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Is Subsidizing Companies in Difficulties an Optimal Policy?

An Empirical Study on the Effectiveness of State Aid in the European Union

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Is Subsidizing Companies in Difficulties an Optimal Policy? An Empirical Study on the Effectiveness of State Aid in the European Union

Abstract

Even though state aid in order to rescue or restructure ailing companies is regularly granted by European governments, it is often controversially discussed. The aims for rescuing companies are manifold and vary from social, industrial and even political considerations. Well-known examples are *Austrian Airlines* (Austria) or *MG Rover* (Great Britain). Yet, this study aims to answer the question whether state aid is used effectively and whether the initial aim why aid has been paid has been reached, i.e. the survival of the company. By using data on rescued companies in the EU and applying a survival analysis, this paper investigates the survival rates of these companies up to 15 years after the aid has been paid. In addition, the results are compared to the survival rates of non-rescued companies which have also been in difficulties. The results suggest that despite the financial support, business failure is often only post-poned; best survival rates have firms with long-term restructuring, enterprises in Eastern Europe, smaller firms and mature companies. However, non-funded companies have an even higher ratio to go bankrupt.

Keywords: European competition policy, state aid, firm survival, survival analysis, control group

JEL Classification: K21, L49, L59

Sollten Unternehmen in Schwierigkeiten durch den Staat gerettet werden? Eine empirische Studie zur Effektivität staatlicher Rettungsbeihilfen in der EU

Zusammenfassung

Obwohl das Überleben von Unternehmen in Schwierigkeiten durch die Unterstützung des Staates häufig zunächst gesichert werden kann, sind diese finanziellen Hilfspakete stark umstritten. Die Ziele solcher Rettungsmaßnahmen sind vielfältig und reichen von sozialen Gründen über die Unterstützung und Erhaltung bestimmter Industriezweige bis hin zu politischen Beweggründen. Die Rettung der Fluggesellschaft *Austrian Airlines* (Österreich) oder die des Automobilkonzerns *MG Rover* (Großbritannien) sind bekannte Beispiele. Das Anliegen dieser Untersuchung ist es nun, zu beantworten, ob die Subventionen effektiv sind, sie also das Ziel erreichen, die Unternehmen langfristig und erfolgreich am Markt zu halten. Hierfür wurde ein Datensatz erstellt, der alle Unternehmen erfasst, die in der EU im Zeitraum von 2000 bis 2010 Rettungs- und Umstrukturierungsbeihilfen erhalten haben. Wir nutzen die Überlebenszeitanalyse, um zu beantworten, ob die Subventionen effektiv waren. Diese Ergebnisse werden mit denen einer Kontrollgruppe verglichen. Im Ergebnis zeigt sich, dass das Ausscheiden von Unternehmen durch die Subventionen nur verzögert wird, die Überlebensrate im Gegensatz zur Kontrollgruppe jedoch dennoch höher ist. Insbesondere Unternehmen, die mit langfristigen Umstrukturierungsbeihilfen unterstützt wurden, solche mit Sitz in Osteuropa bzw. Ostdeutschland sowie kleinere oder ältere Unternehmen zeigen eine signifikant höhere Überlebenswahrscheinlichkeit.

Schlagwörter: europäische Wettbewerbspolitik, staatliche Beihilfen, Überleben, Überlebenszeitanalyse, Kontrollgruppe

JEL-Klassifikation: K21, L49, L59

1 Introduction

State aid in order to rescue or restructure ailing companies is regularly granted by European governments. Between the years 2000 and 2010 governments spent almost 46 billion euros in order to support companies in difficulties (see chapter 3). Well-known examples of companies that received such support are *Austrian Airlines* (Austria) or *MG Rover* (Great Britain). However, rescue and restructuring aid is also controversially discussed. The European Commission acknowledges "rescue and restructuring aid is one of the most distortive forms of aid" (European Commission 2006, p. 28). Thus, "it cannot be the norm that a company which runs into difficulties is kept artificially in the market" (European Commission 2003, p. 13). However, such an aid "may in exceptional circumstances be justified by the countervailing benefits" (European Commission 2006, p. 29).

It is undisputed that in some circumstances state aid becomes necessary to overcome market failure and thereby enhance efficiency with a view on growth and welfare (Meiklejohn 1999; Stiglitz 2000). However, as there are several different types of aid, their motivation varies as well. In the case of firm specific aid economic justifications include employment considerations, the correction of externalities, asymmetric information or market power (Gual and Jodar-Rosell 2006). Yet, the bankruptcy of a large enterprise may lead to market power concentration and a lay-off of many employees thus governmental support is supposed to restore the long-term viability of the enterprise and thus secure employment (Rodrik 2004). Furthermore, in terms of firm-restructuring state aid smoothes the process of (re-)gaining competitiveness and therefore mitigates negative social externalities (Nitsche and Heidhues 2006). Apart from such efficiency-related justifications, state aid may also follow equity concerns with a view on correcting social inequalities, e.g. by way of supporting companies in economically underdeveloped regions (cohesion policy, Gual 2000).

On the other side of the coin, and politically, intervention in the market to overcome 'market failure' may be associated with the danger of 'government failure' (Self 1993). Centralised institutions are 'doomed to choose' and thus have the problem of 'picking winners', especially in the case of firm-specific measures. Furthermore, an effective use of the government funds is forced by increased financial constraints e.g. restricted state budgets and the cautious capital markets which led to increased political pressure. Thus, governments have tended to reduce their overall state aid levels whilst redirecting state aid resources to objectives that are clearly targeted at projects promising growth and welfare. This goes in line with the strategy of the EC which published in 2005 the socalled State Aid Action Plan (SAAP) that stresses the objective of 'less and better targeted state aid' (EU Commission 2005). Member states shall further consolidate their national industrial policies. The attitudes towards state aid were influenced by the Lisbon Agenda, with the Council of Ministers taking a growing interest in the scale and ef-

ficiency of government intervention, which is reflected in the objective of 'less aid, but better' (Wishlade 2006, p. 233). In this context, the former Commissioner Neelie Kroes stated 2009: "We need a better balance of aid. We need to ensure state aid is used effectively" (Kroes 2009).

Yet, this study aims to answer the question whether state aid paid to rescue and restructure companies is indeed used effectively and whether the initial aim why such aid has been paid has been reached, i.e. the survival of the company.

Econometric studies analyzing state aid are rare. So far, econometric literature has focused mainly on the analysis of EC decisions on state aid in order to identify the extent of state aid control (Brouwer and Ozbugday 2010), the factors influencing levels of state aid in different countries (Clements et al. 1998; Zahariadis 1997) or analyzing state aid to support new firms (Santarelli and Vivarelli 2002). More specific studies analyzing the effectiveness of R&R aid are rare. A sector specific study by Hakenes and Schnabel (2010) analyzes bailouts in the financial sector; Thompson (2005) investigates general firm survival in the shipbuilding industry. Other studies focus on country specific bailouts; e.g. Schweiger (2007) investigates the impact of rescue and restructuring aid on static and dynamic efficiency of the Slovenian economy and Murn et al. (2010) analyse the performance of R&R aid receiving companies in Slovenia. The only comparative EU studies known to the author are London Economics (2005) and Glowicka (2008). They analyzed whether firms that received aid between 1995 and 2003 survived and which variables might have influenced the probability to survive. Using both the same database they found "that almost 50% of the companies having received rescue aid did not survive while only 20% of the companies having received restructuring aid folded" (London Economics 2005, p. 14). However, their sample has been quite small (63 resp. 86 observations) which might have led to these results. In contrast, there is a variety of studies analyzing firm survival in general (for an overview see the meta analysis by Manjón-Antolín and Arauzo-Carod 2008).

