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Ela Glowicka

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Wissenschaftszentrum Berlin für Sozialforschung gGmbH,
Reichpietschufer 50, 10785 Berlin, Germany, Tel. (030) 2 54 91 – 0
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ABSTRACT

Effectiveness of Bailouts in the EU*

by Ela Glowicka

Governments in the EU frequently bail out firms in distress by granting state aid. I use data from 86 cases during the years 1995-2003 to examine two issues: the impact of bailouts on bankruptcy probability and the determinants of bailout policy. I have three main results. First, the estimated discrete-time hazard rate increases during the first four years after the subsidy and drops after that, suggesting that some bailouts only delayed exit instead of preventing it. The number of failing bailouts could be reduced if European control was tougher. Second, governments' bailout decisions favored public firms, even though public firms did not outperform private ones in the survival chances. Third, subsidy choice is an endogenous variable in the analysis of the hazard rate. Treating it as exogenous underestimates its impact on the bankruptcy probability.

Keywords: State aid; European Union; Discrete-time hazard; Bivariate probit

JEL Classification: K2; G3; L5

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ZUSAMMENFASSUNG

Die Wirksamkeit von Beihilfe in der EU

Europäische Unternehmen, die in Schwierigkeiten geraten sind, werden regelmäßig von den Regierungen in der EU durch Rettungs- und Restrukturierungsbeihilfen (R&R-Beihilfen) unterstützt. Im vorliegenden Paper werden 86 von der Europäischen Kommission überprüfte Fälle von R&R-Beihilfen zwischen 1995 und 2003 herangezogen, um zwei Probleme zu untersuchen: die Auswirkung von R&R-Beihilfen auf die Bankrotthäufigkeit und die bestimmenden Faktoren für Subventionspolitik der Regierungen.

Dabei kommt die Studie zu drei Ergebnissen. Es zeigt sich, dass sich die geschätzte Bankrottwahrscheinlichkeit während der ersten vier Jahre nach der Beihilfe erhöht und danach sinkt. Dies deutet darauf hin, dass einige Beihilfen den Marktaustritt nur verzögern, anstatt ihn zu verhindern. Die Zahl der Firmen, die erfolglos Beihilfe bekommen, könnte durch eine strengere europäische Beihilfekontrolle verringert werden. Das zweite Ergebnis besagt, dass die Regierungen bei der Beihilfevergabe staatliche Unternehmen bevorzugt haben, obwohl staatliche Unternehmen gegenüber den privaten keine bessere Überlebenswahrscheinlichkeit haben. Drittens ist die Beihilfewahl eine endogene Variable in der Analyse der Bankrottwahrscheinlichkeit. Sie als exogen zu behandeln bedeutet, ihre Auswirkung auf die Bankrottwahrscheinlichkeit zu unterschätzen.

1 Introduction

The objective of this paper is to investigate the effectiveness of bailouts in the European Union (EU). Bailouts in the EU are pursued by governments in order to save endangered jobs, support development in certain regions, or promote a certain type of economic activity. Such subsidies also have an impact on competition in the European common market, therefore the European Commission strictly controls them: whenever a government wants to bail out a firm, it must get an approval from the Commission. I examine the effectiveness of bailouts in maintaining survival of firms in distress and I assess European bailout control from this perspective. I also provide empirical evidence on the criteria used by governments in their bailout decisions.

The reasons why some governments bail out are often of political nature. Helping a firm in trouble draws media attention and voters' sympathy, as in the case of Germany's chancellor, Gerhard Schröder, who gained on political support after bailing out the construction firm Philipp Holzmann.[1] Governments may also lack commitment to a hard no-bailout policy, creating soft-budget constraints for firms. This is particularly likely in the case of public firms (Maskin and Xu (2001)). Potentially, there are also economic reasons for bailouts. If a failing firm is a monopolist in providing statewide services necessary for economic activities, e.g. railways, a bailout may be needed to avoid a large negative externality on the whole economy (Segal (1998)). A bailout might also be a part of the strategic trade policy with the aim of increasing the market power of domestic firms, at the cost of competing firms from other countries (Głowicka (2005)). Finally, if the bankruptcy results in many lost jobs in a region with high unemployment, a bailout might be socially justified.

Bailouts are frequently undertaken by EU governments and paid with taxes. Between 1992 and 2003, 79 firms in difficulty were supported by European governments with the aid often expressed in billions of euros.[2] Governments support firms for a short period of time to help them work out the plan of further action (rescue subsidy) or they subsidize the restructuring process in the firm (restructuring aid). Every bailout decision must be notified to the European Commission. This is required, because a bailout is a highly selective subsidy: its recipient is one specific inefficient firm, which cannot stay in the market without public support. This kind of aid is likely to distort competition, since it acts directly against competitive forces, which led to the risk of exit. In this

[1] A good illustration of the perception of this decision is a title page of Tageszeitung on the day after the bailout decision, Nov. 26, 1999: "Holzmann bails out Schröder" ("Holzmann saniert Schröder"), suggesting that it was actually Schröder's political career which was bailed out.

[2] For example, in 2002 Bankgesellschaft Berlin AG received EUR 9,7 bn rescue and restructuring aid, while the total aid, less agriculture and railways, granted by 15 EU member states amounted to EUR 49 bn.

way, countries might try to increase market share of their national champions at the cost of firms from other countries. Such practices are forbidden in the EU by the European competition law, but they can be granted an exemption according to Article 87 of the EC Treaty. Here, countries' industrial policies and EU's competition policy meet and engage in a battle: governments bail out firms of their choice pursuing their own unilateral policies, but the Commission forbids the aid if it adversely affects fair competition in the common market. Bailouts in particular are regulated by the *Community Guidelines on State Aid for Rescuing and Restructuring Firms in Difficulty*[3] and in the EU terminology are called rescue and restructuring (R&R) aid. The European state aid control is now under a "comprehensive, coherent and far-reaching reform" with an objective of "less and better targeted state aid".[4] For this process, a better understanding of how R&R subsidies have worked in the past would be useful.

