Review of Industrial Organization **21:** 283–303, 2002.

Exit and Survival in a Concentrating Industry: The Case of Daily Newspapers in the Netherlands

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Abstract. This paper studies the effects of aggregate, industry-, and firm-specific factors on the exit hazard rates in the market for daily newspapers in the Netherlands from 1950 to 1996. We present a brief overview of the exit literature. On the basis of the existing empirical evidence, we decided to specify and estimate exponential and piecewise constant hazard rate models. We find that exit hazard rates of daily newspapers depend on the circulation size, ownership, and number of incumbents. Moreover, the effects are time-dependent. We do not find any significant effect of macroeconomic factors.

Key words: Concentrating industry, daily newspapers, scale economies, survival chances.

JEL Classifications: C41, D21, L13, L16, L82.

I. Introduction

The dynamics of exit patterns in industry and services are complex and still poorly understood. In recent years, it has been recognized that firm- and industry-specific characteristics, such as firm size and volatility in market shares, are crucially important features of an ongoing concentration process (see, e.g., Klepper and Grady, 1990; Agarwal and Gort, 1996). To date, empirical analyses have had limited success in testing hypotheses on firm- and industry-specific determinants of survival chances of firms. The primary reason has been the limited availability of firm-specific industry life cycle data. As a result, the issue of explaining industry

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We thank Martin Carree, Glenn Carroll, Joan Hemels, Alfred Kleinknecht, Marc van Wegberg and the referees for useful comments. The first author is grateful to the Maastricht University Fund SWOL for financial support through a grant.

turnover in terms of idiosyncratic, industry-specific, and aggregate effects is still open.

While a sizeable number of recent theoretical studies examined the determinants of entry and exit, the majority of empirical work examined entry. To the extent that exit has been analysed, a symmetric relation between entry and exit has usually been imposed. There are, however, several theoretical reasons to believe that the factors conductive to entry differ from those affecting exit decisions. In fact, the few existing theoretical models on exit are indecisive on whether the decline of incumbency is caused by macroeconomic, industry-specific or idiosyncratic firm shocks. From these models testable predictions regarding the survival chances of firms in a concentrating industry have been derived. Only a few studies subjected these theories to empirical tests, for instance Baden-Fuller (1989), Lieberman (1990), and Boeri and Bellmann (1995). But to the best of our knowledge, no empirical study has investigated the three types of factors in an integrated way. The purpose of this study is to examine the influence that macroeconomic and industry-specific developments, and idiosyncratic firm characteristics have on firm survival in a concentrating industry. Empirical evidence is taken from the Dutch market for newspapers that has experienced a continuous decline in the number of daily newspapers which coincided with a significant increase in demand between 1950 and 1996. Exponential and piecewise constant hazard rate models are used to analyse the influences of the three types of determinants on the survival chances of newspapers along the concentrating industry's time path. The piecewise constant model is flexible enough to account for various forms of time-variation in survival chances. We find that the newspaper's specific and industry-specific characteristics largely explain the newspaper's survival chances. This is in line with the theoretical findings of, for instance, Ghemawat and Nalebuff (1990), Hopenhayn (1992a, b), and Klepper (1996).

The paper is organized as follows. Section II presents an overview of the theoretical and the empirical findings on exit behaviour. It surveys the current state of knowledge in the industrial organization literature about the determinants of exit decisions of firms during the upsurge concentration process in an industry. A distinction is made between macroeconomic, industry-specific, and firm-specific determinants of exit. In Section III the post-World War II history of the daily newspaper industry in the Netherlands is described and some stylised facts are presented. Section IV describes the empirical model, in particular the variables used at the three levels to explain the exit of daily newspapers. Section V presents and discusses the empirical results. Section VI concludes that the survival of daily newspapers in the Netherlands during the post-World War II concentration process is basically explained by sector- and firm-specific factors.

II. Theoretical and Empirical Findings

In this section we review the theoretical exit models that are available in the literature. We distinguish between three categories of factors that influence exit decisions of firms: (1) Macroeconomic effects such as the counter-cyclicality of exit rates and variations in aggregate demand; (2) industry-specific factors such as the industry's competitive structure, set-up costs, technological innovations, and specific demand shocks; and (3) firm-specific variables such as age, size, innovative power, fixed and variable production costs.

1. Macroeconomic Effects

Entry and exit rates of firms vary over the business cycle (Campbell, 1998). Entry rates are found to be pro-cyclical, although, in general, the relationship between entry rates and GDP growth is weak and statistically insignificant. Exit rates, on the other hand, are counter-cyclical. Their correlation with future GDP growth is negative, large, and significant. Campbell explicitly models the idiosyncratic uncertainty experienced by plants in a vintage capital framework. Exogenous technological progress is embodied when new plants are built. The calibrated entry and exit of plants exhibit strong cyclical variation similar to that found in real world data. The features of Campbell's model are in line with the findings of Chetty and Heckman (1986). They predict larger fluctuations in employment than in output or in the utilization of capital stocks as a result of entry and exit over the business cycle. Davis and Haltiwanger (1992) observe that gross entry-exit turnover moves counter-cyclically, with the effects most pronounced in larger and older plants and plants belonging to multi-plant firms. In a vintage model of creative destruction Caballero and Hammour (1994) investigate the variations in aggregated demand as a source of economic fluctuations, and how a continuously renovating productive structure responds to them. They show that a fall in demand will cause the most outdated plant or firm to become unprofitable and therefore to likely disappear when the industry is hit by a recession. Hence, an apparently important influence on entry-exit turnover is the stage of the business cycle (Caves, 1998). However, Ilmakunnas and Topi (1999) found that the role of macroeconomic influences on exit in the Finnish manufacturing industry is inconclusive. The extent to which the exit process depends on the variations in aggregate demand depends on the adjustment costs and technological adoption in the industry. Therefore, the overall influence of the aggregate demand on exit remains an empirical question.

