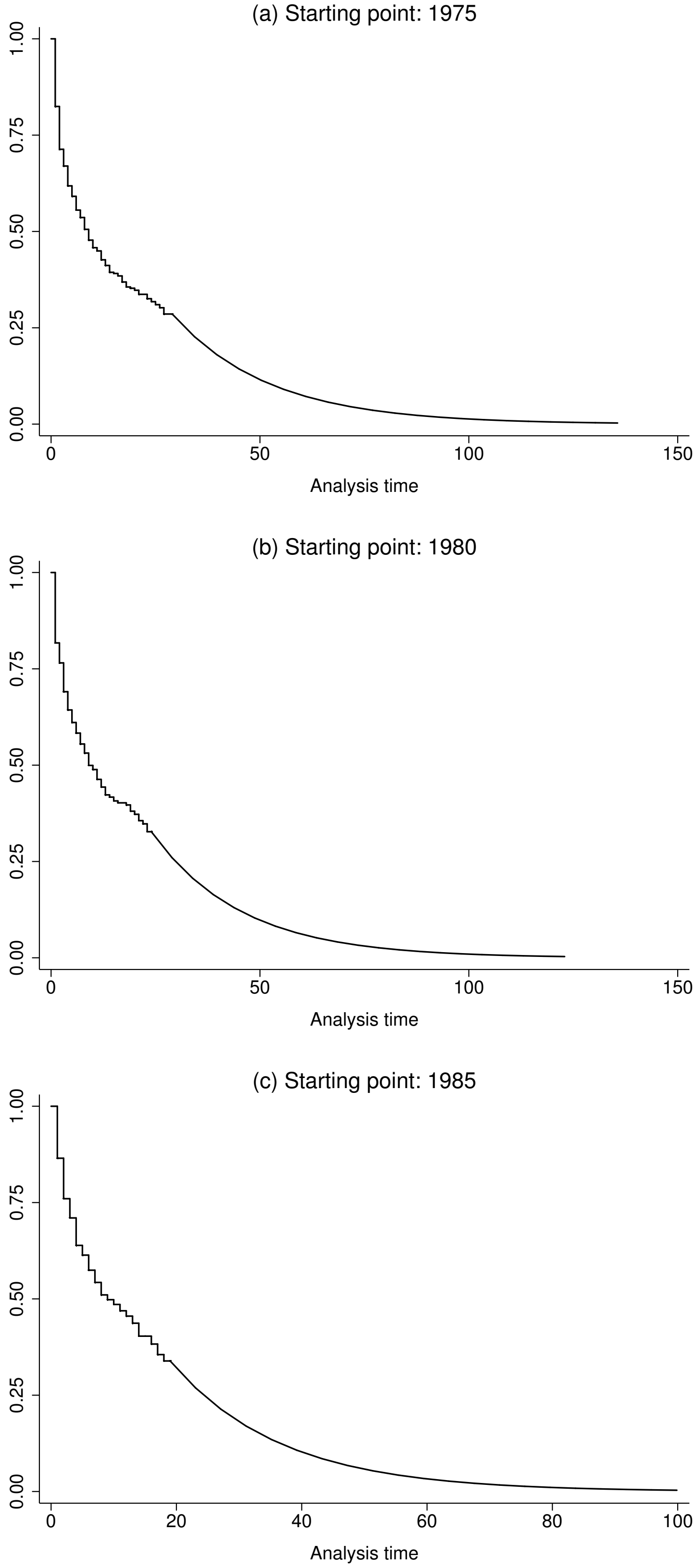
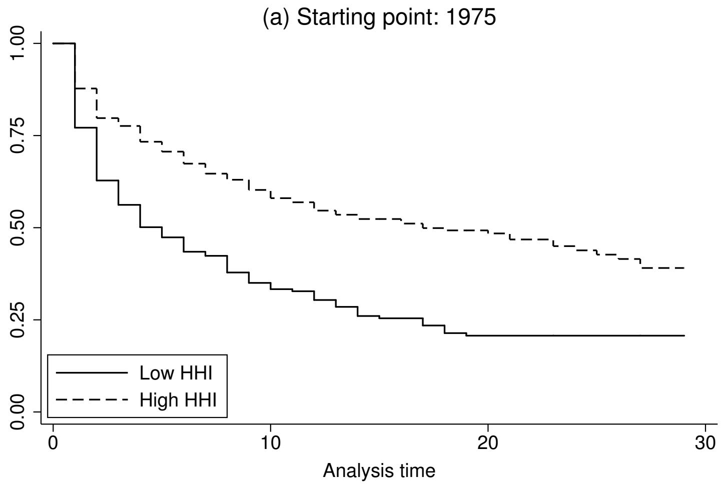
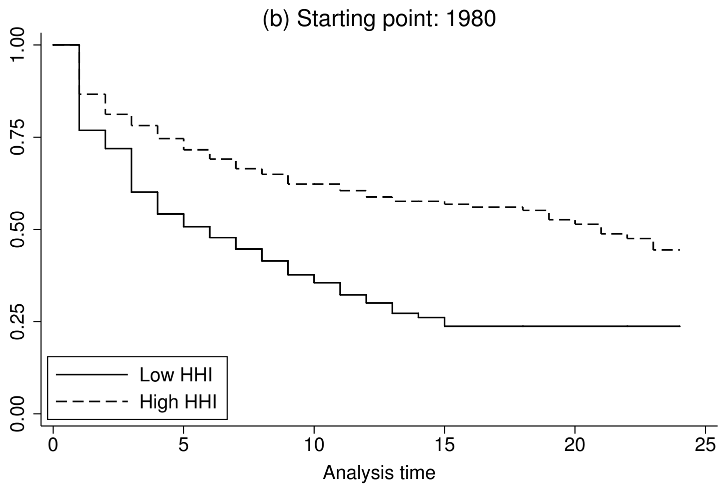