This article adds to the literature in several ways: first, we empirically test the effectiveness of state aid for rescue and restructuring firms in difficulties. Second, in contrast to previous literature we compare our results with non-funded firms that are faced with similar difficulties. Third, in order to gain new insights we test which firm characteristics might influence the survival rates of supported firms.

Therefore we collected data on companies that received R&R aid, which has been approved by the European Commission between the year 2000 and 2010. We apply a survival analysis and investigate the survival rates of these companies up to 15 years after the aid has been paid. In addition, the results are compared with the survival rates of non-rescued companies that have been also in severe difficulties. The results suggest that funded firms have a higher survival probability than non-funded firms. Yet, despite this financial support business failure is still high in the group of funded firms and the market exit is often only post-poned. The highest survival rates have companies that get long-term support, enterprises in transition economies as well as small and new firms.

2 Theoretical background and hypotheses

The main economic justification for state aid is to enhance efficiency in order to optimise total welfare. Markets might be restricted in their efficiency, leading to market failures. Yet, governments can intervene in order to correct such markt failures, like externalities, asymmetric information or market power and coordination problems and in respect of public goods.

A very common example of positive externalities are R&D activities. Private companies face the difficulty to internalize the spillovers of R&D which leads to an underinvestment by private firms. Besides the microeconomic arguments public support might also be justified from a macroecomic perspective. Especially the endogenous growth theory has leveraged the understanding that spillover effects from R&D investments are essential for long term economic growth (Grossman and Helpman 1992, Romer 1986 and 1990). Thus, most governments provide public funds to support R&D activities (OECD 2010).

Additionally, public subsidies might be justified in the case of information asymmetries. Companies might face difficulties in acquiring loan capital as the information about the potential of the company to return a loan or on the risks of conducted projects (especially in the case of R&D projects) are unknown. Such information asymmetries between investors and companies create uncertainty that affects financing conditions and hence may complicate or even hinder investments (Czarnitzki and Hottenrott 2011). This restriction applies especially to small and medium-sized companies (SME) with limited equity and little reputation. Yet, SME's contribution to technological progress and thus economic growth through R&D activities has been found to be essential (Audretsch 2006).

In the case of industry or even firm specific aid additional arguments besides market failure justifications are needed (Oxera 2009). Since there is a cost of public funds, optimization of government resources may call for intervention in specific sectors in which externalities can have a larger impact on total welfare. First, bankruptcy of a large enterprise may lead to market power concentration and a possible reduction of total welfare. Second, in terms of restructuring firms, state aid smoothes the process of restructuring and therefore mitigates negative social externalities (Nitsche and Heidhues 2006). Third, agglomeration externalities might justify state aid measures for specific industries. Industrial policy may foster the creation of clusters by possibly subsidizing firms generating these externalities. A fourth possible justification for sector-specific aid lies in the market failure of imperfect competition, constituting the basis for strategic trade policy developed first by Brander and Spencer (1983). In an imperfect, oligopolistic market subsidising local companies will increase welfare of the subsidising state as the profit of foreign companies will be directed to the local company. The latter could

reduce costs and thus also prices. A classical example in a European context is the Airbus case, documented in Neven and Seabright (1995).

Besides these economic considerations which are based on efficiency justifications also social aspects may justify the provision of state aid. It is a fundamental aim of the European Union to promote economic prosperity and social cohesion throughout the entire territory of the Union. This can be achieved for example by training for employees in a specific industry in order to correct social inequlities (Rodrik 2004). Total welfare will be increased if the benefits in terms of social and cohesion goals outweigh the negative effects of distorting competition. Some forms of state aid involve a mix of efficiency and equity justifications. Regional aid presents such a mix.

Aside from economic and social justifications and on the other side of the coin, state aid in support of economic activity necessarily represents an intervention in the market and will generate effects on competition both within the country providing state aid and between the country and foreign economies. In addition, intervention in the market to overcome 'market failure' may be associated with the danger of 'government failure'. Governments may not have all the necessary information to determine which industries are capable of generating agglomeration effects (Gual and Jodar-Rosell 2006). Thus, the provision of state aid needs an effective control system in order to distinguish 'good' from 'bad' aid (Friederiszick et al. 2008).

2.1. State Aid Control in the European Union

Yet, since the enactment in 1958 the EC Treaty ever contained rules regulating industrial policies and the provision of state aid. The primary function of such a control is to ensure a free competition between enterprises from different member states on the Common market. The main provision of the Treaty defines:

'Save as otherwise provided in this Treaty, any aid granted by a Member State or through State resources in any form whatsoever which distorts or threatens to distort competition by favouring certain undertakings or the production of certain goods shall, insofar as it affects trade between Member States, be incompatible with the common market.' (Article 107 (1) Treaty on the Functioning of the European Union TFEU)

Thus, in general state aid is prohibited if the aid measure is granted through state resources and might distort competition in the internal market. However, Article 107 (2) TFEU and Article 107 (3) TFEU list the exemptions from the prohibition in order to balance competition and trade considerations against the wider objectives of the EU (e.g. economic and social cohesion). These two paragraphs build the foundation for several exemptions which are mainly codified in the Commission's soft law provisions, such as Regulations, Guidelines and Communications. One of these Guidelines deals with state aid granted in order to rescue or restructure ailing companies and was introduced in 1994.

Yet, European state aid control has a strict legal tradition. An economic assessment of state aid measures and their effects was not foreseen in the rather form-based analysis of state aid procedures. One reason might be 'the desire to limit political influence, rather than to focus on economic effectiveness' (Friederiszick et al. 2008, p.625). Another reason is the higer predictability of the outcomes of a form-based analysis. Yet, especially the 2004 Eastern enlargement and the Lisbon strategy strengthened the need to streamline European state aid policy. At least with the introduction of the State Aid Action Plan (SAAP) an economic analysis of state aid measures has found its way in European state aid control (for an overview see Friederiszick et al. 2008). The key elements of this reform package are 'less and better targeted state aid' which intends to reduce overall aid levels and turn the focus on aid measures which are better suited to increase total welfare, to pursue a refined economic approach in the assessment and to enhance the enforcement of state aid rules appliying more effective procedures, increased transparency and higher predictability (European Commission 2005). Subsequent to the launch of the SAAP the Commission has started its State Aid Modernisation (SAM), a comprehensive revision of its Guidelines and Regulations (European Commission 2012).