Bailout control takes place mainly in Europe, as there is no equivalent bailout policy in the United States. A recent exception is perhaps the Air Transportation Stabilization Board created by the Congress in 2001 with the objective of supporting airline survival after the terrorist attacks on the World Trade Center. Vig (2004) describes activities of this Board as a dismal failure, since none of the big carriers was saved by the loan guarantee program announced by the Board. The reason was that the carriers did not want to give away equity stakes in return for the bailout, which was one of the conditions of getting the loan. This outcome is a warning that subsidizing firms in difficulty is not an easy task.

I analyze R&R aid granted to 79 firms from 10 EU countries during the years 1992-2003. I create a data set from four information sources: decision texts of the Commission, London Economics (2004) report to the Commission, the AMADEUS data base and newspapers. The list of bailed-out firms is fixed and I collect additional information on these firms, which makes it a unique data set. Whatever the objective of a bailout, a necessary condition for achieving this objective is preventing bankruptcy.[5] If a bailed-out firm nevertheless goes bankrupt, none of the potential objectives can be achieved. Bankruptcy is defined as ceasing operations of a firm. Sometimes firms become insolvent, sell most of their assets, reduce employment dramatically and stay active in the market. I define this situation also as a bankruptcy.

I study three issues. First, I ask the question: how did the risk of bankruptcy change after

[3] OJ C 244, 1.10.2004, p.2.

[4] *Reforming Europes State Aid Regime: An Action Plan for Change*, speech by Neelie Kroes, who is a Member of the European Commission in charge of Competition Policy, during the Wilmer Cutler Pickering Hale and Dorr and the University of Leiden joint conference on European State Aid Reform. Brussels, 14th June 2005.

[5] This is not a sufficient condition of success, as problems other than bankruptcy may arise: in the long term surviving firm may need to be supported again or social benefits may turn out to be lower than economic costs. Using this approach, I will thus tend to underestimate potential distortions caused by the bailouts.

the bailout? To provide an answer, I estimate the hazard rate of all R&R aid beneficiaries. The results show that in the first four years after the bailout firms exit at an increasing rate. This indicates that a bankruptcy after the bailout does not occur randomly, but is a result of a wasteful behavior: firms went bankrupt with delay, because they could afford to survive a bit longer with the means granted by the state. Prediction from the hazard equation suggest that the Commission could have reduced this phenomenon by prohibiting rescue aid in sectors with small externalities on the economy. The required standard of proof in the Commission's bailout approvals should be at least a 70% chance of survival for four years after the bailout. That would reduce the number of approved bailouts that end up in bankruptcy.

Second, I investigate determinants of governments' decisions to grant rescue versus restructuring subsidies. Firms receiving a restructuring subsidy go bankrupt less often than rescue aid receivers. Allocation of these two types of aid to different firms is therefore a tool for discrimination. I find that public firms receive restructuring aid with higher probability due to governments' preference for public employment. Once I control for public employment, being a public firm becomes a disadvantage in chances for restructuring aid. All public firms which were later privatized received exclusively restructuring aid, as well as public firms older than 100 years. This special position of state-owned firms is likely to cause soft budget constraints. I also find a strong time trend in the data: after the year 2000 rescue aid was 68% more likely than restructuring aid. This is likely to be a result of a political campaign at the European level to reduce R&R aid, which started with the Lisbon Agenda in 2000. As a consequence of this tendency, however, firms are granted aid which is less efficient in preventing bankruptcy.

Third, I reject the hypothesis that the subsidy type is exogenous in the hazard estimation. Governments select firms that get more comprehensive restructuring aid and influence the firm's survival chances by this choice. The impact of the endogenous subsidy type on the hazard rate is stronger than in the case of the exogenous subsidy type. Thus, without taking the endogeneity into account, the effect of the subsidy type on the hazard is underestimated.

The most closely related literature is empirical bankruptcy prediction. Studies of bankruptcy typically use survival analysis to predict duration of Chapter 11 protection in the American bankruptcy law. Bandopadhyaya (1994) finds the counterintuitive result that the higher the outstanding interest of the firm, the earlier the firm gets over its difficulties. His explanation is that creditors are more willing to compromise during negotiations when the debt is high. Li (1999) develops a Bayesian approach to hazard estimation. In both of these papers, the probability of exiting Chap-

ter 11 protection increases during the first two years. My result is exactly opposite: the probability of bankruptcy increases with time during the first four years. Although not directly comparable, R&R aid is less efficient in preventing firms' bankruptcy than Chapter 11 protection. The biggest difference between Chapter 11 and R&R aid is the incentives they create. Managers avoid Chapter 11 ex ante, since the likely outcome of starting bankruptcy proceedings is that creditors will get a part of the equity. In addition, under Chapter 11 protection firms incur legal and opportunity costs. R&R aid, in turn, never requires a transfer of equity to creditors. It allows to continue operation by a subsidy from the taxpayers. Thus, the incentives of European managers to avoid bankruptcy are not as strong. Therefore, I provide empirical support for the suggestion of Nitsche and Heidhues (2006) that R&R aid should be linked to bankruptcy proceedings, for example by granting aid only to firms that are legally bankrupt. This condition would not be uniform in the whole EU, since so far there is no common bankruptcy law for the member states.[6]

Papers evaluating state aid programs are popular (for an overview see Heckman (2001)), but concerning bailouts in the EU the only empirical analysis is by Chindooroy et al. (2005) (based on the LE report (2004) done by the same authors). Their paper provides summary statistics about the cases and a discrete choice estimation of survival probability. They find that about 30% of R&R aid beneficiaries went bankrupt, which they attribute to the business cycle. My paper is different from theirs in several ways. Since hazard models give better survival probability estimates (Shumway (2001)), I use the hazard approach.[7] It allows me to compare R&R aid to the Chapter 11 protection. I also analyze governments' bailout policies, which is an entirely new research topic. Finally, I show that the subsidy type cannot be treated as an exogenous variable in studying survival probability. According to my estimates, subsidy choice and bankruptcy are interdependent outcomes.

The paper is organized as follows. The next section describes the legal framework for bailouts in the EU and provides some summary statistics on how the guidelines were applied during the years 1995-2003. Next, I estimate the hazard rate of R&R aid beneficiaries, compare it to Chapter 11 hazard rates and assess the effectiveness of bailouts in preventing bankruptcy. In section 4, I empirically examine governments' choices to grant rescue versus restructuring aid. In section 5, I explore the endogeneity of the subsidy choice in the hazard rate analysis. Finally, I conclude in the last section.