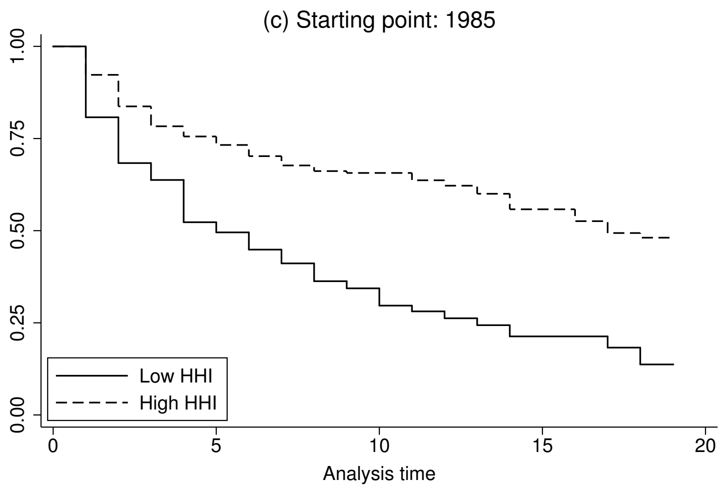
Figure 3: Kaplan-Meier survival functions: HHI



Log−rank test: chi2(1) = 31.46, p−value = 0.000.



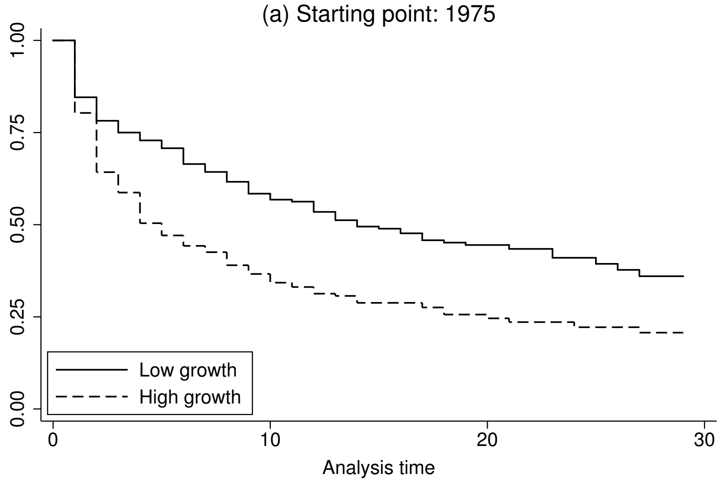
Log−rank test: chi2(1) = 35.12, p−value = 0.000.



Log−rank test: chi2(1) = 48.18, p−value = 0.000.