2.2 Guidelines on rescue and restructuring aid

From an economic perspective state aid in order to rescue or restructure companies in difficulties is among the most distortive types of state aid. In a market economy the exit of inefficient companies is a regular process, Schumpeter (1975) characterized this as process of creative destruction. The provision of state aid to rescue ailing companies prevents necessary market adjustments as inefficient companies are artificially kept in the market at the cost of competitive firms. Therefore, a deviation from the general principle of the prohibition of state aid as laid down in the Treaty should be limited (European Commission 2004). The conditions that allow for such an exemption have been adopted in 1994 when the European Commission published its original Community Guidelines on State aid for rescuing and restructuring firms in difficulty (European Commission 1994). These Guidelines have been modified in 1999 and 2004. Revising the Guidelines the Commission pursued the aim to tighten the requirements for R&R aid.

Yet, prior to an approval by the European Commission national procedures determine whether a company is eligible to receive state support. Bankruptcy laws vary enormously among member states. Therefore, bankruptcy laws significantly influence the outcome of a rescue and restructuring process and firms' survival rates (Davydenko and Franks 2008). Thus, the number of R&R cases notified to the European Commission can vary across member states. However, the preconditions for an approval of such state aid measures are determined in the R&R guidelines by the European Commission. Hence, all cases in the EU are subject to the same conditions. The most important facts are now explained in more detail.

First, the firm must qualify as a firm in difficulty. The European Commission does not provide an exact definition, yet typical indications are provided. In addition, a recently established firm, younger than three years may not receive R&R aid. Second, rescue aid serves only the short-term survival as it needs to be reimbursed within a period of not more than six months and needs to be restricted to the amount needed to keep the firm in business. Third, restructuring aid targets the long-term restructuring of the beneficiary. Therefore, a restructuring plan needs to be implemented that aims at the restoration of long-term viability. The aid needs to be limited to the minimum, the beneficiary has to provide an own contribution and compensatory measures have to be implemented to limit distortions of competition.

The Guidelines of 2004 tighten the requirements for restructuring aid: the one-time-last-time-principle has been strengthened, the necessary contribution of the beneficiary has been substantiated and compensatory measures have been extended. The one-time-last-time-principle was already determined in the Guidelines of 1994. Yet, in the past the Commission was quite generous with this provision and has approved several exemptions. In particular larger firms - like *Air France*[1] - have benefited from this liberality. In both cases new aid has been paid while the formal investigation was still going on. In another case - *Crédit Lyonnais*[2] - the Commission approved further restructuring aid, although the bank already received once rescue respectively restructuring aid in the past. A precondition for the compatibility with the Common Market has been the provision of comprehensive return services (Soltész and Marquier 2005). Similarly, *Fairchild Dornier*[3] received rescue aid twice. However, a concluding investigation of the second rescue package was redundant in that case as the company was at that time already liquidated and the investigation of the Commission groundless. Besides these repeated aid packages it is not unusual and also covered by the Guidelines to convert an initially granted rescue aid subsequent to the six-month-period into restructuring aid. The company has six months time to elaborate a restructuring plan and to find a private investor. Since the year 2000 22 firms received rescue aid which was converted after six month into restructuring aid.

Additionally, a positive decision by the Commission requires a substantial contribution by the private investor. Prior to the year 2004 the Commission disposed of a wide scope of discretion regarding the appropriate contribution. For example, *Philipp Holzmann* supplied 90% whereas *LTU* achieved only a contribution of 40% of total restructuring costs. Yet, the 2004 Guidelines specify this share. In general the Commission regards a contribution of 25% for small firms, 40% for medium-sized firms and 50% for large firms as sufficient. However, in unexceptional circumstances and in cases of hardship - which have to be proved by the supporting government – the Commission can accept

1 European Commission, decision from 27.07.1994, OJ EG 1994 No. L 254, pp. 73.

2 European Commission, decision from 20.05.1998, OJ 1998 No. L 221, pp. 28.

3 European Commission, decision from 7.05.2004, OJ EG 2004 No. L 357, pp. 36.

lower contributions. Certainly, such discretion increases the possibilities to exert influence by political stakeholders.

Summing up, the tightening of the R&R Guidelines shall increase the effectiveness of rescue and restructuring aid. The intended impact, to secure firm survival and subsequently a positive development of the beneficiary, shall be better ensured than under the old Guidelines. Besides, state aid control shall become more effective, as transparency and confirmability are increased.

Yet, this study aims to answer the question whether state aid paid to rescue and restructure companies is indeed used effectively and whether the initial aim – firm survival - has been reached.

3 Data and Hypotheses

The analysis is based on a unique dataset comprising firms in difficulties from the EU member states. There are two subsamples in this dataset. On the one hand it contains firms that received R&R aid which as been notified and approved by the European Commission in the years 2000 and 2010 in one of the EU member states. The other subsample comprises non-funded firms. As our dataset comprises funded and non-funded firms we are able to to analyse the effectiveness of state aid.

The primary source for information on these cases has been the European State Aid register, which provides several case documents (final decisions, letters to member states, press releases etc.).

Decisions that could not be included in the dataset comprise cases where the aid was approved but not being paid out and cases where the Commission found that the subsidy did not constitute aid. Furthermore, due to the economic crisis in 2008 and 2009 especially banks but also companies in other sectors received R&R aid based on separate rules which have been adopted in response to the economic crisis (European Commission 2009). However, the the reasons leading to the firms' difficulties were very distinct during the crisis and thus these cases have also been excluded. In addition, one case had to be dropped from the dataset as the company received rescue aid twice which is on the one hand not allowed according to the R&R Guidelines. On the other hand and in our case of even more relevance, we would have two events of aid in that case which would distort our analysis.[4] One firm has been omitted in the analysis since an exact date of closure could not be identified.

[4] As mentioned on page 10, further companies received rescue aid twice. However, the aid packages for *Air France* and *Crédit Lyonnais* have been approved prior to the year 2000. Hence, these two cases are not included in our sample.

The final dataset includes 190 different companies that applied either rescue or restructuring aid. Thereof the Commission approved R&R aid in 141 cases, whereas it denied such aid in 49 cases (see Table 1).

Table 1:
Decisions by the EC regarding R&R aid between 2000 and 2010

	Total	Bankrupt	Survival
Positive Decisions	141 *(74%)*	44 *(31%)*	97 *(69%)*
Negative Decisions	49 *(26%)*	29 *(59%)*	20 *(41%)*
All Decisions	**190** ***(100%)***	**73** ***(38%)***	**117 (*62%)**

Source: State Aid Register, Amadeus database, firm websites, own calculations.

For each company in the data set, it was identified whether the company was still active or whether it has failed. The reference date has been the 30/11/2012. Information on the current status of the companies (survival, bankruptcy) was compiled via company information (company websites, press releases, annual reports) and in particular the Amadeus database. Yet, a clear definition of firm failure does not exist in the literature and authors use several terms to describe it: organization mortality, organizational death, exit, bankruptcy, decline, retrenchment, downsizing, liquidation and failure (Mellahi and Wilkinson 2004). With respect to our research question, the survival of firms having received state aid for rescue and restructuring, we define failure if the following criteria are fulfilled:

- The firm went bankrupt. This includes the liquidation of the company: the sale of assets, firm name, brand name.
- The company was sold and the main production site in the aid providing country was closed. The majority of the employees was released and production has ceased or transferred abroad. Hence, the social effect of the aid to save employment in a specific area is undermined.