The literature mentioned above leads us to formulate the hypothesis that general economic conditions negatively affect exit decisions of firms from a market. Firms are less inclined to exit a market when the demand is high and the state of the economy is expected to remain favourable.

2. Industry-specific Effects

In large, according to Agarwal and Gort (1996), exit is determined by stage-related changes in competition intensity: concentration tendencies intensify competition and only the fittest incumbents survive. Increased competition narrows the average expected return on investment as the industry life cycle progresses towards maturity. For example, firms that are unable to implement the most efficient production process associated with economies of scale and scope will have to exit the market so that the number of firms will shrink over time.

The organizational ecology literature (e.g., Hannan and Freeman, 1989; Carroll and Hannan, 1995), however, points at a reversed causal relationship between competition (number of firms) and entry rates. Competition rises with an increasing number of firms in the market and subsequently leads to higher exit rates. Hence, the size of the market is likely to influence the number of firms exiting. Therefore, we argue that exit is positively related to industry size, which can be measure by the number of firms present in the previous period (Carroll and Hannan, 1995; Ilmakunnas and Topi, 1999).

Sutton (1992) notices that there are industries with rather low set-up costs, where a growth of market size in terms of sales goes hand in hand with fewer incumbent firms. A competitive escalation of endogenous sunk cost outlays leads to a situation in which only a small number of firms survive and dominate the market. This escalation process has been studied in the recent game theoretic literature (Sutton, 1997). Other theories that account for the product life cycle are based on changes in production technology. For instance, Jovanovic and MacDonald (1994) postulate a model in which a major exogenous technological improvement leads to exit of those firms that are unable to adjust sufficiently to the new regime. The new production technology reduces production costs, but increases the optimal level of output per firm, leading to a reduction in the number of firms over time. Firms that are able to implement the new large-scale technology survive. The innovation boosts the output and value of the remaining firms.

Finally, industry demand factors, in particular consumer's satisfaction and loyalty, play an important role in shaping the industry structure. Incumbent firms that produce the product that becomes standard in the market develop a competitive advantage. Economies of scale in producing and selling the standard product are incorporated as a result of the possibilities of mass production of the standard product. Evidence from large size incumbent firms suggests that firms producing the dominant design product enjoy the advantages of economies of scale (see, e.g., Geroski, 1991; Klepper and Simons, 2000). As industry demand shrinks, the exit rate of firms is likely to increase. Ghemawat and Nalebuff (1985) theoretically show that shrinking demand creates pressure for capacity to be reduced or eliminated to maintain profitability. If firms have different market shares but identical costs then the survival chances of firms depend on the size ordering of the active firms. However, firms rarely have identical cost structures. Jovanovic and Lach

(1989) specify a model in which both fixed and variable production costs are vintage-specific. Sufficiently strong scale economies can give large firms enough cost advantages to force smaller and less efficient firms out of the industry. This is in line with the results found by Fudenberg and Tirole (1986), who analyse a theoretical model in which firms have asymmetric information about each other's fixed costs. They show that high cost firms exit earlier than low-cost firms in a declining industry. Hence, the studies of the effect of specific industry developments imply that profit margins of firms decrease if the demand for the products becomes more homogeneous and eventually declines. In conclusion, we put forward the hypothesis that, in particular, the less efficient and high-cost firms are driven out of the market when the possibility of mass production of the product arises or when the industry specific conditions become less favourable.

3. Firm-Specific Effects

Klepper (1996) summarizes various cross-sectional regularities within industries and differences of R&D, costs and profitability across firms. He finds that as firms grow in size they spend more on endogenous sunk costs such as R&D, advertising and marketing. As a result of scale difference, the pay-back period for the sunk costs will shorter and the profitability will be larger for large firms than for small firms. Once entry ceases, the smallest firms are driven out of the market in a disproportionate number. In his theoretical models, Hopenhayn (1992a, b) accounts for the empirical regularity that the size distribution is stochastically increasing in age of firm cohorts. He confirms that in general older firms, which have lower hazard rates, tend to remain larger before they exit. However, Hopenhayn (1992a) also shows that the sign of the effect of higher entry sunk costs on size distribution is not obvious.[1] These costs have a price effect and a selection effect, although he observes that firm size and concentration are positively correlated to rates of return. This is in line with the finding of Demsetz (1973) that higher concentration is associated with higher profits for larger firms, but not for the smaller firms. Jovanovic (1982) postulates a theory of selection with incomplete information that is consistent with these findings. Hence, we argue that the longer a firm remains in the industry, the more it learns about its true costs and its relative efficiency and the more likely it is to survive. Moreover, firms that grow as a result of efficiency are expected to have higher survival chances (Agarwal and Gort, 1996). Therefore, we put forward the hypothesis that survival opportunities of firms are positively related to age of the firm.

[1] Hopenhayn considers the case where input prices are fixed. The price effect indicates that output price increases with a higher entry barrier, leading to higher employment and output for the firms. But a higher entry barrier reduces the competitive structure of an industry, rises profit for incumbents, misallocation, and inefficiencies. The less innovative and efficient firms remain in the industry. The absence of selection reduces output and employment.