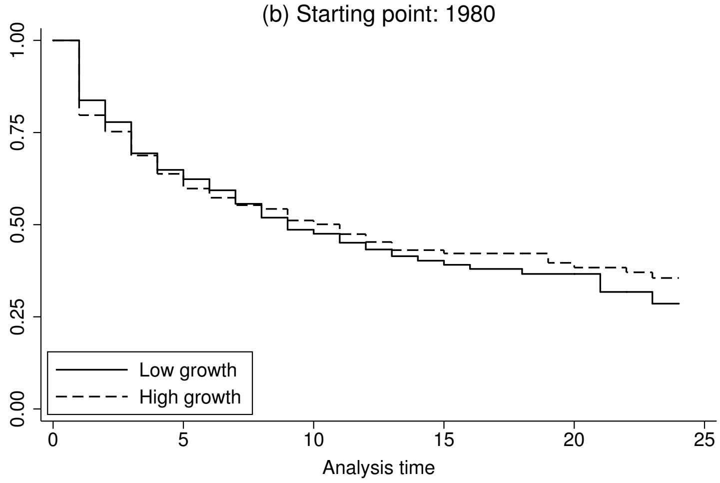
Figure 4: Kaplan-Meier survival functions: Industry growth

(a) Starting point: 1975



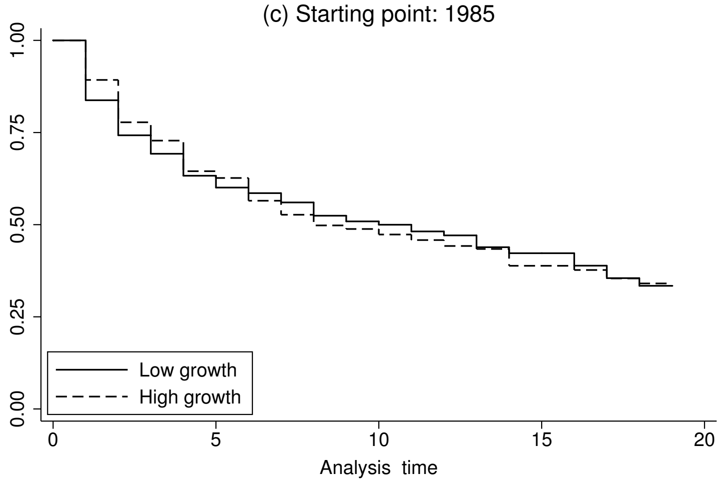
Log−rank test: chi2(1) = 17.55, p−value = 0.000.

(b) Starting point: 1980



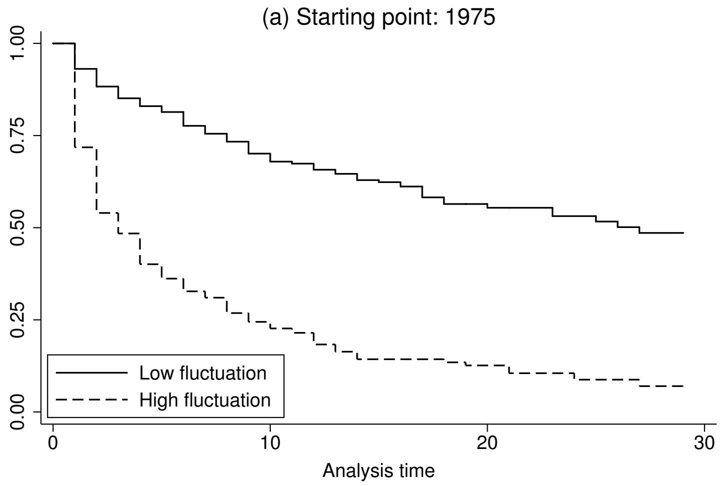
Log−rank test: chi2(1) = 0.30, p−value = 0.582.