In contrast, the success of aid receiving companies is specified in our study as follows:

- The status, name and production site are unchanged.
- The company has been sold in large parts to a new investor. Yet, even though take-overs and mergers are sometimes treated as firm deaths (Dunne and Hughes 1994) we treat them as continuous (like Harhoff et al. 1998) as not the ownership is essential but the preservation of workplaces. Thus, in our study a firm has survived if at least 50% of employment remains at this location. If the company has been renamed, privatised or nationalised is also innocuous.

In sum, failure has generally negative consequences for a company and its region. However, we take not into consideration the causes of failure, which can be both organizational or environmental factors (Mellahi and Wilkinson 2004).

Applying these criteria to our sample of 190 companies 117 firms have survived and 73 have failed to exist on the reference date (30.11.2012). Table 1 shows that firms having received R&R aid after a positive decision, have survived more often than firms that did not receive R&R aid as the Commission came to a negative decision. This result is in line with our assumption: if the R&R Guidelines are effective firms not fulfilling the conditions of the Guidelines and thus receiving a negative decision should fail to survive more often than firms fulfilling the conditions of the Guidelines and hence receiving the financial aid. Thus, we formulate our first hypothesis as follows:

H1: The share of firm survival is higher for firms with a positive Commission decision than for firms in similar difficulties but with a negative Commission decision.

The survival of rescued and restructured firms depends on a variety of characteristics. Therefore, in a second step, we analyze whether firms that have survived differ in their characteristics from those that have failed. Therefore, we analyzed in more detail whether several internal (firm-specific) and external factors (related to the environment of the firm) influenced the probability to survive in the group of firms with a positive Commission decision (141 cases). According to the literature the most relevant internal factors are the age and size of the company and the company's ownership. External factors that we included in our analysis are the type of aid, the conditions of the R&R Guidelines, the company's country of origin with its economic background and the industry the company is active in.

3.1. External Factors

The type of aid the ailing company has received might influence the probability to survive. Whereas rescue aid aims at short-term survival, no restructuring plan is needed, restructuring aid is intended to support companies in the long-run, with a substantial restructuring plan and a sufficient contribution by the private investor. Table 2 shows that in the case of a positive decision rescue cases have a higher failure rate than restructuring cases (49% compared to 20%).

Yet, the higher failure rate of firms receiving just rescue aid is not surprising and goes in line with the findings of previous studies conducted by London Economics (2005) and Glowicka (2008). Using both the same database they found "that almost 50% of the companies having received rescue State aid did not survive while only 20% of the companies having received restructuring aid folded" (London Economics 2005, p. 14). Thus we hypothesize:

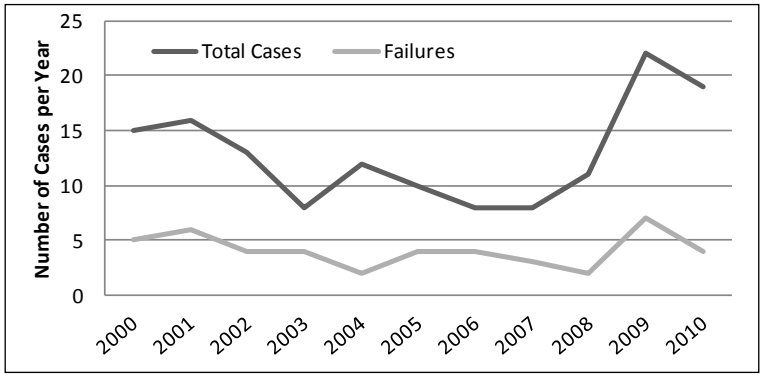
Table 2:
Decisions by the EC regarding R&R aid between 2000 and 2010

	All Decisions		Positive Decisions		Negative Decisions	
	Total	Bankrupt	Total	Bankrupt	Total	Bankrupt
Rescue Aid	59 *(31%)*	27 *(46%)*	53 *(38%)*	26 (*49%*)	6 *(12%)*	1 *(17%)*
Restructuring	106 *(56%)*	39 *(37%)*	66 *(47%)*	13 (*20%*)	40 *(82%)*	26 *(65%)*
Both	25 *(13%)*	7 *(28%)*	22 *(15%)*	5 (*23%*)	3 *(6%)*	2 *(67%)*
Total	**190** ***(100%)***	**73** ***(38%)***	**141 (*100%)***	**44 (*31%*)**	**49** ***(100%)***	**29** ***(59%)***

Source: State Aid Register, Amadeus database, firm websites, own calculations.

H2: Firms receiving restructuring aid have a higher possibility to survive than firms that received only rescue aid.

Figure 1:
Cases per year and associated failures



Source: State Aid Register, Amadeus database, firm websites, own calculations.

The number of cases per year varies in our sample from eight up to 22 cases per year (Figure 1). We allocated the cases according to the date when the beneficiary received the aid, instead of the date of notification as for the company and its further development the aid is decisive not the notification. The latter can take place either prior to the payment as usually member states have to apply for an approval. However, it also occurs that the required notification has been disregarded by the Member State and the Commission became aware of the aid only after the payment was done. The number of failures per year varies in our sample from two up to seven failures. Whereas the number of total cases is highest in 2009 the number of failures is relatively constant over the years.

Depending on the date of notification the cases were assessed according to the valid Guidelines. In our sample 18 cases were judged on the basis of the R&R Guidelines of 1994, 44 cases according to the Guidelines of 1999 and 79 cases were evaluated on the basis of the current Guidelines released in 2004 (Table 3). As outlined above the R&R Guidelines were tightened in 2004. Thus we further hypothezise:

H3: Firms that received rescue or restructuring aid, which has been approved according to the 2004 Guidelines have a higher likelihood to survive than firms where the aid was judged according to the 1999 Guidelines.

Table 3:
Relevant R&R Guidelines

	No. of Cases	Survival	Bankrupt
1994	18 *(13%)*	12 *(66%)*	6 (*33%*)
1999	44 *(31%)*	28 *(62%)*	16 (*36%*)
2004	79 *(56%)*	57 *(72%)*	22 (*28%*)
Total	141 *(100%)*	97 (*69%*)	44 (*31%*)

Source: State Aid Register, Amadeus database, firm websites, own calculations.

The majority of cases is related to firms active in the manufacturing industry (86 cases). Other frequent sectors have been: transport (17), services (13) and agriculture (10 cases). Due to the small sample size we divided the sample in two sub-samples: manufacturing (86 cases) and non-manufacturing (55 cases) industry. Firms active in high-tech industries are found to have higher failure rates than those active in more traditional industries and sectors (Audretsch 1995, Agarwal and Audretsch 2001). Thus, we hypothezise:

H4: Firms in the manufacturing industry have lower survival rates than firms active in other sectors than manufacturing.

Besides the distribution among industrial sectors also the distribution among member states is inhomogenuous. The majority of cases affected firms in Germany (48 cases), followed by Poland (27 cases) and Italy (22 cases). In contrast 11 member states do not appear in the sample. Yet, several studies investigated whether exit dynamics differ between firms in a transition and in a comparable stable market environment. Comparing failures among new firms in East and West Germany Prantl (2003) came to the conclusion that liquidations after bankruptcy filings are higher for East German firms. She argues that this might be a result of different industry structures and more difficult conditions on the labor and the capital market. Thus, we formulate our final hypothesis on external factors as follows:

H5: Firms from Western Europe have a higher survival rate than firms situated in a transition economy.

