Business History
Vol. 53, No. 1, February 2011, 144–168

Routledge
Taylor & Francis Group

The evolution of German industrial legends: the case of Baden-Württemberg, 1940–2007

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Combining agency-theoretical with organisational population ecology approaches, this article analyses which factors drive the survival probabilities of organisations of the same type – listed stock corporations – facing the same institutional environment over a long period of time. It presents results from a unique hand-collected data set starting with the 51 largest firms in Baden-Württemberg in 1940 and follows their evolution for five time points from 1949 until 2007. Through an econometric survival analysis it is found that (i) the presence of *multiple blockholders*; (ii) a healthy capital structure (*capital gearing*); and (iii) the *number of subsidiaries* all have a positive impact on the probability of survival of the companies in our sample. To complement the findings from the survival analysis three exemplified anecdotal case studies are presented as narratives which are supportive of the general findings.

Keywords: corporate governance; organisational ecology; survival analysis; SSOP methodology; evolutions of firms

Introduction

In the Kingdom of Württemberg, now part of the German Federal State of Baden-Württemberg, from 1840, a number of industrial companies were established. Some of those firms later gained worldwide fame for their well-known brands (Maschinenfabrik Esslingen founded in 1846, Württembergische Metallwarenfabrik (WMF) 1853, Hohner 1857, Märklin 1859, Junghans 1861, Voith 1867, Mauser 1872, NSU 1873, Steiff 1877, Daimler 1883, Bosch 1887, Salamander 1891, Knorr 1899). The stunning economic boom of that time was spurred by the state industrial policy in the Kingdom of Württemberg.

These enterprises, despite similar starting conditions, later on developed very differently during their evolutionary process. For instance, the Maschinenfabrik Esslingen in the nineteenth century was one of the largest employers in the region and significantly larger than Daimler-Benz. However, today the Maschinenfabrik Esslingen has become a 100% subsidiary of Daimler and manages industrial sites of the conglomerate group. Its minority shareholders were squeezed out in 2003 by the

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ISSN 0007-6791 print/ISSN 1743-7938 online

DOI: 10.1080/00076791.2011.546672
http://www.informaworld.com

now sole major shareholder, Daimler. What caused the different developments of these corporate twins separated at birth?

We present results from a data set starting with the 51 largest firms in Baden-Württemberg in 1940 and follow their evolution for five time points from 1949 until 2007. In particular, we include performance measures (total assets, turnover, profitability), physical measures (employees, subsidiaries), ownership, strategy (internationalisation), and structure (top management), as defined by Wilson et al. (2007) in their project on 'Mapping Corporate Europe' which builds on the framework of Whittington and Mayer (2000). (2)

The goal of our research is an analysis of the determining factors for the rise and decline of firms through a better understanding of their evolutionary process (survival analysis, and clinical case studies). Existing models of corporate evolution focus on the impact of agency costs, when the separation of ownership and cash-flow rights arises (e.g., Bhattacharya & Ravikumar, 2001, 2005; Burkart, Panunzi, & Shleifer, 2003). However, we see the evolutionary process also as adapting to challenges which result due to the institutional environment, an approach which relates to the literature on organisational ecology (Baum & Shipolov, 2006).

Our ambition is to expand both the population ecology perspective on organisations and the agency-theoretical approaches to an integrated model of the survival of firms over a very long time horizon. According to organisational ecology, those firms survive that have the best fit with their environmental conditions (Beck, 2008). The fundamentals of this field go back to Darwinism and the concept of human ecology developed by Hawley (1950). Hawley presents a model of competition and differentiation in four stages: in the first stage demand exceeds supply of resources, the second stage describes *homogeneity* among competitors, the third stage describes *selection* and extinction of weak entities from the population; the final stage is *isomorphism* and means that similar environmental conditions lead to similar organisations.

According to Hannan and Freeman (1977) – the founders of modern organisational ecology theory – *selection* leads to the demise of unfit or maladapted organisations. However, Hawley (1968) states that even inferior competitors can move to other areas or adapt to more specialised survival strategies. While organisational ecology also researches the evolution of firms and uses survival analysis as its principal method, firm survival is mainly analysed with respect to density dependence, resource partitioning, and spatial partitioning. *Density* defines the number and/or size of competitors while *resource partitioning* concerns competition of different organisational forms, most notably *generalists* or *specialists* (Freeman & Hannan, 1983). The *spatial* dimension relates survival to differences in local conditions and clusters.

While this study highly relates to organisational ecology, our assumptions and specific research questions are different. Ecological theorists such as Baum and Shipolov (2006) assume that individuals cannot conceive and implement changes that improve organisational success. This *structural inertia theory* implies environmental determinism and loss of human agency. Hannan and Friedman (1984) differ between *core* and *peripheral features* in explaining mortality rates. In our empirical analysis we control for these features. The *core features* of organisations are rarely changed and include *strategy* and *structures* like core technology (our proxy: *industry*) and market strategy of organisations, which we proxy by exposure to *foreign trade* activities. The *peripheral features* protect an organisation's core from (3)

uncertainty by broadening its connections to the environment and include the number and size of subunits, which we measure by the number of *subsidiaries*.

Agency-theoretical approaches assume that individual actors can control and influence determining factors of organisational success and these we want to study as well. In particular we want to know which concrete factors drive the survival probabilities of organisations of the same type – listed stock corporations – which are facing the same institutional environment over a long period of time. We hypothesise that *ownership, capital structure*, and the number of *subsidiaries* positively influence the survival of our sample firms. While the first two sets of explanatory variables are classical determinants from the financial economics literature, the number of subsidiaries is an element of the organisational structure which is drawn from population ecology analysis. So we accept the notion that both approaches have complementary explanatory power for firm survival and need to be integrated in the empirical analysis. However, we argue that based on our empirical results the striking importance of ownership and capital structure provides some evidence in favour of the agency-theoretical approaches over the pure organisational ecology perspective.

Furthermore, the analysis of our hand-collected data set shows a great diversity of shareholder and governance structures over time and different dynamics of shareholder structures among one firm of organisations – listed stock companies. Some companies experience dynamic changes in their ownership structure, underlined by heavy disputes between the founders and their family members, the accumulation of hostile blocks of shares, the large influence of banks, and the emergence and resolution of pyramid structures and cross-holdings. Other companies turn into dynastic multi-generation family businesses which remain stable for decades in their ownership structure. This rich heterogeneity in ownership patterns seems to matter for survival and is interesting in its own right to document.

The study is divided into six sections. The remainder of the paper starts with a story about the general industrialisation process that went on in the Württemberg region. This is followed by a description of the sources and structure of the data sample and an overview of the definitions and distribution of the variables. The empirical results in section four include a survival analysis explaining the failure or survival of the firms as explained by their strategy, structure, ownership, and performance (SSOP). Section five complements the econometric analysis by presenting three clinical case studies of firms from the sample. The final section concludes.

The industrialisation process in the Württemberg region

As of today, the federal state of Baden-Württemberg represents one of the wealthiest and most industrialised regions and has the highest per capita GDP in Europe. The region's industrial success is quite remarkable when one takes a closer look at the economic situation of the two forerunner states, the Kingdom of Württemberg and the Grand Duchy of Baden at the turn from the eighteenth to the nineteenth century. In the early days of the nineteenth century the region was dominated by agricultural activity, rather small cities, and a lack of natural resources such as coal and iron ore.

Although the textile industry already existed, only a small number of manufacturers had attained the stage of industrial production. It was not until the

early decades of the nineteenth century that the first machines, such as spinning frames, looms and knitting machines from England, helped to revolutionise the textile industry. As importing coal on a large scale was not economically feasible at that time, water and wood were the main sources of energy resulting in a large number of water wheels for energy production. Württemberg's economic appearance in the first half of the nineteenth century was primarily characterised by the textile and paper industries.