Also, the minimum efficient size of the firm will increase when a product matures and when technological change slows down. The decreasing rate of technical change reduces the rate of obsolescence, making investment in capital-intensive production methods more profitable.[2] This increases the survival chances of firms that attain the minimum efficient size (see, e.g., Gort and Klepper, 1982; Klepper and Graddy, 1990; Rosen, 1991). These studies concentrated on industries that approach maturity. Only few studies in industrial organization investigated the minimum efficient size of firms in a declining industry. For instance, Reynolds (1988), Whinston (1988), and Ghemawat and Nalebuff (1990) developed dynamic game-theoretic models for multi-plant firms in a declining industry. They show that large firms that anticipate an eventual decline in demand of a specific product begin to close plants or merge with a rival to provide a revenue increase of the remaining plants. Of course, the main purpose of these firms is to increase or maintain economies of scales. Based on the findings of industrial organization studies it is, therefore, expected that the size of a firm is negatively related to ceasing production as the product matures. Furthermore, larger firms increase their survival chances by closing plants.

Finally, when economies of scale are important, firm growth and survival chances crucially depend on the degree of market heterogeneity in the industry. Firms can target their products to heterogeneous market segments or choose a homogeneous market segment (Freeman and Hannan, 1983; Carroll, 1985; Sutton, 1992). This process of resource partitioning generates a dual market structure. In an ongoing tendency of firms to grow in size the intensive competition occurs in the most abundant market segments. The surviving firms become larger and less specialized. Firms that are established in a specialist's niche can shelter against this heavy competition. This, in turn, increases the survival chances of the specialist firms. In general, empirical studies of resource partitioning find that concentration rises coincide with increasing survival chances of specialist firms relative to generalist firms (e.g., Carroll, 1985; Carroll and Swaminathan, 1992; Swaminathan, 1995). Hence, we argue that by finding a niche market firms increase their opportunities to survive in a concentrating industry.

III. The Post-World War II Period of Daily Newspaper Industry in The Netherlands

The ability to measure exit patterns depends upon access to a longitudinal data set containing observations tracking firms from an industry over time. We use a longitudinal database of newspaper firms in the Netherlands. Unlike for the vast majority of industries, the history of the newspaper industry is well documented. Another

[2] Utterback and Abernathy (1975), for instance, showed that the majority of product innovations for 77 firms operating in five industries were introduced during the expansion stages of the life cycle, while process innovations dominated the latter phases of the life cycle. They also observed that innovations in latter phases were more likely to originate from large size firms.

Table I. Daily newspaper firms in the industry 1950–1996

Year	Publishers	Editorially independent newspapers[a]	Editorially dependent newspapers	Total circulation (× 1000)	Real compensation in Hfl mln[b]
1950	60	68	48	2781	
1960	56	62	41	3105	
1970	35	48	39	3965	4.84
1980	24	44	36	4554	3.58
1990	21	43	35	4589	
1996	14	37	18	4754	

Sources: CEBUCO, annual reports NDP.

[a] The editorial independence is defined as a newspaper with its own chief editor, who is not subordinated to the editor staff of another newspaper.

[b] Deflated with CPI (1950 = 1). These subsidies compensated the income losses of newspapers in financial problems due to the advertisements in television and radio. In 1968 and 1969 the compensation budgets were in (real) million guilders 13.18 and 15.32 respectively (1 Euro = 2.20371 Hfl).

interesting aspect of this industry is, that the Dutch daily newspaper industry experienced a concentration process after World War II (see also Kranenburg et al., 1998). In 1950, for instance, 60 independent publishers were selling 68 editorially independent newspapers, and 44 editorially dependent newspapers. In 1996 14 independent publishers were selling 37 editorially independent newspapers of the 55 daily newspapers that appeared in the market. But while the number of newspaper titles shrank, the total number of copies sold increased. Table I exhibits the declining number of publishers and newspapers, and the increase in aggregate copies sold. These features point at the existence of economies of large-scale production during the concentration phase in the industry's life cycle. They are consistent with evidence of increasing scale economies for other countries' newspaper industries like Argentina, Ireland, and the U.S.A. (Rosse, 1967, 1970; Carroll, 1987).

Newspaper publishers anticipated the decline in the demand for specific newspaper products and merged with rivals to raise joint profitability. Rather than merging, large newspaper firms often acquired smaller rivals to dismantle them. The large newspaper firms utilize their capacity more efficiently by reducing excess capacity in the industry. In the period 1950 to 1996 many editorially independent newspapers became dependent or ceased to appear, while many editorially dependent newspapers disappeared as well. Ownership of two or more daily newspapers provides opportunities for economies of size in news gathering, in securing advertising, in financing, and in management by lowering average and marginal costs. These cost advantages are greater for chain ownership, for high aggregate

circulations, and for editorially homogeneous newspaper products.[3] Large-scale newspaper firms became more pronounced, and the reader's preferences for newspapers became more homogeneous after World War II. The continuous decline in the number of available newspaper titles and the significant increase in number of copies sold underline these developments. According to Hemels (1997), this process is a consequence of the breakdown of traditional socio-political and religious barriers in the Netherlands. The decrease of the number of daily newspapers in the industry was speeded up by the introduction of television and radio advertising. Starting in the late 1960s, the request for corrective government action increased, especially by the Dutch Newspapers Publishers' Association (NDP).[4] To ensure heterogeneity among newspapers, the Dutch government financially supported the newspaper industry on several occasions. During the late 1960s the newspaper industry received a government subsidy of approximately 40% of the annual revenues of advertisements on television and radio to compensate for suffered income losses (see Table I). As temporary provision against the deteriorating competition conditions of newspapers, the Dutch government established a press relief fund "Bedrijfsfonds voor de Pers" in 1971, to financially support daily newspapers struggling for survival. This fund became a foundation in 1974 that still exists today.[5] Furthermore, the collective price policy of the NDP and Dutch government restricted the newspapers to compete with prices. Newspapers could only compete with the editorial and the commercial content and quality of their products. Abbring and van Ours (1994) suggest that if the government wants to maintain multiformity in the Dutch newspaper market it should give specific financial support to a newspaper firm. But other studies of newspaper markets show that government interventions to protect multiformity in the daily newspaper industry have not been successful (Murschetz, 1997; Picard, 1995). For instance, Gustafsson (1993) finds that government actions were not successful in sustaining the media pluralism in Sweden. The data in Table I suggest that Dutch government interventions have probably delayed the concentration process in the newspaper industry, but they could not stop it. If increased concentration is due to cost advantages and super-