[6] A comparison of bankruptcy systems in Sweden, France, Germany, United Kingdom and United States can be found in Couwenberg (2001), who draws attention to the important role of asset sale in retaining viability.

[7] Jenkins (2005) provides an excellent guide to discrete-time hazard rate estimation.

2 Rescue and restructuring subsidies in the European state aid control

2.1 State aid in the EC Treaty

Article 87 (1) of the EC Treaty provides legal constraints to state aid in the EU. State aid is incompatible with the common market, and therefore in general prohibited, when it fulfils four conditions: it is granted from state resources, distorts or threatens to distort competition, favors certain undertakings, and affects trade between member states. Article 88 makes the European Commission responsible for the control of the compatibility of all state aid measures in the member states.

Article 87 (3) gives the Commission the power to grant exemptions to state aid prohibition. R&R aid is exempted based on Article 87(3c): "aid to facilitate the development of certain economic activities or of certain economic areas, where such aid does not adversely affect trading conditions to an extent contrary to the common interest"[8] may be considered compatible with the common market. Also Article 87(3a) is referred to as a reason for exemptions: "aid to promote the economic development of areas where the standard of living is abnormally low or where there is serious underemployment"[9] may be considered compatible with common market. The reasons for exemptions are often summarized as facilitation of social and regional cohesion: governments want to support certain industries or sustain jobs in poor or dependent on one big firm regions. Detailed rules, according to which the Commission grants the exemption, are specified in the *Community Guidelines on State Aid for Rescuing and Restructuring Firms in Difficulty*, described in the remainder of this section.

R&R subsidies are covered by a *de minimis* rule:[10] aid that does not exceed EUR 100 000 over a continuous period of three years is not considered incompatible with the common market. The rule was introduced to reduce the cost of administrative burden on the Commission created by state aid control and to facilitate subsidies for small and medium enterprizes (SME), which are expected to use low amounts of R&R aid more often. The ceiling amount in the *de minimis* rule is a gross grant or its equivalent. The rule does not apply to transport, shipbuilding, agriculture, fisheries sectors, export-related activities, and aid promoting domestic over imported products.

[8] OJ C 325, 24.12.2002, p.67.

[9] ibid.

[10] OJ L 10, 13.1.2001, p.30. On March 9, 2006 the Commission proposed to increase the ceiling of the *de minimis rule* to 150 000 EUR, but the decision to adopt it was not yet made.

2.2 Community Guidelines on State Aid for Rescuing and Restructuring Firms in Difficulty

The guidelines explain the way the European Commission exercises its discretion in the field of bailouts. The first guidelines were adopted in 1994, they were amended in 1999 and 2004, and the current version - on which I focus here - stays in power until 9 October 2009. The general approach of the Commission to R&R aid is that this is the most questionable type of subsidies, since it is directed towards inefficient firms and it is very likely to act against competitive forces that would drive the firm out of the market. According to the guidelines, R&R subsidies are justified only in three circumstances: by social or regional considerations, to support small and medium-sized enterprizes, and in presence of a menace of high market concentration. While the first two objectives are a matter of social judgement, the last one is an economic issue.

The guidelines define a firm liable to R&R aid, called a *firm in difficulty*, as "unable, whether through its own resources or with the funds it is able to obtain from its owners/shareholders or creditors, to stem losses which, without outside intervention by the public authorities, will almost certainly condemn it to going out of business in the short or medium term." Such firms typically have "increasing losses, diminishing turnover, growing stock inventories, excess capacity, declining cash flow, mounting debt, rising interest charges and falling or nil net asset value".[11] This includes also firms that filed for insolvency, subsidiaries of firms that are also in difficulty, or subsidiaries, which prove that the state of difficulty is their own responsibility and the parent cannot help. Newly created firms (up to 3 years old) are not eligible for R&R aid. The most important element of the definition is that without the subsidy the firm would exit the market - only a state intervention can keep it alive.

Bailouts consist of two kinds of subsidies: rescue and restructuring.[12] While a rescue subsidy is meant to keep the firm in operation for the time needed to asses the situation and prepare a plan of further action, restructuring aid is a long-term assistance in implementation of the restructuring plan, which must aim at restoring firm's viability. Each of rescue and restructuring subsidies can be granted only once every ten years (five in the agricultural sector). This is the so-called *one time - last time principle* and refers to all types of beneficiaries: large firms, groups of firms, firms in assisted areas and SME's. If both aid types are granted, the order also matters: rescue aid should

[11] The guidelines, p.C 244/3.

[12] A bailout does not need to be a transfer of resources, it may also be soft position in debt recovery. For example, when firms in a deteriorating condition do not pay taxes or social security obligations and public institutions are more patient in recovering the debt than a private creditor would be, the firm gets an advantage over its competitors. This was the main issue in the case C-276/02 in the European Court of Justice, as discussed in Nicolaides and Kekelekis (2005).

be given before restructuring aid, otherwise the restructuring process proves to be not successful in restoring viability and a firm is not eligible for the rescue subsidy. From an economic point of view, strict application of the one time - last time principle is crucial, since it helps reducing efficiency distortions caused by soft-budget constraints.

Rescue aid can be granted as a loan or a loan guarantee at a market interest rate for a maximum of six months. After that time, a restructuring or a liquidation plan must be presented to the Commission. In principle, there is a maximum amount of rescue aid, which depends on earnings before interest and taxes, depreciation and working capital according to a formula in the appendix to the guidelines, but exceptions are possible.

Restructure subsidy is granted only to those firms that present a market survey and a convincing plan of restoring the firm's long-term viability. If the market power of the beneficiary is significant, the Commission imposes compensatory measures such as divestiture of assets or reduction in capacity. The beneficiary is expected to make a significant contribution to cover restructuring costs: 25% in case of a small firm, 40% for a medium-sized firm and 50% for a large firm. The implementation of the restructuring plan should be communicated to the Commission by reports at least annually.

Aid for large firms must be notified individually each time, while for SMEs aid schemes are possible. SME's (but not from the agricultural sector) and firms from assisted areas have less strict rules as far as compensatory measures and reporting are concerned. The guidelines do not apply to coal and steel sectors.