The development of railways is commonly interpreted as a major facilitator of the industrialisation process (Ebener, 2010). Also for Württemberg it was meant to herald the second phase of industrialisation. With the inauguration of the first railway track between Cannstatt and Ludwigsburg, Württemberg entered its main phase of industrialisation. Finally it was economically reasonable to import coal and iron ore to newly deployed industrial sites. Next to this new source of energy it was the state-led industrial policy ambitions of King Wilhelm I which facilitated industrial development. An expression of this industrial policy was the establishment of the 'Zentralstelle für Handel und Gewerbe' (Central Office for Trade and Commerce), headed by Ferdinand von Steinbeis, in 1848 (Grube, 1969). The appointment of Ferdinand von Steinbeis as director of the newly founded office, whose tenure lasted until 1880, has had a lasting impact on the development of the soon to become industrial powerhouse of Württemberg. Especially his visionary efforts towards educating a skilled workforce – a dual approach, combining practical hands-on work with well-founded theoretical knowledge – appealed to many other policy makers, not only in Germany. It is mainly accredited to the existence of the Zentralstelle für Handel und Gewerbe and its director Ferdinand von Steinbeis that the resource-scarce, technologically and logistically disadvantaged Kingdom of Württemberg became famous for its industrial development.

In the second half of the nineteenth century companies such as Maschinenfabrik Esslingen (1846), WMF (1853) and Hohner-Musikinstrumente (1857) were founded. Numerous start-ups, mostly in the area of machine production/mechanical engineering, marked a shift in the industrial structure of Württemberg. It was in this period that Württemberg's industrial focus moved from predominantly textiles to machine/mechanical engineering.

During World War I Germany's industrial production was mostly directed towards military purposes, increasingly neglecting civilian needs. Germany's economy was exhausted from the war. Hyperinflation and the world economic crisis were followed by World War II. Württemberg's economy was revived by the machine and engineering industry, particularly with the rise of the automotive and aviation sectors including their suppliers (Daimler and Benz merged into DBAG in 1926, Porsche was founded in 1931).

The direct aftermath of World War II had severe consequences for the industrial landscape of Württemberg. In addition to the war casualties, Württemberg's industrial sites faced far-reaching production restrictions and output monitoring by the occupying forces. Having to cope with serious initial problems resulting from the destruction of industrial sites and demolished transport routes, Württemberg's industrial production managed to pick up production with only little delay. The lack of resources and the effects of dismantling activities were compensated by growing employment and increased working hours. In 1950 Baden-Württemberg's unemployment rate was at 4.3% while the German average still lay above 10% (Meister-Scheufelen, 2006).

Whereas the economic growth of the 1950s was mainly due to a growth in the number of employees and less to productivity growth, the 1960s show an inverted picture, with growth resulting predominantly from productivity increases. The ongoing economic recovery was based on both domestic demand and goods being exported of which machine manufacturing, automotive industry, chemicals and electronic engineering made up the largest part. The first economic crisis after the end of World War II in the 1970s hit Baden-Württemberg severely. While all of Germany was affected by rising oil prices and the weakening US dollar, it became clear that Baden-Württemberg's economy is more dependent on its exports than other German regions with its resource-intense industrial production and a significant part of exports contributing to its economic growth. And while industrial production still contributes more to Baden-Württemberg's GDP in percentage points than in other regions, its service sector displaces the industrial sector as the number one contributor to Baden-Württemberg's GDP.

Apart from being hit significantly by the second oil crisis at the beginning of the 1980s and economic recession in the 1990s, Baden-Württemberg's machine and engineering industry asserted itself and is still shaping the region's image, as the latest data of the Federal Office for Statistics suggests. According to these statistics, the most labour-intensive sector in Baden-Württemberg in 2009 was the machine/mechanical engineering sector with 292,000 employees, followed by the retail industry with 258,600 and the health care sector with 258,200 employees. Württemberg itself takes the first spot when it comes to the number of employees in machine industry/mechanical engineering, with Ludwigsburg, Esslingen and Stuttgart leading the list. A similar picture can be drawn regarding the number of employees in the automotive sector, with Böblingen and Stuttgart being at the top of the list.

Data

Sample Selection

On 11 February 1860, the Stuttgart Stock Exchange was established. Just a few days after the stock exchange's opening the regional newspaper *Schwäbischer Merkur* published the prices of 71 domestic and some foreign stocks and bonds. Among the shares that were traded from the beginning at the Stuttgart stock exchange were those of the *Maschinenfabrik Esslingen*. The most prominent firm in our sample is *Daimler-Motoren-Gesellschaft*, the predecessor of today's Daimler group, whose shares were floated in 1911 for trading on the stock exchanges in Stuttgart, Berlin and Frankfurt.

In a first step, we select all domestic companies with shares traded on the Stuttgart stock exchange, according to the quotations published in the *Schwäbischer Merkur*. As the date for our sample selection we chose the trading day 29 August 1940. This date was chosen to account for possible wartime effects on the evolution of sample firms. On this date, 51 non-financial and non-transportation stock companies were traded. In a second step, we select all companies (i) with headquarters in Württemberg; or (ii) which are exclusively traded at the Stuttgart stock exchange (four companies). Five companies were deleted from the sample because their headquarters were located outside Baden-Württemberg and their stock was listed at other German exchanges, the most prominent example being I.G. Farbenindustrie AG, Frankfurt am Main. Another company was already going into

liquidation in 1940. This leaves us with a final sample of 45 firms (out of 51) for the empirical analysis.

Of these 45 companies four were already listed on the first trading day of the Stuttgart stock exchange published on 11 February 1860: Maschinenfabrik Esslingen AG, Kammgarn-Spinnerei Bietigheim, Württembergische Baumwoll-Spinnerei und Weberei bei Esslingen, and Württembergische Cattunmanufactur Heidenheim.

Our unique hand-collected sample allows us to study particularly interesting questions, for example, whether the early use of equity capital market financing fostered the rise of some firms as world market leaders – also defined as *hidden champions* by Simon (1996). Many of the companies in our sample have managed to achieve prominence beyond their own region and their brands are known around the globe, allowing us to analyse the rise and subsequent fall of global champions. Examples of those are Vereinigte Trikotfabriken Vollmoeller AG, Stuttgart-Vaihingen, and Gebrüder Junghans AG, Schramberg, around 1900 both had more than 3000 employees and were the largest producers of knitted fabric and watches, respectively.

Table 1 provides summary information on all sample companies (sector, founding date, failure date (if applicable), cause of failure (bankruptcy, shutdown of operations), and events which imply organisational changes (merger, takeover) but let the core operating activities survive.

Descriptive statistics of SSOP variables

The SSOP model introduced by Whittington and Mayer (2000) proposes to investigate the fate of firms as explained by their *strategy, structure, ownership*, and *performance* (hence SSOP). Their original study examines the evolving strategies and structure of large European firms in a comparative and historical context and looks at these in the context of a range of hypotheses on professional management, multidivisional structure and diversification associated with the ideas of Alfred Chandler. The aim of the original SSOP approach is to analyse whether European companies have become more 'European' or more globalised. While we focus on companies from a particular region in Germany and do not look at the question of European integration, we still think the SSOP model is suitable for our project, because the variables used are viable candidates for determining the survival of firms.