(c) Starting point: 1985

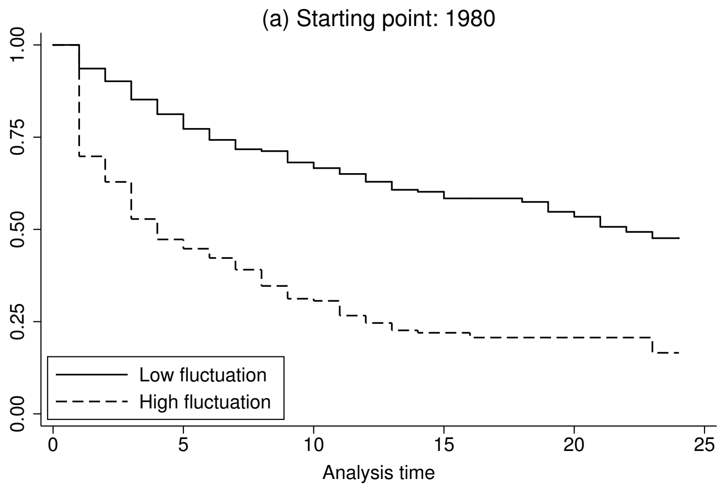


Log−rank test: chi2(1) = 0.00, p−value = 0.944.

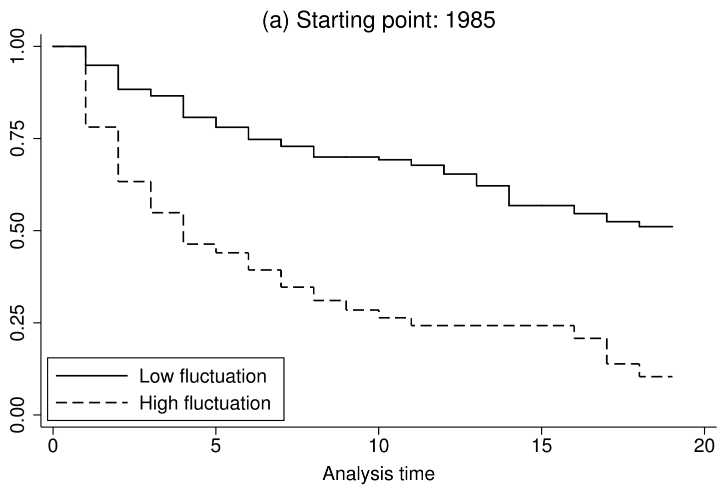
Figure 5: Kaplan-Meier survival functions: Demand fluctuation



Log−rank test: chi2(1) = 109.74, p−value = 0.000.



Log−rank test: chi2(1) = 68.16, p−value = 0.000.



Log−rank test: chi2(1) = 86.57, p−value = 0.000.