To sum up, the guidelines define conditions for public support to firms in difficulty as strict as possible, so that aid is compatible with the common market and is granted only to firms with the highest chance of survival. Governments have to prove that expected social benefits of R&R aid (usually understood as the number of jobs saved) outweigh economic costs. To achieve these potential gains, survival of the beneficiary is a necessary condition.

2.3 Summary statistics on bailout decisions

In the time period from 1995 to 2003, the Commission made 86 decisions on granting individual R&R subsidies to 79 firms from 10 EU countries. In this section, I have a closer look at the summary statistics for various aspects of the subsidy decisions. A cross-sectional data set is used, with each decision as a unit observation.[13]

The decisions I analyze were made during the years 1995-2003. The starting year is 1995, which

[13]For the description of the data set construction procedure, see the Appendix.

is the first year when decisions were based on the guidelines on R&R aid. In some cases, however, the subsidy was notified ex post, hence the year of granting aid was earlier than the decision itself. The last year is 2003, just before the EU enlargement and introduction of the new version of the guidelines. The most aid-intensive period was 1996-1998 with 13-15 subsidies granted each year. After 1998, the number of cases has halved and oscillated around 7 (see table 1).

Table 1: Year of granting R&R subsidy.

Subsidy year	Rescue cases	Restructuring cases	Total
1992	0	1	1
1993	0	1	1
1994	1	5	6
1995	3	5	8
1996	5	8	13
1997	6	9	15
1998	3	11	14
1999	1	5	6
2000	0	2	2
2001	6	2	8
2002	6	2	8
2003	3	1	4
Total	34	52	86

Population: Cross-section of decisions.

There is a clear tendency of granting more rescue aid in recent years. Before 2001, the number of rescue cases was lower than restructuring aid cases. Starting with 2001, this tendency was reversed. The change in the pattern coincides with the European Commission's increased political efforts to limit state aid. For example, the Lisbon Agenda in 2000 encouraged the EU governments to cut state aid for inefficient firms and redirect it to firms with potential for innovation and growth.

Differences between rescues and restructures

The nature of a rescue subsidy as defined by the guidelines is very different from restructuring aid. While the former can be granted to any firm with an acute problem as a short-term solution, restructuring aid is a long-term assistance with viability as an objective. Table 2 reveals that differences indeed exist. For each subsidy type, I report the total number of firms receiving such aid, followed by the number of state-owned and private firms, the number of bankrupt and surviving firms, the number of firms sold after the subsidy and average employment. State-ownership means that the state controls more than 50% of the firm's capital. Bankruptcy and sale are observed in the time period between the subsidy and 2003. Note that ownership status is known only for 69 firms and survival status only for 75 firms (bottom row of table 2).

Table 2: Differences between subsidy types.

Subsidy type	Total	State -owned	Private	Bankrupt	Survived	Sold	Avg. empl
Rescue	27	5	19	13	13	4	3404
Double rescue	1	1	0	1	0	0	1791
Restructure	45	21	17	8	34	18	6333
Double restructure	1	1	0	0	1	0	3508
Rescue and restructure	5	2	3	0	5	1	8730
Total	79	30	39	22	53	23	5340

Population: Cross-section of firms.

The first observation is that there were many more restructuring aid than rescue aid cases. Seven firms received a double subsidy. Five of them were rescue cases followed by restructuring aid, which is the pattern promoted by the guidelines. In the other two cases, the one time -last time principle was clearly violated. Nearly a half of restructuring aid cases concerned state-owned firms, while less than one-fifth of rescue cases involved public firms. In addition, only state-owned firms benefited from the two cases breaking the one time -last time principle. The null hypothesis that ownership and the subsidy type are independent is rejected based on the Pearson's chi-squared test at 5% significance level.[14] If one agrees that restructuring aid is more attractive to firms in difficulty than rescue aid, then state-owned firms had a favorable treatment. Ultimately, it is governments who bail out and they are also the owner of public firms. Therefore, governments may be exploiting the institution of bailouts in the interest of their firms. This should not be difficult. Restructuring aid is always tailored to the specificities of the firm in trouble. The government has an influence on the length and amount of public support, on the instrument used, and the restructuring process undertaken.

Turning to the bankruptcy rate, 22 firms went bankrupt, which makes about 30% of all bailed-out firms. The distribution of bankruptcies is biased towards rescues: a half of all rescue aid cases ended up with a bankruptcy, compared with less than a quarter of restructuring aid cases. The null hypothesis that the type of subsidy is independent of bankruptcy is rejected based on the Pearson's test at 2% significance level. The bias towards rescues is natural given the characteristics of rescue aid, which is only temporary and is not meant to support a restructuring process. Restructuring aid, however, should never end up with bankruptcy -its aim is to get the firm back to viability. This aim was not achieved in 8 cases out of 45 total (17.7%).

Regarding the distribution of firms that were sold to a new owner after receiving the subsidy,

[14]This is only very weak evidence of the correlation, since I have few observations and Pearson's chi-squared test uses a limit distribution.

a higher proportion of restructured firms were sold than the proportion of rescued firms. This suggests that a restructuring subsidy can be used to increase the value of a firm in difficulty before sale, for example before privatization. Out of 28 state-owned firms, 13 were privatized after receiving a restructuring subsidy. In a few cases, privatization was even a condition for R&R aid approval demanded by the Commission. All privatized firms survived.

Finally, looking at average employment, firms with restructuring aid had on average more employees than firms receiving rescue aid. This suggests a too-big-to-fail effect, meaning that big firms get more support from the state in case of distress, because their exit would potentially have a large negative externality on the state-wide or regional economy.

Bailout policies in European countries

EU member states use R&R subsidies in a very differentiated way. Table 3 highlights the differences across countries in detail. For each country, I report the total number of subsidized firms, the number of rescue and restructuring subsidy types granted, the number of state-owned and private firms, the number of bankrupt and surviving firms, the number of firms sold after the subsidy, and finally, average employment in subsidized firms.

Table 3: Differences across countries.