In this paper we analyse the SSOP of the 51 most important companies listed on the Stuttgart stock exchange. However, while we broadly follow the SSOP definitions as the general framework of this research, we deviate from this approach along at least two dimensions. First, given our data constraints, our focus is more on ownership and performance than on strategy and structure. Second, as we are highly interested in the determinants of successful performance and hence the survival of firms through time, we do not look at different cross-sections of the 50 largest firms in each year. Instead we start with all 51 firms listed on the Stuttgart stock exchange in 1940 and follow their development up until 2007.

The measures reported in Tables 2 and 3 are extracted from Hoppenstedt's annual guides on German company data for publicly listed firms (*Hoppenstedt Aktienführer*). In Table 2, for each performance measure we report the mean, the minimum (Min), the maximum (Max) of the sample observations, and the number of observations (N). Unfortunately, due to data limitations, we cannot report every

Table 1. Summary information on sample companies.

ID	Name	Founding	Incorporation	Failure	Industry	Failure (shut-down of firm's operating activities)	Organisational change of survivors
1	Baumwollspinnerei Unterhausen AG	1883		1993	Textile	Shut down	–
2	Brauerei Wulle AG	1859	1896		Breweries	Survivor	1971 takeover
3	Bürgerliches Brauhaus Ravensburg AG	1817		2001	Breweries	Brewery shut down, later only asset holding company	–
4	Daimler Benz AG	1926			Transport	Survivor	Blockholder change
5	Deutsche Linoleumwerke AG	1926			Construction	Survivor	Takeover
6	Maschinenfabrik Esslingen AG	1846		1968	Engineering	Operations shut down, later only asset holding company	–
7	Aesculap vormals AG für Feinmechanik vormals Jetter & Scherer	1867			Other	Survivor	Takeover
8	Portland Zementwerke Heidelberg	1874			Construction	Survivor	Only blockholder change
9	Fr. Hesser Maschinenfabrik-AG	1861	1911		Engineering	Survivor	1974 takeover
10	Himmelwerk AG	1879			Electrical	Survivor	Merger (Flender-Himmelwerk GmbH)
11	Matthias Hohner AG	1857	1909		Metal	Survivor	Blockholder change
12	Holzwerkzeugfabrik Laupheim AG	1859	1891		Other	Bankruptcy; time of failure unknown	–
13	Gebrüder Junghans AG	1861			Other	Survivor	Split off
14	Kammgarn-Spinnerei Bietigheim AG	1856		1956	Textile	Shutdown	–
15	Knoeckel, Schmidt & Cie Papierfabriken AG	1888		2000	Paper	Bankruptcy	–
16	C.H. Knorr AG	1838			Other	Survivor	Takeover
17	Kolb und Schüle AG	1760	1898	2000	Textile	Bankruptcy	–
18	Kraftwerk Altwürttemberg AG	1905			Other	Survivor	2001 merger of 5 firms
19	Maschinenfabrik Weingarten AG	1898			Engineering	Survivor	Takeover

(*continued*)

Table 1. (*Continued*).

ID	Name	Founding	Incorporation	Failure	lndustry	Failure (shut-down of firm's operating activities)	Organisational change of survivors
20	Mittelschwäbische Ueberlandzentrale AG	1923			Other	Survivor	1999 merger
21	Neckarwerke Elektrizitätswerke AG	1900	1905		Other	Survivor	1997 merger; 2000 takeover
22	Neckarsulmer Strickmaschinenfabrik AG	1884			Engineering	Survivor	1969 takeover
23	Ostertag-Werke Vereingte Geldschrankfabriken AG	1867	1904	1973	Metal	Insolvency proceedings, later assset holding company	–
24	Salzwerk Heilbronn AG	1883			Other	Survivor	1971 merger
25	Schüle-Hohenlohe Aktien-Gesellschaft	1897		1954	Other	Liquidation	
26	Sektkellerei Schloss Wachenheim AG	1888			Other	Survivor	1996 takeover
27	Spinnerei und Weberei Pfersee	1866	1881		Textile	Survivor	1997 merger (Pfersee-Kolbenmoor AG)
28	Stuttgarter Bäckermühlen AG	1887			Other	Survivor	Takeover
29	Stuttgarter Gipsgeschäft	1870		1974	Construction	Operations shut down, later only asset holding company	–
30	Stuttgarter Hofbräu AG	1872			Breweries	Survivor	2010 takeover
31	Stuttgarter Vereinsbuchdruckerei Akt.-Ges.	1872			Other	No information about failure	–
32	Süddeutsche Baumwolle-Industrie AG	1882		1983	Textile	Bankruptcy	–
33	Süddeutsche Zucker AG	1926			Other	Survivor	No change
34	Ulmer Brauerei-Gesellschaft A.-G.	1884		2002	Breweries	Brewery shut down	–
35	Verein deutscher Oelfabriken	1887			Chemicals	Survivor	Takeover
36	Vereinigte Deckenfabriken Calw AG	1895	1905	1997	Textile	Bankruptcy	–

(*continued*)

Table 1. (*Continued*).

ID	Name	Founding	Incorporation	Failure	Industry	Failure (shut-down of firm's operating activities)	Organisational change of survivors
37	Vereinigte Filzfabriken AG	1858			Textile	Survivor	Takeover
38	Vereinigte Trikotfabriken (R. Vollmoeller) AG	1881	1901		Textile	Survivor	No information
39	Wolldeckenfabrik Weil der Stadt Akt.-Ges.	1920		1996	Textile	Bankruptcy	–
40	Württembergische Baumwoll-Spinnerei und Weberei bei Eßlingen	1856		1961	Textile	Operations shut down, later only asset holding company	–
41	Württembergische Cattunmanufactur	1766	1956	1966	Textile	Operations shut down, later only asset holding company	–
42	Württembergische Elektrizitäts-AG	1906	1923		Other	Survivor	Merger of some firms
43	Württembergische Leinen-Industrie, Blaubeuren	1882		1975	Textile	Operations shut down, later only asset holding company	–
44	Württembergische Metallwarenfabrik	1853			Metal	Survivor	Blockholder change
45	Ziegelwerke Ludwigsburg AG vormals Ganzenmüller & Baumgärtner	1899		N/A	Construction	Bankruptcy; time of failure unknown	–

This table provides summary information for all companies in the sample.

measure for every firm in the sample hence the number of observations differs from year to year. We report all your values in PPP-adjusted 2007 DM.

As can be seen from Table 2, the surviving sample firms have grown remarkably over time. Mean turnover has increased from 47.3 million Deutsche Mark (DM) in 1949 to 1241.4 million DM in 1969 and 25 billion DM in 2007. Average earnings have increased from 1.4 million DM in 1949 to over 1 billion DM in 2007, and mean total assets have increased from 68.5 million DM in 1949 to 32 billion DM in 2007. Mean operating margins as defined by earnings divided by total assets have steadily increased over time while capital gearing has worsened due to a hefty increase in corporate leverage.

Table 3 reports the measures as defined by the SSOP approach, divided up into *physical* measures, and measures of *ownership, strategy*, and *structure* following Wilson et al. (2007).

Table 2. Performance measures.