[3] Heterogeneity of newspaper firms or publishers arises from differences in capacity costs, and high first-copy costs, like the collection and organization of editorial and advertising copy and preparation of the printing mechanism. These costs are ineluctable to produce even one copy. The marginal production costs of the subsequent copies may be very low (see also Corden, 1953; Ferguson, 1983; Norton and Norton, 1986).

[4] In 1962 a Commission of the Lower House, which examined the possible consequences of the introduction of television and radio advertisements, concluded that the newspapers would have to compete with television and radio for advertisements. They expected that a large amount of the advertisement budget from business would flow to television advertising, which might reduce the survival chances of many newspapers. In 1965 the Dutch government decided to allow advertisements in these other media.

[5] Hemels (1997) and Lichtenberg (1995) provide an overview of trends in the newspaper industry in the Netherlands, and summarize the types of financial support the newspaper industry can receive. A compensation scheme is available to newspapers which face financial problems, and some financial support is available to all newspapers like tax and postal rate reductions, and subsidies.

ior efficiency of large-scale newspaper firms (see, e.g., Jovanovic, 1982; Klepper and Graddy, 1990), then a deconcentration policy can reduce innovative activities, and retain high production costs (Hopenhayn, 1992a), or as Demsetz (1973, p. 3) points out, "there are definite dangers of decreasing efficiency through the use of deconcentration or anti-merger policies". It is likely that the Dutch daily newspaper industry will become more concentrated as long as a differential advantage in expanding output persists.

IV. The Empirical Model

The data set we use in this study consists of all editorially independent daily newspapers that existed in the Netherlands after 1950, and which published selected material of interest to a general public. Out of a total of 78 daily newspapers, 40 became editorially dependent or ceased to appear between 1950 and 1995. Losing editorial independency is considered as exit. When a larger newspaper acquired a smaller rival then the newspaper was often withdrawn from the market shortly thereafter.[6] In constructing the data set we used information from the Dutch Central Bureau of Statistics (CBS), the Dutch Central Bureau for Newspaper Publicity (CEBUCO), the Dutch Newspaper Publishers' Association (NDP), and information obtained from the National Press Museum.

The data are used to test our expectations in the form of hypotheses derived from the, mainly theoretical, literature (see Section II). We selected variables that should account for the macroeconomic, industry-specific and firm-specific determinants of exit rates.

The macroeconomic variables reflect the influence of changes in economic conditions at the macroeconomic level and shifts in the readers' preferences on the demand for newspapers and, through that, on exit rates. We concentrate on two factors in particular: real income per household ($Income_{t-1}$), and a measure for the heterogeneity of the readers' preferences ($Entropy_{t-1}$). The first variable, the purchasing power per household, measures the apparently important influence of the stage of the business cycle on exit rates. The variable $Entropy_{t-1}$ is a proxy which should capture the shifts in ideological and / or religious ties after World War II, when these ties became loose and more diffuse, leading to a reduction in demand for newspapers that are differentiated on the basis of ideology, religion or political affinity.[7] This process changed the market structure for daily newspapers. Some

[6] Excluded are the financial newspapers "Het Financiele Dagblad" and "Economisch Dagblad", the official newspaper of the Netherlands "Nederlandse Staatscourant", and the shipping newspaper "Dagblad Scheepvaart".

[7] Readers of newspaper have different product preferences. For every sufficiently strong identifiable set of reader product preferences at least one newspaper must exist as long as per unit costs are not much higher than those of the largest newspapers. Diversity in taste increases with the number of groups with distinct religious and ideological preferences. An indicator for diversity is the dispersion of members over different trade unions within the Netherlands. Trade unions had and to some extent still have an ideological and/or religious orientation reflecting major ideological ties in society. To

daily newspapers which identified themselves with political parties or special interest groups ceased to appear, while others became increasingly independent from the group they originally belonged to and broadened their scope and circulation (Hemels, 1997).

The second effect we investigate is the influence of industry specific determinants on the survival chances of the Dutch daily newspapers. The variable $Ntot_{t-1}$ represents the total number of daily newspapers in the market. We shall test to what extent the number of dailies in the previous period $t-1$ affects the probability to exit in the current year t as a proxy of competition intensity.