Country	Firms No.	Restr.	Rescue	Public	Private	Bankrupt	Survived	Sold	Avg. empl.
Greece	1	1	0	1	0	0	1	0	7 529
Netherlands	2	1	1	1	1	1	1	1	4 906
Austria	4	3	3	1	3	1	3	1	390
UK	4	2	2	2	2	0	4	2	4 640
France	11	9	3	9	2	0	11	6	19 187
Portugal	4	4	1	1	1	0	3	1	141
Spain	10	8	2	5	5	4	6	2	928
Italy	15	10	6	6	5	6	7	5	5 447
Belgium	4	2	2	1	0	1	2	0	3 037
Germany	24	12	14	3	20	9	15	5	3 774
Total	79	52	34	30	39	22	53	23	5 340

Population: Cross-section of decisions.

Germany leads with 24 bailed-out firms, followed by Italy, France and Spain with 15, 11 and 10 firms respectively. Notably, there are also 5 member states that did not bailout any firm (not in the table): Denmark, Finland, Ireland, Luxemburg and Sweden. While in case of Luxemburg one can have doubts if this result is because of government's policy or economy size, in the other four cases it looks like a hard no-bailout policy.

A comparison of the policies of Germany and France provides interesting insights. Among 24

Germany's beneficiaries, the majority received rescue aid. Only 3 beneficiaries were state-owned and employment was lower than the total average. In contrast, France used mainly restructuring aid, mainly directed to state-owned firms and had the highest number of sold firms. French bailed-out firms employed four times more people than the total average and none of them went bankrupt. These two policies seem to be opposites. Germany provides short-term support for smaller private firms, while France uses R&R aid to restructure huge state-owned firms. Italy's and Spain's policy is similar to that of France, but the majority of Italian firms went bankrupt and Spanish governments supported much smaller firms.

Differences in countries' policy can also be found in the distribution of industries, from which the bailed out firms came (I use a 2-digit NACE codes as industry classification, see table 14 in the Appendix). The distribution is presented in table 4. Some countries grant R&R aid mainly in

Table 4: Countries' bailouts per industry.

	Country										
Industry	EL	NL	AT	UK	FR	PT	ES	IT	BE	DE	Total
services	.	.	.	.	2	.	.	2	1	1	6
finance	.	.	.	1	5	.	.	2	.	1	9
transport	1	.	.	2	3	.	.	1	2	2	11
electric water	.	.	.	1	.	.	.	.	.	.	1
trade	.	.	.	.	.	.	1	.	.	1	2
construction	.	.	1	.	.	1	1	6	.	2	11
manufacturing	.	2	3	.	1	3	7	3	1	17	37
mining	.	.	.	.	.	.	1	1	.	.	2
Total	1	2	4	4	11	4	10	15	4	24	79

Population: Cross-section of firms.

sectors, where negative externalities of a bankruptcy may be painful for the whole economy (e.g. UK). Other countries bail out in sectors, where such externalities are unlikely to exist (Netherlands, Austria, Portugal, Spain). Finally, there are countries that grant R&R aid economy-wide (Italy, Germany, France). The Pearson's test rejects the hypothesis that the industry and the country of R&R aid receivers are independent.

Characteristics of bailed-out firms

Table 5 presents summary statistics about R&R aid beneficiaries. Industries supported by R&R aid are state-wide infrastructure providers in transport, electricity/water supply and banking, but also manufacturing and construction sectors, trade, and services. A striking observation is that nearly half of all cases involved the manufacturing industry, a third of which went bankrupt after

Table 5: Time-invariant firm characteristics.

	Total	**Bankrupt**
Industry		
services	4	1
finance	9	0
transport	11	1
electric & water supply	1	0
trade	2	0
construction	10	6
manufacturing	36	12
mining	2	2
Total	75	22
Ownership		
private	38	13
state owned	30	7
Total	68	20
For sale		
unchanged	50	21
new owner	23	0
Total	73	21

Population: Cross-section of firms.

receiving the aid. A high share went also to the construction sector, where bankruptcies were more common: 6 out of 10 firms left the market. There were no bankruptcies in the financial, trade and electricity and water supply sectors. There are fewer state-owned firms than private ones (at least among those for which I know their ownership status), which clearly indicates that R&R aid is not used to support only the public sector. But state-owned firms tend to go bankrupt less often than private ones. All firms which were sold after the subsidy survived.

Table 6: Other firm characteristics.

Variable	Obs	Mean	Std. Dev.	Min	Max
Age (years)	66	58	69.3	1	457
Average employment	75	5 340	11 768	36	69 671

Population: Cross-section of firms.

Table 6 reports summary statistics about age and employment. Age is defined as the number of years passed between incorporation and the subsidy. R&R beneficiaries are 58 years old on average. There is one firm that was only 1 year old when it was subsidized, which is against the rules of the guidelines, since firms younger than 4 years cannot be bailed out. There is also one 457 years old firm. Average employment is the average number of people employed in the period between the bailout and the year 2003.[15] It reached 5340, indicating that bailed-out firms were on

[15]I use average employment to indicate the size of the firms. Due to numerous missing data in this variable, I

average large.

Summary

The overview on how R&R aid was granted highlights two typical problems with R&R aid: high mortality rate and a strong influence of political economy issues.

Bankruptcy rate amounts to about 30% of all beneficiaries and 17% of restructuring aid beneficiaries. Given that one of the objectives of the guidelines is to make sure that aid is not given to firms with low survival chances, this bankruptcy rate suggests possible shortcomings in the Commission's decision-making process.

The political economy of R&R involves at least three issues. Public firms get more restructuring aid than private firms. Governments' bailout policies are very heterogenous across countries and vary from a hard no-bailout approach to frequently given support to firms from various industries. Finally, a few cases break *one time - last time* principle, indicating that the guidelines were not the only criterion of the Commission when approving the subsidy.

I address these two issues in the next sections. In section 3 I evaluate bailouts in terms of effectiveness in ensuring sufficiently high probability of survival and in section 4 I analyze governments's bailout policies.

3 Hazard rate for bailed-out firms and European bailout control

The subsidized firm' survival is a necessary condition for achieving the bailout's objectives, e.g. save jobs or prevent a domino effect. R&R aid is supposed to be granted to firms with high survival chances. It is particularly true in case of restructuring aid, which is required to bring the firm back to viability. Survival patterns are therefore an important information for the assessment of bailouts' effectiveness: bankrupt implies that they failed.