	1949	1959	1969	1999	2007
Turnover (in million DM)					
Mean	47.3	1,138.3	1,241.4	36,240.2	25,168.0
Min	4.9	27.8	1.1	39.5	28.3
Max	128.8	9,544.9	22,346.1	333,463.3	149,098.5
N	11	14	28	11	9
Returns (earnings) (in m DM)					
Mean	1.4	7.4	37.0	1,468.0	1,091.2
Min	−0.9	0.1	−0.2	6.6	1.1
Max	10.3	83.5	756.0	12,814.7	5,977.5
N	32	30	28	10	9
Total assets (in m DM)					
Mean	68.5	290.5	657.4	40,063.7	32,680.2
Min	1.9	5.2	3.5	15.3	11.0
Max	450.4	3,893.9	10,741.8	388,339.3	202,641.0
N	41	33	28	11	9
Rectified net operating margin (earnings/total assets)					
Mean	1.70%	2.90%	3.30%	4.80%	4.50%
Min	−7.40%	0.30%	−3.00%	1.30%	1.20%
Max	7.90%	8.20%	15.90%	8.40%	9.60%
N	41	30	28	10	9
Capital gearing (total assets–liabilities/liabilities)					
Mean	127.6	13.6	10.7	3.1	1.43
Min	5.5	2.1	1.2	0.2	0.58
Max	3,178.0	63.3	76.3	10.9	2.74
N	40	33	28	10	9

The reported ratios are extracted from Hoppenstedt's database on company data for publicly listed firms. For each ratio we report the mean, the minimum (Min), the maximum (Max) of the sample observations and the number of observations (N).

Note: Base year = 2007; values converted into Deutsche Mark (DM)Values adjusted with CPI on the basis of Deutsche Bundesbank statistics.

Year	Factor 2005
1949	24.2
1959	26.9
1969	34.1
1999	91.4
2005	100
2007	103.9

Table 3. Physical (A), Ownership (B), Strategic (C), and Structural measures (D).

	1949	1959	1969	1999	2007
A. Physical measures					
Number of employees					
Mean	1136	3844	5813	54258	46772
Min	44	9	3	218	99
Max	5433	63432	99006	466938	272383
N	28	32	27	11	9
Number of subsidiaries					
Mean	2.4	1.8	4.4	23.3	17.3
Min	0	0	0	0	2
Max	31	14	31	57	55
N	45	32	28	11	9
B. Ownership measures					
Foreign-owned firms	2	1	2	10	1
State-owned firms	1	1	1	1	1
Free-float firms	0	0	1	0	3
Firms with multiple blockholders (> 10%)	4	7	14	10	4
N	14	9	27	11	9
C. Strategic measures					
Home market	n.n	0	2	n.n	n.n
Partly home market	n.n.	8	6	n.n.	n.n.
Partly international	n.n	2	1	n.n	n.n
International	n.n	0	0	n.n	n.n
N	0	10	9	0	0
D. Structure measures					
Number of firms with foreign managers	2	0	0	2	1

The reported ratios are extracted from Hoppenstedt's database on company data for publicly listed firms. (A) For each ratio we report the mean, the minimum (Min), the maximum (Max) and the number of observations (*N*). (B) The variable Foreign-owned firms is the number of firms in the sample which have a foreign investor, who holds at least 10% of equity. The same methodology is applied with the variable State-owned firm. The variable free float represents the number of firms in the sample which have no shareholder who holds at least 5% of equity. The variable multiple blockholders represents the number of companies which have at least two investors who hold more than 10% of equity in the company. (C) The variable Home market represents the number of firms which generate less than 10% of their turnover in foreign markets. Partly home market indicates that between 10% and 50% of the turnover is generated in foreign markets. Partly international indicates that 50–90% of turnover is generated in foreign markets and international when the share of turnover generated outside the home market exceeds 90%. (D) When at least one member of the management board is foreign, a firm is classified as a firm with foreign managers.

Physical measures (A): For each measure we report the mean, the minimum (Min), the maximum (Max), and the number of observations (N). The average *number of employees* increases from 1136 in 1949 to 46,772 in 2007. The average *number of subsidiaries* is 2.4 in 1949 and rises tenfold to 23.3 in 1999. However, with the exception of the most recent year 2007 there are always firms in the sample which do not have a single subsidiary.

Ownership measures (B): The variable *foreign-owned firms* is the number of firms in the sample which have a foreign (block) investor, who holds at least 10% of equity. The same methodology is applied to the variable *state-owned firms*. The variable *free float* represents the number of firms in the sample which have no single shareholder who holds at least 5% of equity. The variable *multiple blockholders*

represents the number of companies which have at least two investors who hold more than 10% of equity in the company.

Strategic measures (C): The variable *home market* represents the number of firms which generate less than 10% of their turnover in foreign export markets. *Partly home market* indicates that between 10% and 50% of the turnover is generated through sales in foreign markets. *Partly international* is defined as 50–90% of turnover being generated in foreign markets and a firm is classified *international* when the fraction of turnover generated outside the home market exceeds 90%.

Structure measures (D): When at least one member of the management board is foreigner, a firm is classified as a *firm with foreign managers*.

Survival analysis

General discussion of survival analysis issues

The empirical method of survival analysis is used to measure and to explain the time to an event of interest – in our case the shut-down of a firm's operating activities. Survival data are characterised by the start time of the period, the end time, and a dummy variable which contains information on whether failure or right-censoring occurred at the end of the period. Right censoring means that the time of failure is (5) not known for an observation. Therefore, we merely know that the failure occurred after the end of our period of analysis.

In addition, the survival time can be explained by covariates (explanatory variables). From the literature we know that firm mortality rates are not constant during the evolution of a firm (see Cleves, Gould, & Gutierrez, 2003, p. 246f). Most researchers therefore opt for a parametric specification when modelling firm mortality. Survival models used in testing ecological approaches assume exponential, Weibull, Gompertz, log-normal, log-logictic, or generalised gamma distributions. Thus we have to employ statistical concepts which allow us to discriminate between them.

Parametric models can be used with single or multiple record data. Single-record data means that each observation records the entire history of a subject. In the case of multiple-record data, there is a variable that identifies each firm and ties the separate firm's observation together. Each observation in the dataset represents a time span.

An important question in survival analysis is the definition of 'survival' and 'death'. The empirical results from population ecology studies are highly sensitive and differ depending on whether death occurs through dissolution or by absorption through merger, as was shown by Freeman, Carroll, and Hannan (1983). Unlike many studies in corporate finance we define death in our sample as the complete shutting down of operations, while treating mergers, takeovers, etc. as mere organisational changes of surviving firms. We report these events in Table 1.

Application of SSOP methodology for survival analysis

Ownership measures

In the Hoppenstedt manuals of 1949 the ownership structures of only 14 companies (31%) were reported (see Table 3). For this reason, we also use the ownership structures in 1960 and 1970 for the survival analysis based on SSOP variables.

Concentration (according to SSOP). The SSOP classification for concentrated stock ownership is not applicable for our sample. Only one company could be identified which in 1969 was widely held (see Table 3). All other companies have at least one shareholder with a block of at least 10% ownership. Due to the small variation in the data no dummy variables can be used to map the SSOP classification in the survival analysis. Alternatively, we could use the percentage stake of the largest blockholder. However, this variable would be too imprecise a measure, as often due to the lack of disclosure requirements, only vague indications of the level of stock ownership are reported (e.g., 'majority stake is owned by founding family').

State-owned firms (according to SSOP). At the record dates in 1949, 1959, and 1969, only one company could be identified which was state-owned according to the classification (Salzwerke Heilbronn AG, see Table 3). Therefore this variable also had to be excluded from the survival analysis.

Foreign-owned firms (according to SSOP). From 1949 until 1969 foreign blockholders (temporarily) held stakes in four firms from the sample. These blockholdings were more than 10% according to the SSOP classification. Consequently, for the survival analysis we include a dummy variable which is set to one for these four firms.

Existence of multiple blockholders (not SSOP). To gain further knowledge of the impact of ownership structures on the evolutionary process of companies in the context of the survival analysis we also introduce a dummy variable that takes the value one if a company has multiple blockholders each with shareholdings of at least 10%. During the survey period from 1949 to 1969, such block ownership structures were to be found in 14 companies (see Table 3). In six of these companies at least one of the blockholders is a bank or another financial intermediary. The prevalence and importance of multiple blockholders has recently been documented by Laeven and Levine (2008).