3.2. Internal Factors

Furthermore, 98 firms are private entitites whereas 43 firms are state owned on the date the aid was paid. Whereas 65 % of all private beneficiaries survived, among the group of state owned firms 77% surived. Studies examining the ownership status mainly focus

on the distinction between foreign or domestic firms, single or multiplant firms or the different legal forms of firms. A study that distinguishs between state owned and private firms has been conducted by (Li et al. 2005). Analyzing firms in a Chinese Science Park, they found that state owned firms are less likely to exit than private firms and with respect to the rescue of ailing companies they found that financial distress has a smaller negative effect on the survival of state-owned firms. Thus, we hypothesize:

H6: State-owned firms have a higher probability to survive than private firms.

The size of the supported firms varies in our sample from 10 employees to firms with more than 100.000 employees. In average the beneficiaries employ 4.073 people. The classified distribution of firms in our sample is displayed in table 4.

Table 4:
Classification of beneficiaries according to the number of employees

	No. of Cases	Survival	Bankrupt
< 50	25 *(18%)*	20 *(80%)*	5 (*20%*)
50 - 249	29 *(21%)*	19 *(66%)*	10 (*34%*)
250 - 499	28 *(20%)*	21 *(75%)*	7 (*25%*)
500-2.499	29 *(21%)*	18 *(62%)*	11 *(38%)*
≥ 2.500	30 *(21%)*	19 *(63%)*	11 *(37%)*
Total	141 *(100%)*	97 (*69%*)	44 (*31%*)

* rounding differences

Source: State Aid Register, Amadeus database, firm websites, own calculations.

The main justifications for R&R aid are social and regional considerations. Yet, the impact of a firm's bankruptcy on employment in a structurally lagging region is higher if a large company fails than for smaller companies. Thus, it is more likely that larger firms receive public support than smaller firms. In addition, the financial means will be higher for larger firms leading probably to a higher survival ratio for that group. In addition, numerous studies have found that larger firms have lower hazard rates than smaller firms (Manjón-Antolín and Arauzo-Carod 2008; Disney et al. 2003; Thompson 2005). The fact that smaller firms have a higher failure risk is known as "*liability of smallness*" (Hannan and Freeman 1984). Thus, we hypothesize in more detail:

H7: Larger firms have a higher possibility to receive R&R aid than smaller firms. Larger firms will have a higher survival rate than smaller firms.

The R&R guidelines specify that firms younger than three years are not eligible for R&R aid. Yet, in our sample 24% of all beneficiaries are less than ten years active whereas 40% of all firms are more than 50 years active (table 5). The survival rate is highest for firms older than 100 years, and lowest for firms younger than 10 years.

Table 5:
Classification of beneficiaries according to the company's age

	No. of Cases	Survival	Bankrupt
≤ 10	33 *(23%)*	20 *(61%)*	13 (*39%*)
11 - 25	22 *(16%)*	13 *(59%)*	9 (*41%*)
26 - 50	30 *(21%)*	20 *(67%)*	10 (*33%*)
51-100	37 *(26%)*	29 *(78%)*	8 *(22%)*
≥ 100	19 *(13%)*	15 *(79%)*	4 *(21%)*
Total	141 *(100%)*	97 (*69%*)	44 (*31%*)

* rounding differences

Source: State Aid Register, Amadeus database, firm websites, own calculations.

These results are confirmed by several investigations analyzing the influence of firm age on firm survival. The majority of studies found that older firms have lower hzard rates whereas younger firms have higher hazard rates, also known as "*liability of newness*" (Stinchcombe 1965; Freeman et al. 1983; Harhoff et al. 1998). The argument behind this theory: smaller firms have less experience and resources and thus have to learn routines and efficient management strategies whereas older firms have established structures and often the financial means (Mellahi and Wilkinson 2004). With respect to our sample we expect a lower hazard rate for older firms and hypothesize:

H8: Mature firms have a higher survival rate than younger firms.

Table 6:
Average Amount of State Aid

	n	State Aid *(∅ in million Euros)*	State Aid/Employee *(∅ in Euros)*
Private Firms	98	211	140,000
State Owned	43	590	63,000
SME (<500)	82	13	76,000
Large Firms (> 500)	60	757	84,000
Young Firms (< 50 years)	85	445	118,000
Mature Firms (> 50 years)	57	145	36,000
Total	141	330	83,938

* rounding differences

Source: State Aid Register, Amadeus database, firm websites, own calculations.

In sum, the 141 supported firms received more than 46 billion Euros of state aid from their governments (table 6). In relation to the employees this figure implies that every employee received aid amounting to nearly 84,000 Euros. On average firms received 329.8 million Euro public support, yet the median accounts for only six million Euros, meaning that a number of firms received very large aid packages.

H9: Firms receiving a higher amount of R&R aid per employee have a higher survival rate than firms receiving a lower amount of R&R aid.

4 Methodology and Empirical Results

As outlined above, econometric studies analyzing state aid are rare. Furthermore, there are only a few studies assessing the effects of R&R aid and investigating the survival rates of aid receiving companies. In contrast, there is a variety of studies analyzing firm survival of new businesses (Stinchcombe 1965, Hannan and Freeman 1984). A common approach to assess new-firm survival empirically is the survival analysis (Cleves et al. 2004). As it is the main objective of this paper to shed light on the effectiveness of R&R aid and thus to asses the survival probability of funded firms we apply the statistical methods of the survival analysis. We are thus not restricted to a simple survival / failure result but are able to consider the duration of survival, to account for censoring and to allow for a variety of other variables that might influence the market exit.

The dependent variable in this analysis is the time that elapsed from the point when aid was awarded until the firm exited the market. A firms' probability of surviving beyond a certain point of time *t* (measured in years since the aid was paid) is reported by the survivor function *S(t)*, with $0 \leq S(t) \leq 1$ and with *T* as a non-negative random variable representing the waiting time until the occurrence of an event. T has a probability density function f(t) and a cumulative distribution function F(t) = P (T > t), giving the probability that the event has occurred by duration t:

$$S(t) = 1 - F(t) = P(T > t) \tag{1}$$

This period can either be fully observed or is right-censored (the firms exist until the end of the observation period and do not experience the 'event' (failure)). *S(t)*is estimated by the non-parametric Kaplan-Meier estimator (Kaplan and Meier 1958), where n_j is the number of firms at risk at time t_j and d_j the number of failures at t_j:

$$\hat{S}(t) = \prod_{j \mid t_j \leq t} \left((n_j - d_j)/n_j \right) \tag{2}$$

For the analysis of the development of failure risk over time, hazard rates *h(t)* can be considered additionally. In our setting, the hazard rate is defined as the firms' probabil-

ity that a market exit occurs in a given interval [t, $t+\Delta t$] (the year after state aid was paid), under the condition of having survived until the beginning of that interval:

$$h(t) = \lim_{\Delta t \to 0} \frac{P(t \le T < t + \Delta t \mid T \ge t)}{\Delta t} \tag{3}$$

4.1 Empirical Results

4.1.1 Survival Rates

This first sub-section presents empirical results of exit dynamics using a duration analysis framework. Given the underlying definition of firm closure as specified in section 3, Table 7 gives the Kaplan-Meier estimates of the survivor function (Survival), the number of firms at risk (Risk), the number of firm closures (Deaths) and the hazard rates (Hazard). Additionally, Figure 2 provides the graphical representation of both survival curves and hazard rates for 'Rescued firms' and 'Control group' firms. As mentioned in section 3, the survivor function shows the probability of surviving the observation period, whereas the hazard rate specifies the risk of firm closure. Analysis time as well as graphical representation is restricted to ten years, because of a decreasing number of observations in the time intervals with simultaneously increasing observation time. It has to be noted that the payment of state aid as well as firm closure have been observed exact to a day.