Figure 6: Kaplan-Meier survival functions: Advertising intensity

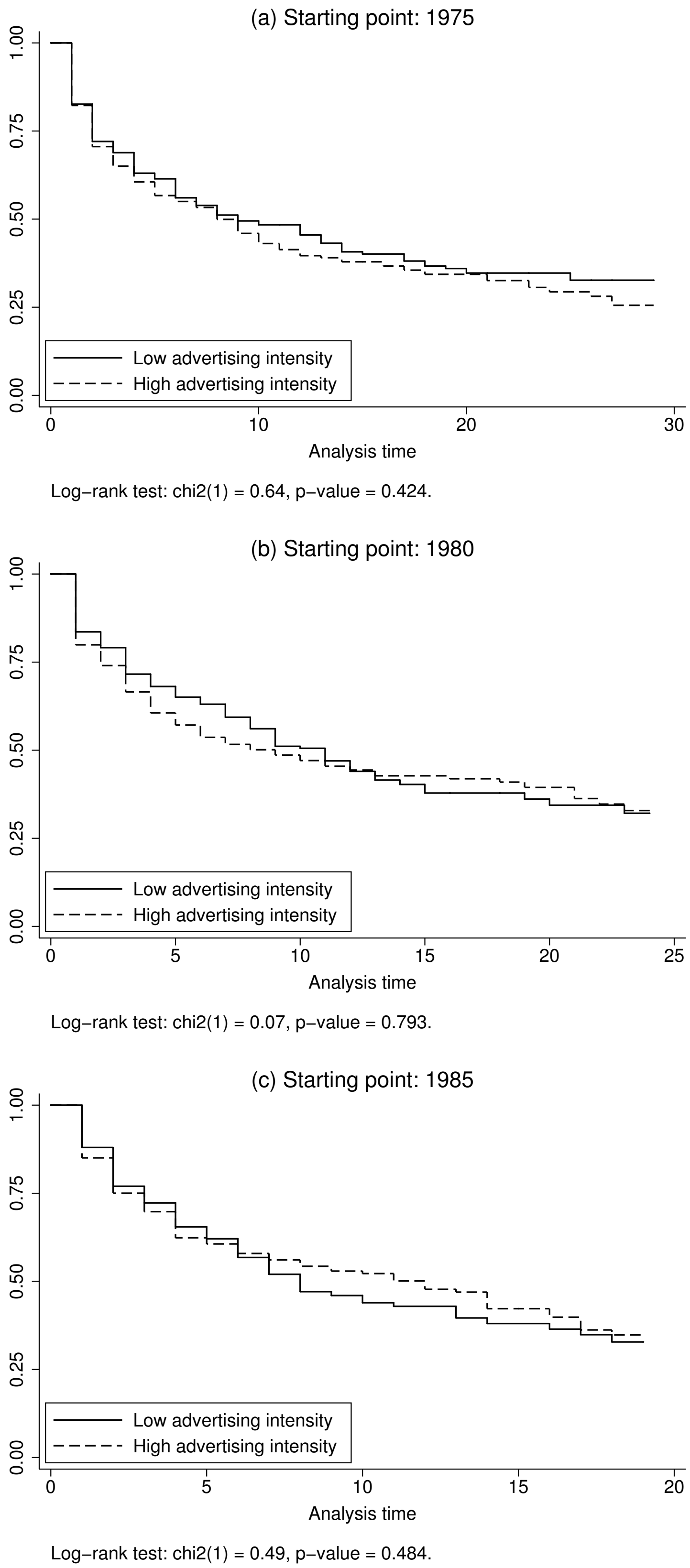
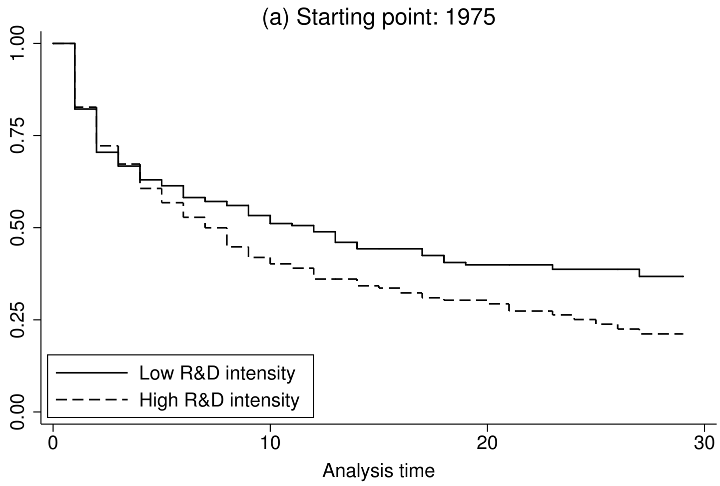
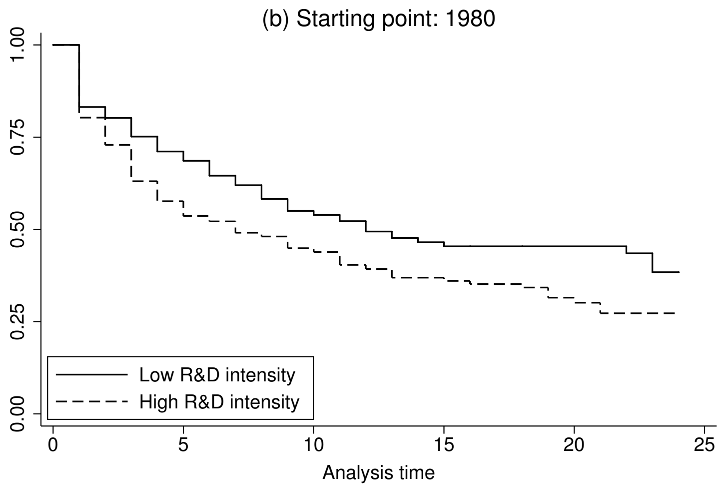