Strategic measures

German companies in the 1949–69 survey period did not have to publish mandatory segment reports. Furthermore, prior to the Accounting Law Reform in the mid-1960s, even revenues were rarely reported in the financial statements. For example, in the financial statements of 1949 the corresponding information could be found for only about 24% of the companies in the sample while information on sales abroad were not published at all.

In the 1970 Hoppenstedt manual of German Stock Corporations (reporting the 1969 financial statements) of the remaining 40 companies (5 companies shut down their operating businesses until 1970) the annual accounts of only 28 companies (70%) can be identified. That difference is explained largely by going privates and conversions to legal forms other than stock corporations. Therefore the financial statements of these companies are no longer included in the Hoppenstedt manuals of German stock corporations.

In the Hoppenstedt manuals of 1969 revenues have been reported by all the companies in their financial statements. However, only 32% of companies differentiated between sales revenues generated at home against those from abroad. Information on export activities or sales abroad (as opposed to purely domestic sales) can often be found in the report on the general business

development. From the available data we can construct a dummy variable (*Foreign trade*) that takes the value 1 if any information can be found on export activities (slightly different from SSOP methodology). As can be seen from Table 3, the SSOP classification into Home market, Partly home market, Partly international and International cannot be fully reconstructed on the basis of published data available from the sample companies. Unfortunately, this is also the case for a distinction between transactions within and outside Europe (SSOP variable: Internationalisation) or a revenue-based classification of the degree of diversification (SSOP variable: Diversification).

Structural measures

The Hoppenstedt manuals of German companies also provide no reliable data to draw conclusions on existing organisational structures (Functional, Multidivisional, Holding, Functional holding) as defined in the SSOP framework.

Furthermore, no reliable data on the internationalisation of the management or supervisory boards can be established. In 1949, we could identify foreigners as directors in only two companies (see Table 3). Between 1959 and 1969, among the companies included in the sample no board positions held by foreigners could be identified. Due to the low variability of the data, this variable cannot be considered in the context of the survival analysis.

Specification of survival analysis

Death as shut-down of operating activities

In the survival analysis all companies receive a dummy value of 1 if they have shut down their operating business by the end of 2009 (and 0 otherwise). Among these events closure and bankruptcy are subsumed. This definition of companies having to shut down their operating businesses includes those which are still active but only as asset management companies managing the real estate assets of their former production facilities. Thus these *living deads* also receive a dummy value of 1. Many of these companies remain listed stock companies, but their shares were in many cases traded only occasionally.

Of the 45 companies used in the data set under the above criteria, 18 companies (40%) obtain a dummy value of 1. Of these, seven companies remain active only as asset management companies. For two companies we could not determine exactly when their operating businesses shut down. For the following analysis these two companies had to be excluded from the data.

Table 4 shows that 27 companies have survived from the original sample of 43 companies. This corresponds to a survival rate of 62.8%. Of these only nine companies could be found in the Hoppenstedt database for the year 2007. Five companies were delisted through takeovers and mergers and could no longer be identified by the end of 2007. The remaining 13 sample companies which have not ceased their operations are either (i) formally independent subsidiaries of listed companies (for example, NSU-Werke, now VW subsidiary Audi); or (ii) they have established successor companies formed after restructuring efforts (e.g., Junghans watch factory GmbH & Co. KG and Junghans Microtech GmbH as the successors of Gebrüder Junghans AG); or (iii) they have delisted for other reasons.

Table 4. Survival function of sample firms (Kaplan–Meyer estimator).

Time period	Begin total	Fail	Survival	Survivor function values	Std. error
1940–1950	43	0		1.0000	–
1951–1960	43	2		0.9535	0.0321
1961–1970	41	3		0.8837	0.0489
1971–1980	38	3		0.8140	0.0593
1981–1990	35	1		0.7907	0.0620
1991–2000	34	5		0.6744	0.0715
2001–2010	29	2	27	0.6279	0.0737

Note: 45 total observations, 2 event time missing.

In analysing the timing of the shutdown of operations it is striking that while the data set starts in 1940, World War II has not been a significant determinant for the shutdown of operating businesses. In fact, the largest clustering of delistings was in the 1990s (five cases), followed by the 1960s and 1970s (three cases each), the 1950s and 2000s (two cases each) and the 1980s (one case).

Parametric model selection

Nested model selection. In the first step, we fit a generalised gamma model. The 95% confidence interval for kappa (-0.3645; 3.0733) includes both 0 and 1. Therefore, the use of a log-normal model (kappa = 0), or a Weibull model (kappa = 1) could be an appropriate parametric model that generates the failure times in our data. Otherwise, an exponential model (kappa = 1, and ln(sigma) = 0) seems not to fit our data very well, because ln(sigma) is outside the 95% confidence interval (-1.9537; -0.0419). To discriminate between a Weibull, exponential, and log-normal model, we additionally test the following hypotheses using a Wald test.[1]

(1) H_0: kappa = 0, in which case, if H_0 is true then the model is log-normal test statistic results: chi2 = 2.38, Prob > chi2 = 0.1225;
(2) H_0: kappa = 1, in which case, if H_0 is true then the model is Weibull test statistic results: chi2 = 0.16, Prob > chi2 = 0.6861;
(3) H_0: kappa = 1, ln(sigma) = 0, in which case, if H_0 is true then the model is exponentialtest statistic results: chi2 = 11.14, Prob > chi2 = 0.0038.

In sum, the test results seem to suggest the use of the Weibull model for our data.

Non-nested model selection

When models are not nested, Wald tests are unsuitable (see Cleves et al., 2003, p. 246). In the case of non-nested models, the best-fitting model is the one with the lowest value of the Akaike (1974) information criterion (AIC).

Again, the Weibull model is selected for different parametric model.

Right censoring. In our sample there are firms which have survived through our analysis time period 1940–2007 (time at risk). Due to the economic success of some German industrial legends we cannot observe these firms long enough for all of them to fail. These successful firms can only provide survival information while few cases

Table 5. Comparison of AIC values for different parametric model.

Distribution	Log likelihood	k	c	AIC
Exponential	−26.762627	6	1	67.525254
Weibull	−22.597365	6	2	61.194730
Gompertz	−23.436046	6	2	62.872092
Log-normal	−23.378077	6	2	62.756154
Log-logistic	−23.161849	6	2	62.323698
Generalised gamma	−22.512438	6	3	63.024876

The table shows the AIC values for the basic model (Part A of Table 6). Models B and C show similar results (available on request). k is the number of model covariates. c is the number of model-specific distributional parameters.

in our sample contain information on failure. From a purely statistical perspective, right censoring could be a methodological problem for our analysis.[2]

The right censoring can easily be treated in parametric models. For our successful firms we cannot measure the failure time exactly but we can assume that the failure occurs after the end of the analysis period t_i. From a purely statistical view we replace the density of t_i, $S(t_i|x_i, \beta)$ h $(t_i \mid x_i, \beta)$, by only the survival function $S(t_i \mid x_i, \beta)$.[3]

Left censoring. Unfortunately, the chosen sampling design of analysing the 50 largest firms creates a left censoring problem. Left censoring means that the failure already occurred before we started our analysis. In our case, had a firm failed, the firm would not have been included in our analysis. Therefore, we overestimate the firm survival rate.