Revenues and costs play a crucial role in the determination of individual survival chances of newspapers. Unfortunately, we do not observe prices of individual newspapers nor individual production cost's components. We have aggregate data on the average annual subscription price of daily newspapers. In real terms, however, costs and revenue components are highly correlated at the aggregate level. Given that prices were at least in part set by the government,[8] we shall use aggregate data on the average daily number of pages of newspapers ($Pages_{t-1}$) as an indicator of the attractiveness of newspapers (see Thompson, 1988). An increase in the number of pages is expected to lead to an increase in attractiveness because the attractiveness of a newspaper depends to a substantial degree on the physical quantity of news on offer (NDP annual reports). Moreover, more pages allow a newspaper to attract more advertising revenues. However, an improvement in attractiveness will increase the first-copy costs of newspapers. On the basis of the theoretical findings of the life cycle models developed by, for instance Jovanovic (1982), and Jovanovic and MacDonald (1994), the smallest and least efficient editorially independent newspaper is expected to have a higher exit hazard rate than larger, more efficient newspapers. Accounting for the average number of pages, we expect an increase in $Pages_{t-1}$ to have a negative effect on survival chances as long as the increase in a newspaper production costs, in particular the first-copy costs, exceeds the increase in revenues.

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measure the diversity in preferences we calculate the diversity in number of equivalents. The formula is defined as follows:

$$Entropy = \Pi_{i=1}^{N}[1/m_i]^{m_i},$$

where N = number of trade unions, and m_i = market share of trade union i (= number of members/total number of available jobs in the Netherlands), including a remaining category of non-union members. Unemployed people are not taken into account in this measure. If all trade unions have the same m_i then entropy value is N, and if we have only one trade union then entropy is equal to 1.

[8] The Dutch government maintained a rigid price policy for daily newspapers through a meticulous linking between setting the price for subscribers and the development of the price of newspapers (NDP annual report, 1962). Later on, newspapers were allowed to increase their prices within margins, subject to government's approval as long as the industry could demonstrate that the total costs had increased more than the total revenues in the previous years.

We also include the variables to measure the effects of idiosyncratic factors on the exit probability of the individual newspaper. First, we develop a measure for left censoring, because many of the newspapers existed prior to the start of the industry analysis in 1950. In order to avoid misinterpretation, we correct these cases by adding the variable age of a newspaper (*Age*) at the start of our counting year. Moreover, newspapers that entered in the early phase of the industry life cycle had the time and opportunity to establish themselves in an appropriate market segment. According to Jovanovic (1998), firm's survival rates increase with the age of the firm. Therefore, we expect that the age of incumbent newspaper at the start of the counting year 1950 plays a positive role in the explanation of survival rates in the concentrating industry.

The industry experiences a decline in the number of dailies, and an increase in aggregate number of copies sold since 1950 (see Table I). These features suggest that new large-scale technologies were introduced in the industry. Newspaper firms that were able to implement the new technology first may have had a higher survival chance because they reduced average production costs at a higher level of output at the earliest stage (Jovanovic and MacDonald, 1994). Thus, successful newspapers increase their circulation. The variable $Circ_{t-1}$ represents the average annual circulation of the editorially independent newspaper in the previous year.

We observe that large newspaper firms owning a variety of dailies cease the production of the smaller editorially dependent newspapers they own, while offering the subscribers their editorially independent newspaper as a substitute. We expect that this has led to a reduction in production costs, raising the expected lifetime relative to that of newspapers which did not cease the production of regional subsidiaries (see, e.g., Reynolds, 1988; Whinston, 1988; Ghemawat and Nalebuff, 1990). The variable $Owner_{t-1}$ represents the total number of editorially dependent newspapers a firm owned in the previous year.

The newspaper firm's ability to implement the large-scale technology is positively affected by potential growth of the market segment. The regional dummy variable *Region* indicates whether the survival chances of dailies in regional market segments in the Netherlands differ from those of the national editorially independent newspapers. In the post-war period the market has changed from a geographically partitioned to a more nationwide market (Kranenburg, 1999). With an ongoing tendency of newspapers to grow in size the competition intensifies in the most abundant market segments (see e.g., Freeman and Hannan, 1983). Therefore, we expect that regional newspapers have lower exit rates than the national dailies. The definition of the region in our study is based on the classification published by the Dutch Central Bureau of Statistics. The variable *Region* corresponds to the twelve provinces in the Netherlands.

The survival chances of newspapers are modelled using the hazard or instantaneous exit rate from the industry. Because we analyse the post-World War II period, we assume that the forces affecting the hazard rates in the concentrating phase differ from the ones in the expanding phase of the industry life cycle. The duration

of incumbent firms starts in 1950, i.e., $T = 0$ for incumbents at 1950 (see e.g., Agarwal and Gort, 1996).

We start our analysis with the exponential model that includes the selected explanatory variables. This model enables us to investigate how the exit hazard rate varies as a result of time-variation of the explanatory variables. In this approach the coefficients of the given set of specific variables are constant over time. In order to determine whether the coefficients of the explanatory variables vary through time, we use a flexible piecewise constant hazard rate model with continuous time parameter and time-varying explanatory variables (see Appendix A). The coefficients of the explanatory variables are constant in each defined sub-period but may vary across sub-periods (see, e.g., Lancaster, 1990; Murphy, 1996).

V. Results

Our empirical analysis is split into two parts. First, we will control for heterogeneity among newspapers by including in the exponential hazard model the variables that measure the relevant macroeconomic, industry-specific, and firm-idiosyncratic developments that are relevant for survival. Time-varying explanatory variables will enable us to investigate how the exit hazard rate depends on the observed characteristics of firms, the industry and the macroeconomic developments. Second, we will estimate separate piecewise constant models, in order to determine whether the effects of a given set of specific factors on the survival chances of editorially independent daily newspapers vary between different periods in the concentrating phase.