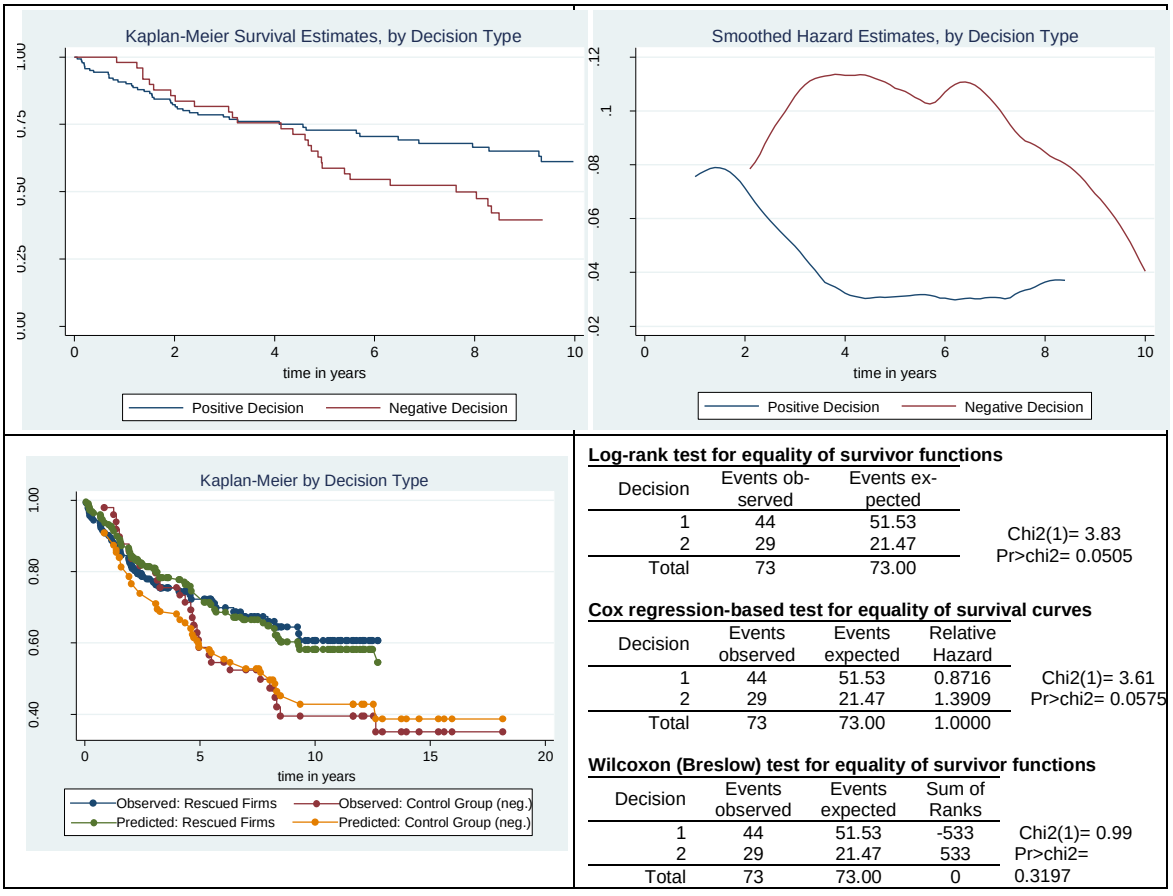
Table 7:
Life table for 'Rescued' firms versus 'Control group' firms

Years since aid was paid	Rescued Firms (n=141)			Control Group (n=49)		
	Risk/Deaths	Survival	Hazard	Risk/Deaths	Survival	Hazard
Up to 1 year	141/13	0.9078	0.0967	49/1	0.9796	0.0206
1 to 2 years	128/12	0.8227	0.0984	48/6	0.8571	0.1333
2 to 3 years	116/6	0.7772	0.0569	42/2	0.8163	0.0488
3 to 4 years	95/2	0.7593	0.0233	40/3	0.7543	0.0789
4 to 5 years	77/3	0.7281	0.0420	36/8	0.5867	0.2500
5 to 6 years	66/2	0.7052	0.0320	28/2	0.5448	0.0741
6 to 7 years	59/2	0.6800	0.0364	26/1	0.5230	0.0408
7 to 8 years	51/1	0.6661	0.0206	23/1	0.4992	0.0465
8 to 9 years	46/1	0.6499	0.0247	20/4	0.3968	0.2286
9 to 10 years	35/2	0.6099	0.0635	15/0	0.3968	0.0000

Source: Author's calculation (using STATA 12).

First, the ‘rescued firms’ have the highest hazard rates in the first two years after the aid has been paid. In comparison, Glowicka (2008) and London Economics (2005) found the highest hazard rate in the fourth year after the aid has been paid. In our sample, the hazard rate decreases continuously from year to year. Thus, if firms survive the first two years after the payment, they have good chances to survive in the long run. Yet, the sample of Glowicka (2008) and London Economics (2005) contains 86 companies that received rescue or restructuring aid between 1995 and 2003. The observation period ended in 2003. Thus, our sample is not only larger (141 cases) we also extended the observation period. For every cases we have at least two years time elapsed after the aid has been paid out.

Figure 2:
Survival and Hazard Rates



Log-rank test for equality of survivor functions

Decision	Events observed	Events expected
1	44	51.53
2	29	21.47
Total	73	73.00

Chi2(1)= 3.83
Pr>chi2= 0.0505

Cox regression-based test for equality of survival curves

Decision	Events observed	Events expected	Relative Hazard
1	44	51.53	0.8716
2	29	21.47	1.3909
Total	73	73.00	1.0000

Chi2(1)= 3.61
Pr>chi2= 0.0575

Wilcoxon (Breslow) test for equality of survivor functions

Decision	Events observed	Events expected	Sum of Ranks
1	44	51.53	-533
2	29	21.47	533
Total	73	73.00	0

Chi2(1)= 0.99
Pr>chi2= 0.3197

Source: Author’s calculation (using STATA 12).

The control group, comprising non-funded firms in difficulties, has the highest hazard rate in the fifth year after the aid has been paid. There is no evidence for a decreasing hazard rate in this sample. However, due to the small sample size of non-rescued firms (n=49) this result has to be taken with caution. As the test statistics show, the difference in the hazard rates between the two subsamples of funded and non-funded firms is statistically significant at the 0.1 level for 2 tests (the log-rank and the Cox regression test), but is statistically insignificant for the Wilcoxon test. Thus, these test statistics indicate

that firms which received R&R aid tend to have a higher probability to survive than firms in comparable difficulties were the Commission denied the payment of aid.