From a purely statistical view, the parametric models can easily deal with left censoring. One simply needs to add the probability that the firm had already survived up until the beginning of our analysis in t_0. For left censoring the likelihood function is:

$$L_i(\beta|t_i, x_i) = \frac{S(t_i|x_i, \beta)}{S(t_0|x_i, \beta)} \cdot h(t_i|x_i, \beta)$$

where the first term is the probability of surviving to t_i, given survival up to t_{0i} (see Cleves et al., 2003, p. 31).

Unfortunately, we do not have any historical data to estimate the nominator of the first term of the likelihood function. It would be an extension for further research. In sum, our empirical results are limited to estimate the survival rate for established industrial firms.

Determinats of survival

In a next step we analyse the survival probabilities and their determining factors for the total period 1940 until 2009. The analysis starts with a distinction according to two industries which are highly representative for our data sample. The survival function value for companies in the textile industry was only one-third and thus significantly lower than for firms in other industries where the survival function value was close to 75%. Companies in the automotive, machinery, and electro industry had an above-average survival function value of 83.3% (other industries: 59.5%).

Table 6. Determinants of survival probability during the maximum period 1940–2010 (Kaplan–Meyer estimator).

Determinants		Total	Fail	Survival	Survival function value	Std. error
Textile industry	Yes	12	8	4	0.3333	0.1361
	No	31	8	23	0.7419	0.0786
Automotive, machinery, and electro	Yes	6	1	5	0.8333	0.1521
	No	37	15	22	0.5946	0.0807
Multiple blockholders	Yes	14	3	11	0.7857	0.1097
	No	29	14	15	0.5172	0.0928
Foreign trade	Yes	16	4	12	0.7500	0.1083
	No	17	6	11	0.6471	0.1159
Subsidiaries	$N = 0$	14	10	4	0.2857	0.1207
	$N = 1$	12	4	8	0.6667	0.1361
	$N = 2$	8	2	6	0.7500	0.1531
	$N = 3$	2	0	2	1.0000	–
	$N \geq 4$	7	0	7	1.0000	–

In addition, we make a distinction between the survival rates adjusted for ownership, physical, and strategic measures. It turns out that the presence of *multiple blockholders* led to a sharp increase in the probability of survival (78.6% vs. 51.7%). Significant differences also result from an early focus on generating sales abroad of *export-oriented* Baden-Württemberg companies. The survival rate for export-oriented companies is 75.0%, while companies that have an exclusive focus on the German market have a survival rate of only 64.7%.

Another impact on the survival function values is induced by the number of subsidiaries. While only 28.6% of firms without any subsidiaries survive, we cannot report a single default of a company which has three or more subsidiaries.

In a final step, the determinants of default (of non-surviving firms) will be examined with parametric Weibull regressions in more detail. Table 7 shows the hazard ratios which allow the testing determinants of survival. The hazard ratio can vary from zero to infinity. A low hazard ratio means low risk of the shutting down of the operation.

For the further investigation of causal relationships between determinants and probabilities of survival we estimate three model variations chosen in order to account for the small number of records and missing values for different variables. The evaluation of the results of the Weibull regressions clearly show that both the presence of *multiple blockholders* and the *number of subsidiaries* significantly increase the survival probability. This corresponds to the results of the previous analysis of survival functions on the basis of Kaplan–Meyer estimators. In contrast to the Kaplan–Meyer estimator, the impact of industries on survival rates is mixed.

The most striking results of model A are the lowest and significant values of multiple blockholders (hazard ratio of 0.1765, $z = -1.65$) and the number of subsidiaries (hazard ratio of 0.5302, $z = 1.76$). Both variables are significant at the 10% level.

Model B shows only a weak correlation between survival rate and *export orientation*. With expected signs the dummy variable for export is statistically significant at the 10% level.

Table 7. Determinants of survival.

Variable	Weibull regression				
	Coef.	Haz. ratio	Std. error (haz. ratio)	z	P > |z|
A. Basic model (N = 41)					
Log total assets	0.0908	1.0950	0.7266	0.14	0.891
Dummy multiple blockholders	−1.7343	0.1765	0.1853	−1.65*	0.099
Dummy foreign blockholder	−0.3627	0.6960	0.7487	−0.34	0.736
Number of subsidiaries	−0.6346	0.5302	0.1914	−1.76*	0.079
Textile industry	0.8233	2.2780	1.3363	1.40	0.160
Automotive, machinery, and electro	−0.2560	0.7742	0.8457	−0.23	0.815
Constant	−5.3380			−1.18	0.237
LR chi2	*18.48***				
Prob > chi2	*0.0051*				
B. Basic model including foreign trade dummy (N = 30)					
Log total assets	−0.7842	0.4565	0.6228	−0.57	0.565
Dummy multiple blockholders	−2.3165	0.0986	0.1141	−2.00**	0.045
Dummy foreign blockholder	−15.9027	1.24e–07	0.0004	−0.00	0.996
Number of subsidiaries	−0.5499	0.5770	0.2331	−1.36	0.174
Foreign trade dummy	−1.1824	0.3066	0.2996	−1.21	0.226
Textile industry	1.2137	3.3659	3.1565	1.29	0.196
Automotive, machinery, and electro	1.2233	3.3983	4.5631	0.91	0.362
Constant	0.0150			0.00	0.999
LR chi2	*15.93***				
Prob > chi2	*0.0258*				
C. Basic model including rectified net operating margin and capital gearing (N = 32)					
Log total assets	−0.7167	0.4884	0.4128	−0.85	0.397
Dummy multiple blockholders	−23.8073	4.58e–11	2.16e–07	−0.01	0.996
Dummy foreign blockholder	−0.2906	0.7478	0.8855	−0.25	0.806
Number of subsidiaries	−1.1036	0.3317	0.1704	−2.15**	0.032
Rectified net operating margin	−2.5521	0.0779	0.7663	−0.26	0.795
Capital gearing	−0.0719	0.9309	0.0324	−2.05**	0.040
Textile industry	2.6161	13.6827	12.8784	2.78***	0.005
Automotive, machinery, and electro	6.5566	703.8742	1447.281	3.19***	0.001
constant	−5.5782			−0.95	0.340
LR chi2	*33.28****				
Prob > chi2	*0.0001*				

*,**,***Asterisks indicate significance at the 10%, 5%, and 1% confidence level.
Number of periods: 7.

Model C shows that higher values for both *rectified net operating margin* and *capital gearing* increase the survival rate. While the *rectified net operating margin* is not statistically significant, for *capital gearing* there is statistical significance at the 5% level.

The control variable *logarithm of total assets* used in all three models turns out to have no statistically significant effect on survival rates.

To summarise, the survival analysis shows that (i) the presence of *multiple blockholders*; (ii) a healthy capital structure (*capital gearing*); and (iii) the *number of subsidiaries* all have a positive impact on the probability of survival of the companies in our sample.

Clinical case studies

The above empirical findings are drawn from an econometric survival data analysis. In order to get a real understanding of the evolutionary process in our individual sample firms, we provide three exemplified anecdotal case studies presented as narratives. Narratives are not only commonly used in business history research, they are also widely accepted as a complementary research method in financial economics. The methodological rationale for their inclusion is the 'inherently closer examination of purposely restricted samples' through hand-collected data like (6) corporate documents from archives (Tufano, 2001). According to Jensen et al. (1989) clinical studies help set the agenda for theory and empirical work 'by providing an in-depth analysis of the important dimensions of a phenomenon'. Wilson et al. (2007) also call for 'a wide range of case studies that will enrich the quantitative (7) evidence' and we are happy to provide them.