The results of the exponential hazard model are reported in Table II. The model includes the variables discussed above. Model 1 displays the estimates of the exponential hazard model based on annual data.[9] It indicates that firm-specific characteristics are important for the survival chances of newspapers in the industry that experiences an upsurge in the concentration rate. The estimates of the firm-specific effects are in line with the expected effects of these factors on survival (see, for instance, Jovanovic, 1982; Hopenhayn, 1992a; Klepper, 1996). Circulation advantages are clearly important for the prospect of newspapers to survive in a concentrating industry. Newspapers that sell more copies reduce average production costs at a higher level of output (see also NDP annual reports). The regional dummy variable *Region* in the models does not demonstrate significant difference in survival chances between regional and national newspapers. The finding suggests that regional newspapers did not find a specialist's niche that offered shelter

[9] We have tried to estimate alternative hazard functions which are more flexible such as gamma model, Gompertz–Makeham model, and Sickle model. Unfortunately, the data were not suitable to estimate these duration dependent models. A simple generalization of the standard exponential model is the piecewise constant model. This generalization not only allows the data to determine the form of the time-dependence of the process, but also the extent to which the slope coefficients of the explanatory variables vary through time.

Table II. Estimates of the exponential hazard model

	Model 1	
Constant	9.0807	(9.9956)
Income_{t-1}	0.1799	(0.1692)
Entropy_{t-1}	−4.4549	(3.5904)
Pages_{t-1}	−0.0719	(0.1091)
Ntot_{t-1}	−0.0189	(0.0318)
Age	−0.0014	(0.0035)
Owner_{t-1}	0.1512	(0.1525)
Circ_{t-1} (/10000)	−0.3632*	(0.0987)
Region	−0.0025	(0.6376)
Number of Spells	2268	
Number of Events	40	
χ^2	37.9914	
Log likelihood	−182.5153	

* Significant at 5%; standard errors in parentheses.

against heavy nationwide competition or that two forces were offsetting each other: scale economies and differentiation. Furthermore, an insignificant effect of ownership of more than one daily newspaper ($Owner_{t-1}$) is found. Newspapers that did not cease the production of their smaller subsidiaries did not reduce their own survival chances significantly.

No important influence is found concerning the initial condition of the daily newspapers. After controlling for the phase in which a newspaper entered the market, we find no significant effect of the newspaper's age on survival chances. This finding suggests that the age of the industry has a stronger effect than the effect of the age of a newspaper that entered in the early phase of the life cycle.

Industry-specific and macroeconomic factors turn out not to have a significant influence on the survival chances of editorially independent newspapers during the concentration stage of the industry. The chi-square statistic in Table II indicates that the effects of the explanatory variables are jointly significant.

Exponential hazard rate models assume that the effects of the explanatory variables on the survival chances of newspapers are constant over the sample period. This, of course, may be too restrictive. The piecewise constant model allows the effects of the explanatory variables on the survival chances of daily newspapers to change over time.

Table III. Estimates of piecewise constant hazard models

	Model 2		Model 3	
Constant(1)	−58.7606*	(27.6816)	−38.3601*	(15.1172)
Constant(2)	−113.6256	(74.9976)	−93.5923*	(35.5501)
Constant(3)	−44.6901*	(29.9487)	−11.2627	(9.3841)
Income_{t-1} (1)	0.5302	(0.3475)		
Income_{t-1} (2)	0.2446	(0.3904)		
Income_{t-1} (3)	0.7437	(2.1608)		
Entropy_{t-1} (1)	2.6597	(7.9985)		
Entropy_{t-1} (2)	4.9659	(11.8251)		
Entropy_{t-1} (3)	7.7706	(13.0209)		
Pages_{t-1} (1)	0.4728*	(0.2255)	0.5149*	(0.1997)
Pages_{t-1} (2)	0.4380	(0.6137)	0.5786*	(0.2883)
Pages_{t-1} (3)	0.5563	(0.7781)	0.4489	(0.2913)
Ntot_{t-1} (1)	0.3588*	(0.1369)	0.2775*	(0.1196)
Ntot_{t-1} (2)	1.0111*	(0.5009)	0.9188*	(0.3459)
Ntot_{t-1} (3)	−0.0504	(0.0403)	−0.0673*	(0.0321)
Age (1)	−0.0069	(0.0060)	−0.0073	(0.0060)
Age (2)	−0.0064	(0.0066)	−0.0058	(0.0064)
Age (3)	−0.0036	(0.0079)	−0.0037	(0.0079)
Owner_{t-1} (1)	0.5056*	(0.2198)	0.5047*	(0.2165)
Owner_{t-1} (2)	0.0393	(0.2692)	0.0361	(0.2653)
Owner_{t-1} (3)	−0.2520	(0.4468)	−0.2507	(0.4477)
Circ_{t-1} (1) (/10000)	−0.5225*	(0.2161)	−0.5143*	(0.2070)
Circ_{t-1} (2) (/10000)	−0.3426*	(0.1394)	−0.3230*	(0.1345)
Circ_{t-1} (3) (/10000)	−0.3360*	(0.1582)	−0.3380*	(0.1589)
Region (1)	0.4356	(1.1999)	−0.2988	(1.0879)
Region (2)	−2.1413*	(1.0149)	−1.9218*	(0.9759)
Region (3)	1.9995	(2.7845)	2.0410	(2.7947)
Number of Spells	2268		2268	
Number of Events	40		40	
χ^2	82.6346		76.7592	
Log likelihood	−160.1937		−163.1314	

* Significant at 5%; standard errors in parentheses.