4.1.2 Firm Characteristics

The second sub-section aims to analyse a variety of firm characteristics, which might influence the possibility to survive. According to our hypotheses set up in section 3 the following internal and external factors are analysed in more detail:

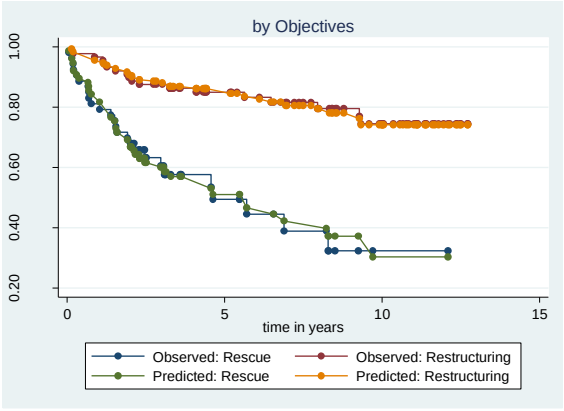
Table 8:
Explanatory Variables

Variables	Explanation and Values
Objectives	Rescued Firms (1); Restructured Firms (2)
State Owned	State Owned Firms (1); Private Firms (0)
Transition	Central and Eastern European Countries of the EU and Eastern Germany (1), Western Europe (0)
Guidelines	New Guidelines = 2004; Old Guidelines = 1994, 1999
Industry	Manufacturing (1), other industries (0)
*Age**	The sample has been splitted into two groups along the median value, firms younger than 40 yours (0); firms older than 40 years (1)
*Size**	The sample has been splitted into two groups along the median value, firms with less than 410 employees (0); firms with more than 410 employees (1)
*Aid**	Aid per employee. The sample has been splitted into two groups along the median value, firms with less than 20,000 Euro/employee (0); more than 20,000 Euro (1)

* The variables Age, Size and Aid have been splitted into two equal subsamples.

The analysis shows that the variables *objective, transition*, *size* and *age* indicate a statistical significant difference for the probability to survive in our sample. Table 8 shows the Kaplan-Meier survival curves for these variables, giving a good impression of the survival probability for each subgroup. First, with respect to the objective the aid has been given for, Table 9 shows, that firms with a long-term restructuring plan have a higher chance to survive than firms that received rescue aid for a short-term period.

Table 9:
Kaplan-Meier Survival Curves



Log-rank test for equality of survivor functions

Objectives	Events observed	Events expected
1	26	12.34
2	18	31.66
Total	44	44.00

Chi2(1)= 21.84
Pr>chi2= 0.0000

Cox regression-based test for equality of survival curves

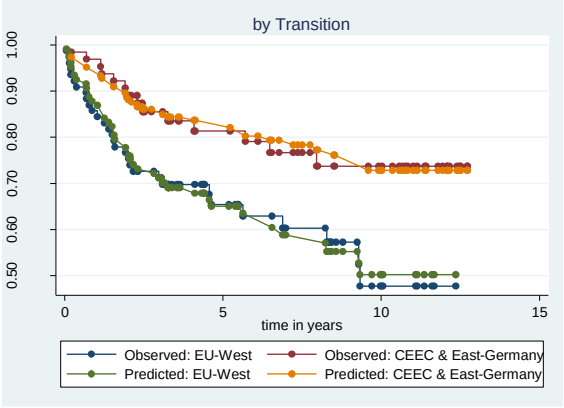
Objectives	Events observed	Events expected	Relative Hazard
1	26	12.34	2.7089
2	18	31.66	0.6780
Total	44	44.00	1.0000

Chi2(1)= 19.37
Pr>chi2= 0.0000

Wilcoxon (Breslow) test for equality of survivor functions

Objectives	Events observed	Events expected	Sum of Ranks
1	26	12.34	1462
2	18	31.66	-1462
Total	44	44.00	0

Chi2(1)= 18.45
Pr>chi2= 0.0000



Log-rank test for equality of survivor functions

Transition	Events observed	Events expected
0	30	21.92
1	14	22.08
Total	44	44.00

Chi2(1)= 5.98
Pr>chi2= 0.0144

Cox regression-based test for equality of survival curves

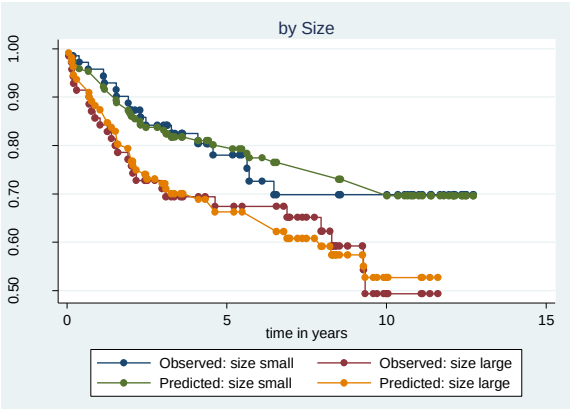
Transition	Events observed	Events expected	Relative Hazard
0	30	21.92	1.4762
1	14	22.08	0.6793
Total	44	44.00	1.0000

Chi2(1)= 6.12
Pr>chi2= 0.0133

Wilcoxon (Breslow) test for equality of survivor functions

Transition	Events observed	Events expected	Sum of Ranks
0	30	21.92	858
1	14	22.08	-858
Total	44	44.00	0

Chi2(1)= 5.50
Pr>chi2= 0.0191



Log-rank test for equality of survivor functions

Size_median	Events observed	Events expected
Small (0)	17	23.15
Large (1)	27	20.85
Total	44	44.00

Chi2(1)= 3.47
Pr>chi2= 0.0624

Cox regression-based test for equality of survival curves

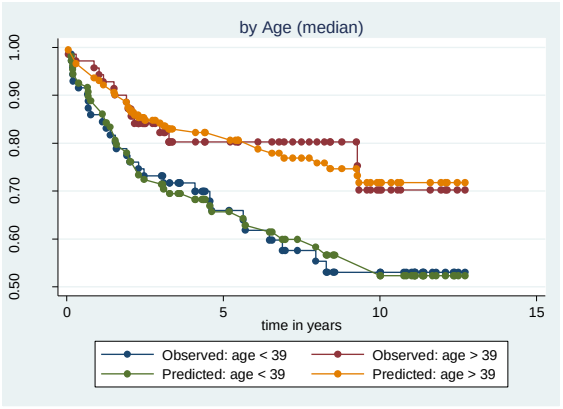
Size_ median	Events observed	Events expected	Relative Hazard
Small (0)	17	23.15	0.7630
Large (1)	27	20.85	1.3504
Total	44	44.00	1.0000

Chi2(1)= 3.48
Pr>chi2= 0.0620

Wilcoxon (Breslow) test for equality of survivor functions

Size_ median	Events observed	Events expected	Sum of Ranks
Small (0)	17	23.15	-685
Large (1)	27	20.85	685
Total	44	44.00	0

Chi2(1)= 3.50
Pr>chi2= 0.0612



Log-rank test for equality of survivor functions

Agemedian	Events observed	Events expected
Age < 39 (0)	29	21.92
Age > 39 (1)	12	22.08
Total	44	44.00

Chi2(1)= 4.57
Pr>chi2= 0.0325

Cox regression-based test for equality of survival curves

Age_ median	Events observed	Events expected	Relative Hazard
0	29	21.92	1.3983
1	16	22.08	0.7169
Total	44	44.00	1.0000

Chi2(1)= 4.65
Pr>chi2= 0.0311

Wilcoxon (Breslow) test for equality of survivor functions

Age_ median	Events observed	Events expected	Sum of Ranks
0	29	21.92	746
1	16	22.08	-746
Total	44	44.00	0

Chi2(1)= 4.15
Pr>chi2= 0.0417

Source: Author's calculation (using STATA 12).