I have already established the key statistics: 14 rescue and 8 restructuring aid receivers went bankrupt, nearly 30% of the total number of the bailed-out firms. A tool to explore survival patterns in more detail is a hazard rate. The hazard rate relates the probability of bankruptcy in a given year to firms' characteristics and the time passed since the bailout. Based on R&R aid characteristics discussed before, I would expect that some of the rescue aid recipients go bankrupt shortly after a bailout and for the remaining firms, the probability of bankruptcy decreases to levels close to zero. In this section, I examine if it is indeed the case.

cannot use employment in the subsidy year.

In the estimation I use an unbalanced panel data set.[16] I examine 75 R&R aid beneficiaries for which the surviving status in known. The time unit is a calendar year. It starts being counted from the year when the subsidy was given and it stops in the year of bankruptcy or in 2003, if the firm survived until then (these are the censored observations, which receive a special treatment in the methodology I will use). Descriptive statistics of survival data are reported in table 7. One

Table 7: Description of survival data.

No. of observations	
Total	409
Bankrupt	92
Censored	317
Average survival (years)	
Total	5.45
Bankrupt	4.18
Censored	5.98

Population: Panel.

fourth of all observations comes from bankrupt firms. Average survival time for bankrupt firms is by nearly two years lower than for censored firms.

3.1 Descriptive statistics for survival patterns

As a description of survival patterns in the data, I compute lifetable estimators[17] presented in table 8. I use actuarial adjustment to account for the fact that censored observations in each period do not happen all at once.[18] Empirical survivor function is defined for each year as a proportion of firms surviving at least until that year. Empirical hazard function in year j is an estimate of the probability of going bankrupt in year j, conditional on surviving until that year.[19] The first row of the table can be read as follows: during the year when they received the subsidy, 4 firms out of 75 went bankrupt. Four other firms went out of the sample, which means that they were subsidized in 2003 and survived that year. The proportion of surviving firms equals 0.9452 with a standard error of 0.0266, while the probability of going bankrupt in the first year after the subsidy is 0.0563 with a standard error of 0.0282.

The highest number of bankruptcies took place in the fourth year after the subsidy and it remained low after that (column 3). This suggests that the first four years are crucial in making a

[16] For details, see the Appendix.

[17] All estimations are done with STATA 9.

[18] Actuarial adjustment is used when the underlying survival time is continuous, but the data is given in discrete time. It assumes that censored observations leave the sample uniformly in each period. The adjusted number of observations in a given period equals the total number of observations minus a half of censored observations ending in this period. For more details see Jenkins(2005).

[19] For definitions, see Jenkins(2005).

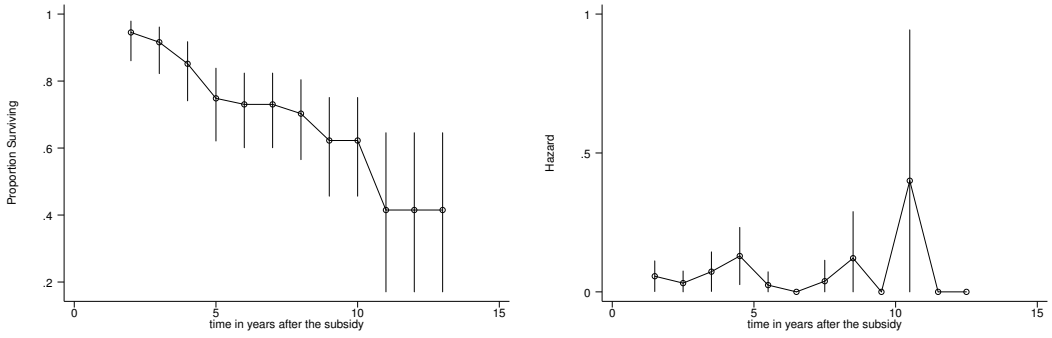
Table 8: Lifetable estimates.

Year	Beg. Total	Bankruptcies	Lost	Survival	St. Error	Hazard	St. Error
1	75	4	4	0.9452	0.0266	0.0563	0.0282
2	67	2	5	0.9159	0.0329	0.0315	0.0223
3	60	4	6	0.8516	0.0435	0.0727	0.0363
4	50	6	1	0.7484	0.0550	0.1290	0.0526
5	43	1	3	0.7304	0.0566	0.0244	0.0244
6	39	0	8	0.7304	0.0566	0.0000	.
7	31	1	9	0.7028	0.0608	0.0385	0.0385
8	21	2	7	0.6225	0.0759	0.1212	0.0856
9	12	0	4	0.6225	0.0759	0.0000	.
10	8	2	4	0.4150	0.1300	0.4000	0.2771
11	2	0	1	0.4150	0.1300	0.0000	.
12	1	0	1	0.4150	0.1300	0.0000	.

Population: Panel.

successful bailout. The last bankruptcies occur 10 years after the subsidy. The lost cases (column 4) are the censored observations ending in a given period. For example, in the seventh year the number of lost cases reaches nine, meaning that nine firms that were subsidized seven years before 2003 survived.

The estimates of survivor and hazard functions with their standard errors are also depicted in figure 1, where vertical lines indicate 95% confidence intervals. The empirical hazard function has a peak in the fourth year and drops after that. This peak is reflected in the concave-shaped step of the survivor function: when the probability of bankruptcy grows, the probability of survival goes down. Standard errors increase with time, since the sample gets smaller and smaller. In the eighth



(a) survivor function (b) hazard function

Figure 1: Empirical hazard and survivor functions.

year, the adjusted number of observations drops below 20. In such a sample, a single bankruptcy is given too much weight. For this reason, I find the estimates for the eighth and the following years unreliable and I ignore them in the further discussion.

If bailouts were helping firms to stay in the market, the hazard would be close to zero and decreasing in time. Unexpectedly, I find a different pattern. During the first year the hazard decreases a little, reflecting the fact that some firms decide to liquidate immediately. Then the hazard increases and reaches the peak of 12% in the fourth year. Only after that it drops to low levels. Such a pattern suggests a "cash-and-carry" behavior: firms use the subsidy to delay their exit up to four years. The scale of this phenomenon is not negligible: 16 out of 75 firms went bankrupt within four years after receiving an R&R subsidy.