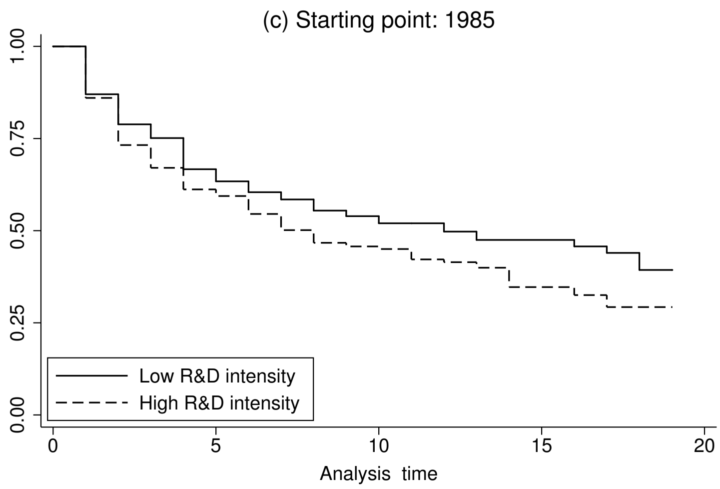
Figure 7: Kaplan-Meier survival functions: R&D intensity



Log−rank test: chi2(1) = 4.84, p−value = 0.028.

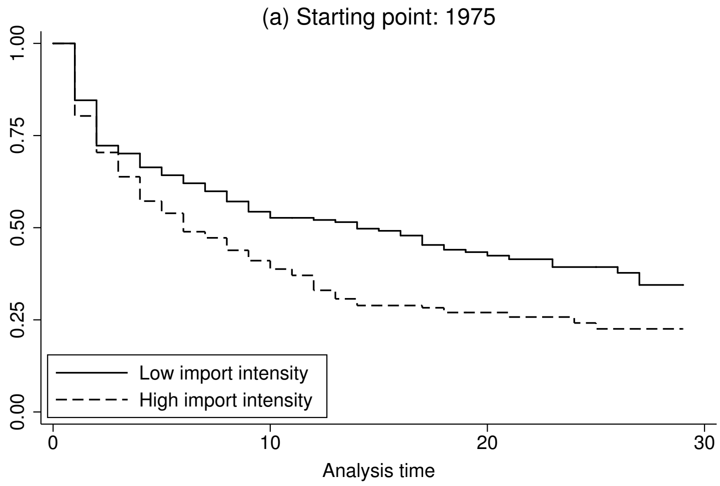


Log−rank test: chi2(1) = 6.23, p−value = 0.013.

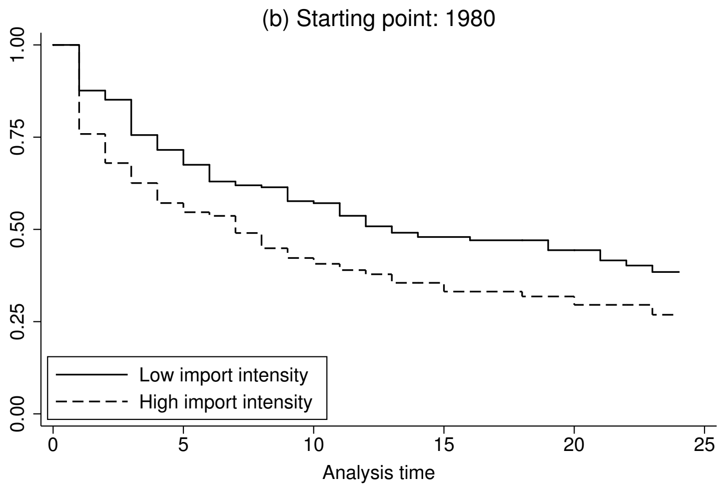


Log−rank test: chi2(1) = 3.67, p−value = 0.055.