The results of the piecewise constant models are presented in Table III. We have split the time periods into three sub-periods of fifteen years[10] each. All estimations of the piecewise constant models shown in Table III were obtained using annual

[10] The three sub-periods choice is based on the results of an analysis that took into account the interactions of the specified variables with the age of the concentrating phase in the newspaper industry life cycle (the age of the concentrating stage is zero at 1950). These interaction effects

data, and are therefore an extension of model 1 in Table II. Model 2 includes the specified macroeconomic, industry-specific, and firm-specific explanatory variables. The estimates of the macroeconomic determinants remain insignificant. This suggests that these macroeconomic factors did not have a substantial impact on the survival chances of daily newspapers. These results lead us to conclude that in our study the industry- and firm-specific characteristics are of greater importance. Consequently, we estimate the same model, but without the macroeconomic factors (model 3). The null hypothesis of no difference between models 2 and 3 cannot be rejected at conventional levels, as is indicated by the computed chi-square statistic of 6.6. With respect to the effect of the firm-specific variables, the effect of $Owner_{t-1}$ is found to be positive and significant in the first sub-period considered and insignificant thereafter. This suggests that editorially independent daily newspapers with many dependent and related newspapers were in a disadvantageous position in the struggle for survival when the market started to become more concentrated. In the beginning of 1960s, the introduction of a 5-day working week and a positive real wage shock raised the pressure on daily newspapers to reduce their production costs that had become excessive (NDP annual reports). This rationalization process appeared to be more successful for newspapers without subsidiaries.

The parameter estimate of *Region* is negative and significant in the second sub-period only. This suggests that newspapers with regional target markets increased their survival chances. However, the importance of resource partitioning has gradually disappeared. As of today, newspapers that are established in a regional specialist's niche cannot avoid being exposed to the heavy competition.

In model 3 we find that the effects of industry-specific developments vary among the three defined sub-periods in the concentrating industry. During the first and the second phases of the increased concentration process in the daily newspaper industry, an increase in the number of pages ($Pages_{t-1}$) reduces the survival chance of a newspaper. This result suggests that the revenue from the required improvement in attractiveness did not exceed the associated increase in (production) costs for a number of newspapers. The insignificant positive effect of the number of pages in the third sub-period suggests that the effect of attractiveness improvement on hazard rates has declined. Another important industry effect results from the number of firms in the market, $Ntot_{t-1}$. An editorially independent newspaper was more likely to exit in the beginning of the upsurge concentration tendency than later in this concentration process. In the first sub-period (1950–1965) the number of newspapers had a significant positive effect on the exit chances. In

of the defined variables on the constant (exponential) hazard rate show that the global optima for these variables were around the fifteenth or thirtieth year of the concentrating phase in the industry life cycle. The approach of interactive analysis of the included variables is based on the work by Hannan (1997) in which the effect of density is evaluated as a function of industry age. We have also estimated the piecewise constant model with a two period split. In a joint test, the null hypothesis of equality of the two sets of parameters is rejected at 5%, as indicated by the computed chi-square statistic of 19.6.

Table IV. Likelihood ratio-tests for the contribution of aggregate, industry-specific and idiosyncratic determinants in each period

	Idiosyncratic determinants versus intercept only[a]	Industry-specific & idiosyncratic determinants versus idiosyncratic determinants[a]	Macroeconomic, industry-specific & idiosyncratic determinants versus industry-specific & idiosyncratic determinants[a]
Period 1	15.0076 (4)**	8.3960 (2)*	2.6742 (2)
Period 2	11.3580 (4)*	17.6154 (2)**	1.3012 (2)
Period 3	15.5682 (4)**	9.1320 (2)*	1.9000 (2)

Notes: the baseline model is the model that includes only the constant term. In parentheses are the degrees of freedom given.

[a] An intercept is included in all hazard rate models.

* Significant at 5 %. ** Significant at 1% level.

the next sub-period the concentration tendency intensified competition even more and according to Jovanovic and MacDonald (1994) and Klepper (1996) the less efficient newspapers exited. In the third sub-period (1980–1995) the hazard rate of incumbents decreased due to the decline in the total number of newspapers in the previous two sub-periods. This finding is consistent with the stylised fact mentioned by Jovanovic (1998), that the number of newspapers was stabilizing at a level of 40 percent below the maximum number of newspapers at the turning point of the industry life cycle.

An additional test of the group effects of the three different kinds of determinants of the exit rates in the defined periods is the log likelihood-ratio test. The entries in Table IV test the null hypotheses that the effect of one additional set of determinants does not affect exit rates of daily newspapers in the defined periods. For instance, column 2 of Table IV contains the likelihood ratio statistics for testing the joint significance of the firm-specific effects. This hypothesis, which entails that the effects of *Age*, $Owner_{t-1}$, $Circ_{t-1}$, and Region are all zero, is rejected for each subperiod. In other words, this evidence supports the view that the effects of firm-specific factors on survival chances are important. In the next step, the overall industry-specific effects are added. The hypothesis of no effect can be rejected at the 5% significance level for the overall industry-specific determinants in each period. The final step includes the macroeconomic determinants in the hazard rate model. The included macroeconomic determinants do not significantly improve the fit of the hazard rate model either.

Our evidence suggests that mainly industry- and firm-specific characteristics determine the survival chances of editorially independent daily newspapers during the concentration stage of the industry. Moreover, the effects of these explanatory variables change over time.

The finding about macroeconomic influences is not as encouraging as some theoretical industrial organization models suggest. It can be argued that the hypotheses about the macroeconomic determinants of exit rates, which follow from common practice (see Section II), are fairly simplistic. The macroeconomic data are more aggregated than the industry and firm specific data used in this study. Their quality as a proxy for the macroeconomic developments is likely to be less than that of industry- and firm-specific factors. Therefore, measuring the impact of macroeconomic developments on exit rates with reasonable precision is difficult if not impossible. Furthermore, the discussion about the influence of macroeconomic factors both in the theoretical and empirical exit models in industrial organization is generally based on the assumption of a growing or mature industry. Industries progressing towards maturity or the ones that are already in the mature stage are characterized by an increase in overall industry demand. However, as either the industry demand or the differentiated product demand shrink, the increased pressure for production cost reduction and for capacity to be reduced or eliminated to maintain profitability is likely to dominate the exit process. This may explain why the macroeconomic factors do not significantly contribute to explaining exit in a concentrating industry or a declining industry.