3.2 Hazard rate estimation

Methodology

To the best of my knowledge, the hazard rate for R&R beneficiaries has never been estimated. The only empirical study on R&R aid so far, Chindooroy et al. (2005), provides estimates for a time-invariant probability of survival. Their results show that rescue subsidy beneficiaries have a lower survival chance than firms getting a restructuring subsidy, while subsidies granted after the year 1999 provide firms with higher survival chance than subsidies granted earlier. As an estimation method they use a single-period discrete choice model. However, according to Shumway (2001) and the following literature, discrete choice models with cross-sectional data give biased and inconsistent estimates of the probability of survival. This is because single-period models do not take into account time changes in the proportion of surviving subjects: if a firm went bankrupt, it is denoted as bankrupt no matter how long it lived after the subsidy. Censored observations, on the other hand, meaning firms which survive until the end of the observation period, are counted as survivors for ever, although it cannot be excluded that they go bankrupt later. This is particularly important for my data, since I have a significant number of censored observations.

The drawbacks of discrete choice models are resolved by the hazard rate approach. Hazard rate is defined as instantaneous probability of an event (e.g. bankruptcy) at a time point. The main characteristic of hazard models is that they define event's risk at each point in time. This allows to code bankrupt and censored firms correctly as active or not at a certain point in time. In addition, time-varying variables and hence more information can be utilized.

I estimate the hazard rate of bankruptcy for R&R aid beneficiaries for 12 years after receiving the subsidy. The data is discrete in time: instead of precise dates, only the years of the subsidy beginning and the bankruptcies are registered. In theory, however, firms may go bankrupt on any working day of the year, so the underlying true hazard is continuous. For such data, empirical sur-

vival literature proposes a complementary log-logistic (or *cloglog*) specification.[20] Complementary log-logistic hazard is a discrete analog of the log-logistic hazard model. It is particularly suitable for data with few nonzero outcomes due to the asymmetry of its tails: the right tail converges to one more quickly than the left tail converges to zero, so that the positive values are given more weight (Buckley, Westerland (2004)). Hazard rate in a time interval j is simply the probability of bankruptcy in this interval conditional on surviving up to the beginning of the interval, which can be written as

$$h(j, X_j) = \frac{S(j, X_j) - S(j-1, X_j)}{S(j-1, X_j)}, \tag{1}$$

where X_j a vector of subject characteristics in period j. S is the survivor function given by

$$S(j, X_j) = \exp(-H(j)\exp(\beta' X_j)), \tag{2}$$

with H_j denoting an integrated baseline hazard of all intervals up to j. Baseline hazard is a part of the bankruptcy probability that depends only on the time spent under treatment and is common for all subjects.

Substituting (2) into (1) and manipulating the formula[21] I get the equation to estimate:

$$h(j, X_j) = 1 - \exp[-\exp(\beta' X_j + \gamma_j)], \tag{3}$$

which describes the probability of bankruptcy in period j as a cloglog function of subject characteristics X and a function of time $\gamma_j = \log(H(j) - H(j-1))$.

Implementation

The dependent variable is an indicator of the bankruptcy of firm i in year j:

$$\text{BANKR}_{ij} = \begin{cases} 1 & \text{if firm } i \text{ went bankrupt in year } j, \\ 0 & \text{otherwise.} \end{cases} \tag{4}$$

As the subject characteristics X I consider the following explanatory variables. To estimate

[20] Cloglog function is defined as $g(x) = 1 - \exp[-\exp(x)]$.
[21] see Jenkins (2005), p.41.

the effect of subsidy type on bankruptcy probability, I include a dummy

$$\text{TYPE}_i = \begin{cases} 0 & \text{if firm } i \text{ got only a rescue subsidy,} \\ 1 & \text{if firm } i \text{ got a restructuring subsidy.} \end{cases} \tag{5}$$

The dummy equals one also in all cases, where both a rescue and a restructuring aid were granted. I expect the coefficient to be negative, since restructuring aid should ensure lower bankruptcy probability of the beneficiary than rescue aid. Potentially, this variable might be endogenous. The subsidy type, which is chosen by the government, could be correlated with the error term from the equation. For example, a firm which is a monopolist (like a state-wide railway) has a very strong bargaining power, which can have influence on both the subsidy type and the hazard. But in my data set I do not have information on market power of aid receivers, so this correlation is captured by the error term and creates an endogeneity problem. As a consequence, the estimates might be biased. Another problem is the potential selection process: governments may grant restructuring aid to big public firms and rescue aid to small private firms. As a result, the variation, which in equation 6 is attributed to the subsidy type, in fact results from other variables or the error term. I deal with these problems explicitly by modelling the government's choice and applying a simultaneous estimation in section 5.

I include LNAGE variable, which is the natural logarithm of years from incorporation to the subsidy year. I expect the coefficient of this variable to be negative, reflecting the fact that a longer market presence gives know-how which decreases the bankruptcy probability.

A variable of particular interest is firm's ownership PUBLIC_i, equal to one if the state has a majority stake in firm i. If public firms are less efficient than private firms, the estimated coefficient of this variable should be positive. On the other hand, if public ownership is of an advantage in financial distress due to lobbying or high bargaining power, the coefficient will be negative.

The size of a firm is represented by a logarithm of its average employment. I separate public from private employment by using two variables: SIZEPUBLIC_i and SIZEPRIVATE_i. I expect the coefficients to be negative - if bailouts prevent job cuts, they should work out especially in case of big firms.

Bankruptcy literature claims that sector characteristics are significant determinants of survival (e.g. Shumway (2001)). I therefore add dummies for industries, in which firms were active: INFRASTR for electricity, transportation and financial services, SERVICE for services and trade and MINMAN for mining and manufacturing. Construction sector is left out as a reference cate-

gory.

Finally, a function of time needs to be estimated (γ_j from equation (3)) to capture duration dependence. Since the empirical hazard rate as depicted in figure 1 does not have any typical shape, I choose to specify the baseline hazard in a non-parametric way: I create dummies for each survived after the subsidy year. There are four years, in which no bankruptcies were observed (6, 9, 11 and 12), so the hazard cannot be calculated. As survival literature recommends, I drop observations from these years and the total number of observations decreases to 355. When predicting the hazard for those years, I assume that it is the same as in the preceding year.