This result goes in line with our hypothesis *H2* and with the findings of London Economics (2005) and Glowicka (2008). Applying a parametric estimation of the hazard rate, Glowicka (2008) found that firms receiving restructuring aid have a 10 percent lower probability to go bankrupt than firms that received rescue aid. Besides, the conditions necessary to receive restructuring aid are stricter than these for rescue aid, a detailed restructuring plan is needed, the owner has to pay a sufficient contribution, the aid needs to be limited to the minimum and compensatory measures have to be implemented.

The second external factor with a statistical significant result has been the economic background of the company's country of origin. Contrary to our hypothesis (*H5*) it is not the firms from Western Europe but those located in CEECs or in East-Germany that have a higher probability to survive. Though our hypothesis needs to be rejected. Yet, whereas the study of Prantl (2003), which found evidence for a higher survival rate for firms with no transition background, compared only firms from East and West Germany, our sample includes also firms from Eastern Europe. One reason explaining the higher survival rates in CEECs and East Germany might be the longer tradition of state support and the higher overall level of state support, which goes far beyond R&R aid (an overview gives Hölscher et al. 2010). Moreover, as Hoshi et al. (2007) found, the general direction in some of the CEECs (those that are also represented in our sample of R&R cases) regarding the composition of state support has not changed fundamentally since accession to the EU.

Third, the size of the company had a statistically significant effect at the 10% level on the survival rate. In our sample, smaller firms tend to have a higher chance to survive than larger firms, which would be in contrast to the sociological ecology literature with its assumption of the "*liability of smallness*" (Stinchcombe 1965; Freeman et al. 1983) and our hypothesis *H7*. Yet, another argument might be the socalled *structural inertia* (Hannan and Freeman 1984). Firms that are faced with severe difficulties as it is the case for our sample of firms receiving R&R aid have to adjust their structures, regardless whether a changing environment or internal processes led to the difficulties. Yet,

such necessary adjustment and learning processes are often implemented much faster in smaller organizations than in larger ones. Hannan and Freeman (1984) argued that even though small organizations are more likely to attempt change they are also more likely to die in that process, as they do not have the financial resources whereas larger organizations have a higher capacity to withstand external shocks. The better adaption to a changing environment seems to be the case in our sample; smaller firms probably adjusted their structures faster, leading in our sample to a lower failure rate than larger firms. Financial distress was a problem all firms had to cope with, yet, governmental support in the form of state aid was provided to all firms in our sample.

Finally, the age of the company had a statistically significant impact on the survival rate in our sample. Hence, our hypothesis that mature firms have a higher survival rate was confirmed whereas younger firms have a higher probability to go bankrupt. This result goes in line with several studies analyzing the impact of firm age on survival rates (Stinchcombe 1965; Freeman et al. 1983; Harhoff et al. 1998). The higher hazard rate for younger firms, also known as "*liability of newness*", might be a result of less experience and less financial resources younger firms are faced with. However, if firms that enter the market get financial support firm survival takes the form of a U-shape, very young firms and mature firms have higher survival rates wheres firms in their "adolescence" (the first years after market entry are over, but firms are not established and mature yet) have a lower probability to survive (Mellahi and Wilkinson 2004). This concept also known as "*liability of adolescence*" (Brüderl and Schüssler 1990) cannot be applied to our sample, as firms are not eligible to receive R&R aid in their first three years after foundation. Besides, funding to support market entry often covers the first three years, and has been not relevant to our sample.

Yet, the other variables did not show any statistical significant difference in the survival rates. Thus, we could not find evidence that the new R&R Guidelines published in 2004 provide stricter rules leading to a higher survival probability of funded firms. In addition, the ownership, the industry and the height of the aid did not show any significant influence on the risk to go bankrupt.

However, these results do not illustrate whether the public resources that were invested in the ailing companies was the best solution in terms of the allocation of resources. In that respect, Schweiger (2007) found in a study analyzing R&R aid to Slovenian manufacturing firms, that the R&R aid hindered the efficient allocation of resources. Even though none of the rescued firms exited the market the aid did not have a positive impact on productivity and thus Schweiger concludes, the aid was distortive and resources could have been used better. Thus, the intervention by the state can be described as 'government failure' (Self 1993).

5 Conclusions, Limitations and Further Research

This paper provided insights on the effectiveness of rescue and restructuring aid in the European Union. In the period under observation (2000-2010) member states paid more than 46 billion Euro in order to prevent bankruptcies and to maintain workplaces. Public support is often justified on the basis of market failure. However, state aid in particular aid not available to all companies but which supports only a few is most distortive. In times of restricted state budgets and with repsect to the notion of 'government failure' an effective use of state aid paid to rescue and restructure companies in difficulties is indispensable.

In order to analyse the effectiveness of such financial means a sample of 190 firms supported by 16 different member states has been investigated in terms of survival and hazard estimates as well as firm characteristics which might influence the probability to survive.

However, one must be careful when drawing policy conclusions on the basis of an empirical analysis using such a heterogeneous sample covering different EU members with different R&R policies. Thus, any policy lesson should be confirmed by more detailed, country-level investigations and case studies. However, overall, the study found that firms which received R&R aid seem to have a higher probability to survive than firms in comparable difficulties were the Commission denied the payment of aid. Yet, the governmental support was in that respect effective as supported firms seem to have a higher probability to survive than firms were such support has been denied. The study has also shown that long-term restructuring; a transition background and older firms have a higher probability to survive after having received state aid than their counterparts. Smaller firms tend to have a higher chance to survive than larger firms, yet the statistical evidence is not as strong as for the other variables.

However, due to our quite small sample size these results have to be taken with caution and should be further investigated by more detailed country-level investigations. A common approach in evaluation studies has become the matching of a treatment group with a control group. In this paper, such a statistical matching of rescued firms with non-rescued firms was not possible as the control group of ailing firms applying for R&R aid has been to small. At country level, such an analysis can be possible through specific databases providing detailed financial data of the firms. Such an analysison a European level fails due to different data sets. Another limitation of our investigation is the question of unobserved heterogeneity. Not all relevant covariates can be included in the specification of our model, as they are simply unobservable. E.g. the quality of managers is an unobservable firm-specific characteristic that may affect firm survival (Manjón-Antolín and Arauzo-Carod 2008).

Finally, further research should not only take into account the survival of the supported firms but also their economic development with regard to figures on employment and turnover in the long run. Restructuring and adjusting structures improves the competitiveness of companies and enhances the chance of survival in the long-run.

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