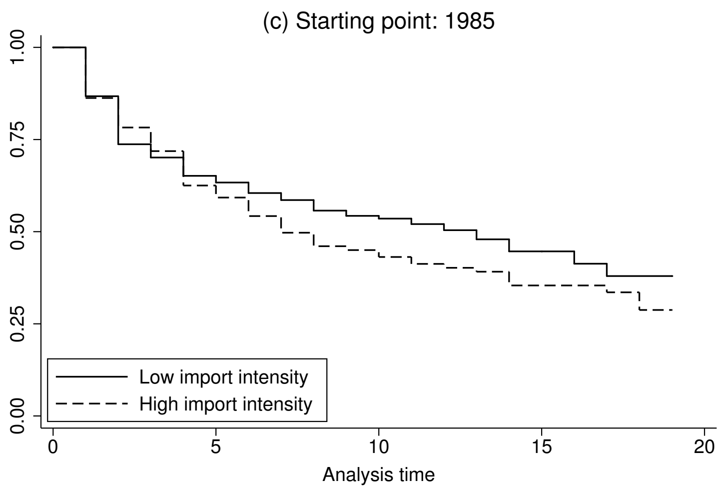
Figure 8: Kaplan-Meier survival functions: Import intensity



Log−rank test: chi2(1) = 9.53, p−value = 0.002.



Log−rank test: chi2(1) = 9.78, p−value = 0.002.



Log−rank test: chi2(1) = 2.44, p−value = 0.118.

Figure 9: Kaplan-Meier survival functions: Presence of cartels exempted from the application of Antimonopoly Act

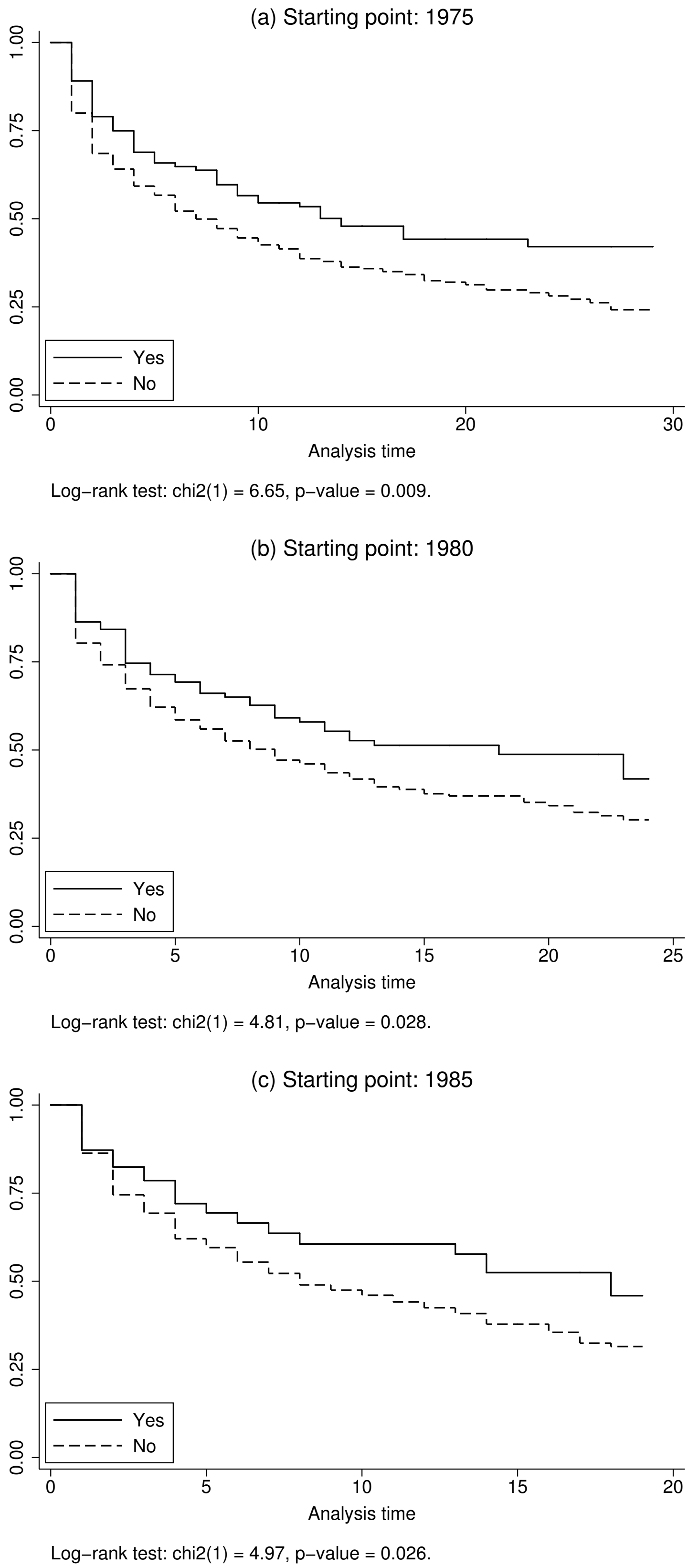


Table 1: Number of observations by the two-digit SIC level.