VI. Conclusions

This study presented a detailed analysis of the determinants of exit chances in the daily newspaper industry in the Netherlands for the period between 1950 and 1996. This period is characterized by increasing concentration in the newspaper industry. We have estimated exponential and piecewise constant hazard rate models to investigate the effects of three categories of determinants of the survival chances of daily newspapers. These are macroeconomic (exogenous aggregate demand), industry-specific, and (idiosyncratic) firm-specific effects.

We do not find any significant effect of aggregate macroeconomic developments on the exit chances of daily newspapers at the 5% significance level once we account for firm-specific factors. However, we find significant effects of industry-specific developments. These effects increase when concentration intensifies. Furthermore, this study shows that the effect of industry-specific developments is not constant between the period 1950 and 1996.

The attractiveness of a newspaper as measured by the number of pages plays a significant role in determining the hazard rate, especially in the first sub-period (1950–1965) and disappears in the third sub-period (1980–1995). An improvement in attractiveness increases the production (first-copy) costs of newspapers. Therefore it is likely that less profitable newspapers have to exit. This process supports the results from theoretic diffusion models that efficient firms grow and survive, while the inefficient firms are forced to exit. At the same time, we observe that the effect on the hazard rates of the total number of daily newspapers in the Netherlands changes significantly in the period considered. Competition intensifies over

the observation period and the large-size, probably the most efficient, newspapers survive. The smallest (inefficient) newspapers are driven out of the industry.

Furthermore, our results show that the estimated hazard rate also crucially depends on the firm-specific characteristics. Our findings point at the existence of economies of large-scale production during the phase of a decline in the number of daily newspaper firms in the Netherlands. When the market became more concentrated, the editorially independent daily newspapers firms with many dependent and related newspapers were in a disadvantageous position in the struggle for survival. The rationalization process appears to have been more successful for newspapers without subsidiaries. Nowadays, this subsidiary effect, although insignificant, has changed. This may indicate the beginning of economies of scope in the industry.

Despite the government financial support aimed at protecting the multiformity in the daily newspaper industry, our results show that the government interventions may have delayed the concentration process in the industry, but did not stop it. It is likely that the Dutch daily newspaper industry will become more concentrated as long as differential advantages in expanding output persist among firms as suggested by, for instance, Jovanovic (1982), and Jovanovic and MacDonald (1994).

This empirical analysis does not answer why and how a particular newspaper changed its specific characteristics. However, it provides insight in the development of the effects of specific explanatory variables for the entire Dutch daily newspaper industry during a period when concentration took place. With the use of the piecewise constant model, we show that the effects of industry- and firm-specific factors on the exit chances in the concentrating market for daily newspapers have changed over time.

Appendix A

For more details, we refer the reader to e.g., Blossfeld and Rohwer (1995). Formally, we parameterize the hazard rate model for editorially independent newspaper i at time t_i conditional on time s_i, that no exit event happens before time s_i, using the exponential distribution. We divide the time axis ($T = 0$ at 1950) into M intervals by the points $l_1, l_2, \ldots, l_{M+1}$ and write the hazard function for the ith newspaper which is observed to exit at t_i in time interval m as

$$\begin{aligned} h(t_i) &= \exp\{\beta_m X_i\},\ l_m < t_i < l_{m+1},\ \text{with } l_1 = 0 \text{ and } l_{M+1} = \infty, \\ m &= 1, 2, \ldots, M \end{aligned} \tag{A.1}$$

and the conditional survivor function for the ith newspaper which is observed to be censored at t_i survival up to s_i as

$$S(t_i \mid s_i) = \exp\{-\Sigma_{m=1}^{M}\ \Delta[s_i, t_i, l] \exp\{\beta_m X_i\}\} \tag{A.2}$$

where

$$\Delta[s_i, t_i, l] = \begin{cases} t_i - l_m & \text{if } s_i \leq l_m, l_m < t_i < l_{m+1} \\ l_{m+1} - l_m & \text{if } s_i \leq l_m, t_i \geq l_{m+1} \\ l_{m+1} - s_i & \text{if } t_i \geq l_{m+1}, l_m < s_i < l_{m+1} \\ 0 & \text{else,} \end{cases} \tag{A.3}$$

where β_m denotes the vector of regression coefficients assumed not to vary in the mth time period, measuring the impact of a set of explanatory variables included in vector X_i also associated with the mth time period (see also Blossfeld and Rohwer, 1995). The specific log likelihood for a sample of N firms can be written as a function of the hazard term and the survival term:

$$\log L = \Sigma_{i \in E} \beta_m X_i - \Sigma_{i \in P} \Sigma_{m=1}^{M} (\Delta[s_i, t_i, l] \exp\{\beta_m X_i\}), \tag{A.4}$$

where E is the set of individuals with an event and P is the set of all episodes having origin state.

The survival analysis of newspapers is an evolving process in continuous time. For estimating, it is discretized into convenient small time intervals. When many events happen, this does not create problems. However, in survival studies the exit event rate is generally low and therefore the defined time period is of more concern (Lindsey, 1998). To take this into account, we estimate the exponential hazard rate model with annual data.

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