In line with this spirit, we present one case of a company that failed and did not survive on its own and shut down its original operations (Maschinenfabrik Esslingen), one case of a survivor that has proven to be extremely successful – except for the most recent decade (Daimler) – but was re-organised in its infancy through a merger, and a case of a company which survived in the same line of business (musical instruments), bearing its former name (Hohner) but with new ownership and production processes. All cases are in line with the general findings of the survival analysis. They illustrate the positive impact on survival of the presence of multiple blockholders and a sound capital structure as in the case of Daimler-Benz, or the lack thereof as in the case of Maschinenfabrik Esslingen. The data which we use comes from historical sources such as annual reports and corporate anniversary chronicles which provide for a rich set of data not easily available through public sources.

The fall of Maschinenfabrik Esslingen

Maschinenfabrik Esslingen Aktiengesellschaft (MEAG) was founded in 1846 by Emil Kessler. Economic conditions were extremely favourable for the creation of Maschinenfabrik Esslingen. The Government of the Kingdom of Württemberg considered the design, construction, and operation of the railway network as a state responsibility, while privately owned enterprises should be responsible for the supply of locomotives, carriages, and operating facilities. In this context, an international tender was called in 1845 for the 'Railway Commission' with the goal of constructing a large machine plant for the production of the above-mentioned railway equipment. Emil Kessler was lucky to win the tender and the property needed for the plant was put at his disposal free of charge by the Esslingen municipality.

From its inception, Maschinenfabrik Esslingen has been offering an extensive product range stemming from locomotives, and railway carriages, to cranes, boilers and machinery, water works, turbines, rolling mills and hammer mills, steamships, (8) and even bridges. Despite some setbacks caused by the 1849/50 recession, MEAG had already managed to conquer markets outside of Württemberg. An example of the rapid economic development of Maschinenfabrik Esslingen was the purchase of 250,000 square metres in the city of Mettingen for the reconstruction of the factory, which was running beyond full capacity in 1908. In its history of more than 120 years

of ongoing business operations, Maschinenfabrik Esslingen produced 5300 locomotives and over 26,000 cars.

The first 70 years of Maschinenfabrik Esslingen's corporate development were dominated by the activities of the founding family. From 1846 until his sudden death in 1867 (due to a heart attack) the founder Emil Kessler ran the company. From 1867 to 1895 it was Emil Kessler Jr. (the eldest son of founder) who ran the company. In 1907, after a period of 12 years without a family member on the management board, Louis Kessler (Emil Kessler Jr.' s son from his second marriage), took over the company's management.

Significant changes in the economic environment after the end of World War I led to major changes in the shareholder structure of MEAG. Due to the war-driven disappearance of the raw material supplies from Lorraine and the Saar in 1920, close cooperation with the *Gutehoffnungshütte* ('Good Hope Mill') was established, through which eventually 50% of the Mill's shares were acquired by Maschinenfabrik Esslingen.

In 1921 Maschinenfabrik Augsburg-Nuernberg (MAN) took over Maschinenfabrik Esslingen. Later, in 1926, MAN ended the production of steam boilers to the benefit of Maschinenfabrik Esslingen, while at the same time MEAG stopped the production of electric cranes and gantry cranes to be substituted by MAN products.

In 1965 Daimler-Benz AG, through its subsidiary *Kraftfahrzeug und Industriemotoren GmbH Stuttgart*, took over the shares of the *Gutehoffnungshütte* and thereby also became the majority shareholder in Maschinenfabrik Esslingen with 71% of the voting capital. The decline in orders from Maschinenfabrik Esslingen resulted in insufficient capacity utilisation levels. This led at first to an only partial, and later in 1968 to a complete leasing out of the property to Daimler-Benz AG. After production of rail transport equipment ceased in 1966, the mechanical engineering division was sold to *Gutehoffnungshütte Sterkrade AG* in 1968. The automotive sector was taken over by *Fahrzeugwerke Esslingen GmbH*, another subsidiary of Daimler-Benz. After that, Maschinenfabrik Esslingen became the sole real estate management company of the Daimler-Benz group. Finally, in 2002, the remaining minority shareholders of MEAG were squeezed out by the controlling shareholder, then DaimlerChrysler, which recently de-merged into Daimler AG.

The rise of Daimler-Benz AG

While the fate of Maschinenfabrik Esslingen in the first decades of the company's history (1846–1920) was dominated by three generations of founding family management, the shareholder structure of the two predecessor companies of Daimler-Benz AG is characterised by the workings and partly by the rivalries between its multiple founding members. At the time of the merger of the two predecessor companies in 1926 into Daimler-Benz AG – 36 or 43 years respectively after their foundation – the six founding families were no longer active in the management and supervisory boards of their former enterprises. The main reasons are probably wealth constraints of the founding families which led to rapid dilution of their ownership stakes in connection with numerous capital increases.

The first predecessor company, *Daimler-Motoren-Gesellschaft*, was founded on 28 November 1890. Originally, 200 shares each were held by its founders Gottlieb Daimler, Wilhelm Lorenz and Max Duttenhofer. Already in 1894 Gottlieb Daimler exited the company following disputes with the other founders. However, in 1895,

the three original founders agreed on a so-called *reunification contract*. Thereafter, Gottlieb Daimler held 178 shares (19.8%). In 1897, he acquired an additional 65 shares (27.1%). After the death of Gottlieb Daimler in 1900, the firm which today only bears his name faced a legal dispute over patent copyrights. In a settlement reached in 1902, the Daimler family waived all claims on the company with the sole exception of a pari-subscription right to 50 shares. As a consequence, 12 years after the founding of the company, the Daimler family had de facto become a minority shareholder.

The second predecessor company *Benz & Cie, Rheinische Gasmotorenfabrik*, was founded on 1 October 1883, in Mannheim, in the legal form of an *Ordentliche Handelsgesellschaft* (OHG) and since 1890 became a stock corporation. Among the original founding members were Karl Benz, Max Rose, and Friedrich Wilhelm Esslinger. On 1 May 1890, Friedrich von Fischer and Julius Ganss replaced the founding members Max Rose and Friedrich Wilhelm Esslinger as partners of the OHG. At the time of the conversion into a stock corporation, Karl Benz, Friedrich von Fischer, and Julius Ganss held 999 shares each. One share per person was held by Henry Perron, a banker and son-in-law of Carl Benz, Jean Ganss, the brother of Julius Ganss, and Max Rose, respectively.

A first hostile accumulation of blocks of shares occurred in 1922, when Jakob Shapiro presented himself to the surprised Benz management with an ownership stake of approximately 40% of the ordinary share capital. However, in 1929, he was unable to meet his payment obligations under an existing Lombard loan with Deutsche Bank and Dresdner Bank. Subsequently, he had to settle this obligation by selling his Daimler-Benz shares, which were formerly pledged to guarantee the loan.

Even after World War II, drastic changes in the shareholder structure of Daimler-Benz AG were taking place, without hindering the economic development of the group in a significant way. In 1954/55 Deutsche Bank owned a shareholding of 25%, presumably from the shares pledged by Jakob Shapiro. In addition, there was another hostile attempt to conduct a stealth accumulation of blocks of shares as in 1952 Friedrich Flick had started a hidden acquisition of Daimler-Benz shares. At the Annual General Meeting on 18 July 1955, the Flick group reported an ownership stake of 25%. At the same time, Herbert and Harald Quandt acquired an ownership stake of 9.06% by the end of 1955. In early 1956, the timber merchant Hermann Krages acquired a total of 8% of Daimler-Benz shares, which he sold in 1956 to the Quandt brothers. Following intense negotiations between the Flick and the Quandt families on a split of this block of shares between them, the Flick family increased their stake by 4.67% and the Quandt family by 3.33%, respectively. Through further acquisitions, Herbert Quandt increased his shareholdings to 15.04% in 1960, which he controlled through his investment holding company *Induwest*. In 1960, both the Quandt family and the Flick family transferred 12.5% stakes each of Daimler-Benz shares to Induwest, which now belonged to both families equally.