Industry	1975	1980	1985
Food, beverage	34	36	51
Textile	16	17	17
Paper, Pulp	14	14	16
Chemicals	67	71	82
Petroleum and Coal	12	13	13
Plastics	7	7	7
Rubber	6	7	7
Stone, Clay, Glass	18	19	21
Iron and Steel	35	37	38
Nonferrous metal	8	9	12
Fabricated metal	15	16	16
General machinery	55	60	66
Electrical machinery	49	57	74
Transportation machinery	21	20	23
Precision machinery	7	9	7
Miscellaneous	12	13	17
All industries	376	405	467

Table 2: The definition of covariates.

Covariate	Definition
HHI	Sum of the squares of market shares.
Industry growth	Difference of the logarithm of industry's output divided by the number of observation years.
Demand fluctuation	Squared industry growth.
Advertising intensity	Industry's advertising-to-total output ratio.
R&D intensity	Industry's R&D expenditures-to-value added ratio.
Import intensity	Industry's imports, divided by total output minus exports plus imports.
Presence of legal cartels	1 if any cartels were allowed, 0 otherwise.

Table 3: Summary statistics for covariates.

	1975		1980		1985	
Covariate	Mean	S.D.	Mean	S.D.	Mean	S.D.
HHI	0.180	0.144	0.184	0.138	0.193	0.141
Industry growth	0.043	0.138	0.002	0.156	-0.012	0.111
Demand fluctuation	0.021	0.064	0.024	0.113	0.012	0.049
Advertising intensity	0.008	0.012	0.009	0.013	0.009	0.016
R&D intensity	0.064	0.042	0.065	0.042	0.072	0.039
Import intensity	0.047	0.068	0.066	0.152	0.079	0.240
Presence of legal cartels	0.269	0.444	0.235	0.424	0.184	0.388

Note: Number of observations is 376, 405, and 467, respectively, when the starting points are 1975, 1980, and 1985. S.D. indicates standard deviation.

Table 4: Duration of market leadership, by covariate (measured in years)

Covariate	Subsample	1975	1980	1985
HHI	Low	13.9	13.5	9.1
	High	28.7	28.4	25.3
Industry growth	Low	26.2	17.6	16.3
	High	14.4	20.8	16.4
Demand fluctuation	Low	38.7	31.6	28.0
	High	7.9	10.6	8.0
Advertising intensity	Low	22.3	19.2	15.8
	High	18.3	19.2	16.9
R&D intensity	Low	25.4	23.3	19.3
	High	15.9	16.1	14.3
Import intensity	Low	24.7	23.5	18.4
	High	15.7	15.7	14.2
Presence of legal cartels	Yes	30.1	26.0	23.6
	No	17.3	17.8	15.2
All industries		19.9	19.4	16.4

Note: The duration is here market leadership is measured by extending the survival function from the largest observed time to zero using an exponential survival function. Based on the median value of each covariate, the full sample is divided into two subsamples.

Table 5: Duration of market leadership, by the two-digit SIC level (measured in years)

Industry	1975	1980	1985
Food, beverage	43.0	45.8	30.3
Textile	13.7	12.3	8.4
Paper, Pulp	22.0	57.3	25.8
Chemicals	22.3	16.9	14.4
Petroleum and Coal	9.2	7.6	4.2
Plastics	12.2	9.5	6.7
Rubber	10.5	26.6	19.8
Stone, Clay, Glass	34.1	35.6	33.0
Iron and Steel	52.6	37.5	27.6
Nonferrous metal	33.6	11.3	8.7
Fabricated metal	29.3	19.7	17.1
General machinery	7.3	9.0	11.0
Electrical machinery	12.2	13.5	11.9
Transportation machinery	15.2	21.1	15.0
Precision machinery	5.3	4.8	5.7
Miscellaneous	21.9	21.0	45.3
All industries	19.9	19.4	16.4

Note: The duration is here market leadership is measured by extending the survival function from the largest observed time to zero using an exponential survival function.