There was a new dynamism in the shareholder structure of Daimler-Benz AG in 1974/75 when Herbert Quandt sold an ownership stake of 14% in DBAG to the Emirate of Kuwait. Following this transaction, Karl Friedrich Flick held 39%, Deutsche Bank 28.5% and the Emirate of Kuwait 14%.

In 1975, it was made public that Karl Friedrich Flick intended to sell its blockholding of 39% to Iran. This led to the intervention of Francis Henry

Ulrich, the CEO of Deutsche Bank and chairman of the supervisory board of Daimler-Benz AG. As a solution, it was agreed upon that the Deutsche bank would acquire 29% of that stake and Friedrich Karl Flick retained the remaining 10% of the shares. The equity stake of 29% was later traded by Deutsche Bank. In a first step, 25.23% was transferred to the *Mercedes-Automobil-Holding* and the remaining 3.77% was placed with other investors. Then 50% of the share capital of the Mercedes-Automobil-Holding was floated on the stock market through an IPO, while the other blocks of 25% each were transferred to the newly created special investment holdings *Stella Automotive Beteiligungs GmbH* and *Star Automotive Beteiligungs GmbH*. For both holding companies it was foreseen that four privileged blocks of shares of 25% each should be reserved for a later sale to institutional and industrial investors. The most widely quoted figure of corporate Germany – the 'Deutschland AG' – was created.

The rise and the fall and subsequent survival of Hohner AG

The economic historian Berghoff (1997, 2001) documents an intriguing case study of the rise and the fall of another world market champion based in Württemberg. He describes the corporate history of the small German stock corporation Hohner AG, a producer of harmonicas. Even more interesting than the global marketing success, however, are the many examples of rent-seeking behaviour of the Hohner family. By 1933 the five sons to whom the father had transferred the business in 1900 had all died or resigned from the management of the firm. Heading the company since then were the founder's grandsons Matthias Hohner and Ernst Hohner, a member of the Board, and from 1920 in control until his death in 1965. (9)

The other patriarch and managing owner, Matthias Hohner, became the most important citizen of Trossingen, a small south German town. Not only was Hohner AG by far the biggest employer in town, the family also had all the members of the city council on its payroll, and therefore had almost uncontested political power. Thanks to heavy monetary contributions, the entrepreneur, who had no formal education, also became doctor *honoris causa*, honorary senator, and even adjunct professor of the University of Tübingen. However, the Hohner corporation had to spend large sums to keep its controlling owners happy. Between 1949 and 1961 Hohner AG spent 11.7 million DM on social contributions and philanthropic donations, as compared to aggregate net capital investments of only 13.5 million DM and aggregate dividend payments of only 7.2 million DM. In 1957, Hohner AG had its centennial corporate anniversary and spent over 1 million DM on celebrations alone. This amount was higher than the annual dividend paid out to shareholders and even higher than the net capital expenditures. In addition to that, corporate employees and alumni received 716,450 DM in centennial gratifications. The celebrations, whose only true goal was to glorify the Hohner family, hosted more than 1000 guests from 33 countries and lasted three full working days.

Finally, excess took its toll and the Hohner family had to pay the price for decades of pseudo-feudal lifestyle. In 1986, Hohner AG only avoided bankruptcy and liquidation because its 14 lending banks accepted a moratorium and wrote off 10.6 million DM in debt. In addition, the state of Baden-Württemberg, through its Prime Minister (and former city council of Trossingen) Erwin Teufel granted 8 million DM through hidden subsidies. Nevertheless, although Hohner AG could be rescued, the founding family lost not only their seat on the managing board but also

saw their voting stake diluted initially from 60% to 30% through capital restructuring, losing effective control of the firm.

The last act of the tragedy was added by Berghoff *post scriptum*. In 1997 Hohner was majority-acquired by the HS Investment Group Inc., which has its headquarters in a tax haven in the Caribbean. This company is reportedly active in producing musical instruments in the Far East and selling them in Western countries. One can imagine that the 100-year-old label *Hohner* fitted very well into its marketing strategy, but the family no longer had a significant ownership stake.

With multiple blockholders, as in the case of Daimler, the failures of MEAG and Hohner AG would possibly not have happened in this way. While both Daimler and MEAG belong to the *automotive, machinery, and electro industry*, the continuous presence of *multiple blockholders* (private investors and banks) – even though, or maybe because, these had always been hostile towards each other – seems to have given Daimler a competitive advantage. This was further supported by a *healthy capital structure* through lots of refinancing rounds on external capital markets. As opposed to the founding families of MEAG and Hohner, the original founders of Daimler were rapidly diluted. Daimler is also the sample firm with the highest number of subsidiaries, of which later on MEAG became one. This all had a positive impact on the probability of Daimler's survival, in addition to being in the 'right' industry. So while we cannot rule out that the causes of the demise of MEAG and Hohner were structural and/or strategic, we would argue that the evidence is most convincing for creating agency-cost free ownership structures and overcoming financing constraints which provide for superior performance and the survival of firms.

Conclusion

Combining agency-theoretical with organisational population ecology approaches, we want to analyse which concrete factors drive the survival probabilities of organisations of the same type – listed stock corporations – which are facing the same institutional environment over a long period of time. We present results from a unique hand-collected data set starting with the 51 largest firms in Baden-Württemberg in 1940 and follow their evolution for five time points from 1949 until 2007. We include performance measures (total assets, turnover, profitability), physical measures (employees, subsidiaries), ownership, strategy (internationalisation), and structure (top management), as defined by Wilson et al. (2007) according to the SSOP framework developed by Whittington and Mayer (2000).

Through an econometric survival analysis we find that (i) the presence of *multiple blockholders*, (ii) a healthy capital structure (*capital gearing*), and (iii) the *number of subsidiaries* all have a positive impact on the probability of survival of the companies in our sample. While the first two sets of explanatory variables are classical determinants from the financial economics literature, the number of subsidiaries is an element of the organisational structure which is drawn from population ecology analysis. Based on these empirical results and in light of the striking importance of ownership and capital structure we would slightly favour the agency-theoretical approaches over the pure organisational ecology perspective in terms of their explanatory power for our sample firms.

To complement our findings from the survival analysis we conduct three clinical case studies. We present one case of a company that failed and did not survive on its

own and shut down its original operations (Maschinenfabrik Esslingen), one case of a survivor that has proven to be very successful (Daimler), and one case of a company which survived in the same line of business as a company bearing its former name (Hohner) but with new ownership and production processes. All cases are in line with the general findings of the survival analysis.

While we do not claim that our results stemming from the German region of Württemberg are representative of European corporations in general, we argue that they contribute to the understanding of European business models in general. First, our time period falls within the era of post-World War II European integration. Second, most of the firms in our sample started out as hidden regional champions but were very international in their export orientation. Finally, as we argue, our results on the importance of ownership and capital structure for the same type of firms operating in the same institutional environment can be generalised to other European corporations.

Acknowledgements

We thank Alexander Eisele and Constantin Ulmer for excellent research assistance.

Notes

1. From the ecological approaches to organisations we know the age, size and density dependence in organisational failure. For a literature review see Baum and Shipilov (2006).
2. We thank one anonymous reviewer for pointing this censoring problem out.
3. This substitution is exactly what the stata command streg does when we indicate a failure variable. The fail contains a dummy variable that is equal to one when is a failure and equal to zero when there is a right censoring (see Cleves et al., 2003, p. 31).

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