I fit the following equation:

$$\begin{aligned} P(\text{BANKR}_j = 1) =& g(\beta_1 \text{TYPE} + \beta_2 \text{LNAGE} + \beta_3 \text{PUBLIC} + \\ &+ \beta_4 \text{SIZEPUBLIC} + \beta_5 \text{SIZEPRIVATE} + \beta_6 \text{INFRASTR} \\ &+ \beta_7 \text{SERVICE} + \beta_8 \text{MINMAN} + \sum_{j=1}^{j=8} \beta_{9j} \gamma_j), \end{aligned} \tag{6}$$

where $g(x) = 1 - \exp[-\exp(x)]$ is the complementary log-logistic function, j is a year index and a firm index i is omitted for the ease of exposition. I estimate three models with different variable sets, since for a few firms data on PUBLIC, LNAGE and employment is missing. Adding these variables to the regression reduces the number of observations. Standard errors were adjusted for within-firms correlation. Marginal effects were calculated for the average value of each variable.

I estimate (6) by the conditional maximum likelihood method. Apart from its doubtless advantages like asymptotic efficiency and consistency, it allows to account for censoring very easily. Suppose a subject i went bankrupt in year j and $T(j)$ is a bankruptcy indicator for period j. The likelihood contribution of such a (non-censored) observation i is $P(T_i = j)$. For a censored observation i that survives until the last time period j, the likelihood contribution simply is $P(T_i > j) = S_i(j, X_i)$. In this way, information from censored observations can be correctly extracted in the estimation.

Results

Marginal effects are presented in table 9.[22]

[22] As a quick robustness check, I estimate a simple probit with one observation per subsidized firm, like in Chindooroy et al (2005). The dependent variable is a dummy equal to one for bankrupt firms and zero for surviving firms. Instead of baseline hazard dummies, I use a dummy RECENT equal to one for subsidies after 2000. The sings of all coefficients are the same as in the cloglog model and the coefficient on RECENT is negative, confirming the model's stability.

Table 9: Estimates of marginal effects on the hazard rate.

Dependent variable: bankruptcy

Variable	**Model 1**	**Model 2**	**Model 3**
Subsidy and firm characteristics			
Subsidy type (d)	-0.100**	-0.099**	-0.096***
	(0.028)	(0.033)	(0.007)
lnage		-0.000	0.002
		(0.935)	(0.747)
public			0.141
			(0.519)
sizepublic			-0.006
			(0.537)
sizeprivate			0.011
			(0.263)
infrastr	-0.044***	-0.040**	
	(0.005)	(0.019)	
service	-0.018	-0.012	0.042
	(0.110)	(0.389)	(0.467)
minman	-0.013	-0.008	0.021
	(0.344)	(0.590)	(0.253)
Baseline hazard dummies			
γ_1	-0.026**	-0.031**	-0.092**
	(0.015)	(0.029)	(0.046)
γ_2	-0.032**	-0.033*	-0.081*
	(0.017)	(0.060)	(0.055)
γ_3	-0.018	-0.024	-0.065**
	(0.103)	(0.128)	(0.048)
γ_4	-0.004	-0.010	-0.050**
	(0.792)	(0.569)	(0.025)
γ_5	-0.027**	-0.029*	-0.056**
	(0.034)	(0.068)	(0.012)
γ_7	-0.024**	-0.025**	-0.047***
	(0.023)	(0.036)	(0.003)
γ_8	-0.007	-0.010	-0.038***
	(0.546)	(0.531)	(0.004)
γ_{10}	0.057	0.043	-0.030***
	(0.347)	(0.456)	(0.007)
N	355	321	297
Nonzero outcomes	22	19	18
chi2	163.613	142.823	157.450
p	0.000	0.000	0.000

Population: Panel. P-values in parenthesis.
***(**,*) denotes significance with 1% (5%, 10%) level in a two-tailed Wald test.

The marginal effect for TYPE is significant and as expected negative. *Ceteris paribus*, firms which get a restructuring subsidy face the probability of bankruptcy about 10% lower than firms with only rescue aid. Restructuring aid is indeed more effective in preventing exit of firms in trouble. It provides firms with more public funds, it assists them for a longer time-period, and it forces firms to introduce restructuring measures aimed at recovering vitality. Still, the effect might be biased due to endogeneity, which I directly address in section 5.

Age of the firms can be understood a proxy for its market experience and know-how. My estimates suggest, however, that it is irrelevant for the hazard rate. Marginal effects for LNAGE are close to zero and highly insignificant. This is in line with results in bankruptcy literature (Shumway(2001)). PUBLIC and both employment variables also turned out to be unimportant for the hazard. Marginal effects of public ownership and public employment are insignificant. Private employment has the most significant effect of about 1%, suggesting that the bigger a private firm, the higher bankruptcy probability.

Bailouts worked the best in the infrastructure sectors (transport, electricity and financial services), for which the greatest and most significant industry effect is observed. Their probability of bankruptcy is 4% lower in every year after the subsidy. These are the critical sectors for the country's economy and their bankruptcy would result in high negative externalities.

Most of baseline hazard dummies are significant, suggesting a strong duration dependence in the survival process. For the interpretation, differences in their absolute values are of the greatest interest, so I plot the predicted hazard. Figure 2 illustrates the results for model 1, as the one with the highest joint significance. The plots show predicted hazard rates for firms in the manufacturing sector which received rescue or restructure subsidy. I ignore predictions from the eighth year onwards as unreliable due to small sample on which they are estimated.

The predicted hazard has a small drop after the first year, indicating that there are some firms, which exit immediately after receiving the subsidy. These firms do not even try to restructure and, as rescue aid is limited in time, they do not live on the means provided by the subsidy. From the second to the fourth year the hazard is increasing: more and more firms exit. After the fourth year, the hazard drops and stays at a lower level. This pattern suggests a dominance of the "cash-and-carry" effect: firms cash the subsidy and enjoy it for some years before they eventually exit. Note also a large difference in the predicted hazard for rescue and restructuring cases. In the fourth year, rescue aid beneficiaries are more than four times more likely to exit than restructuring aid beneficiaries.

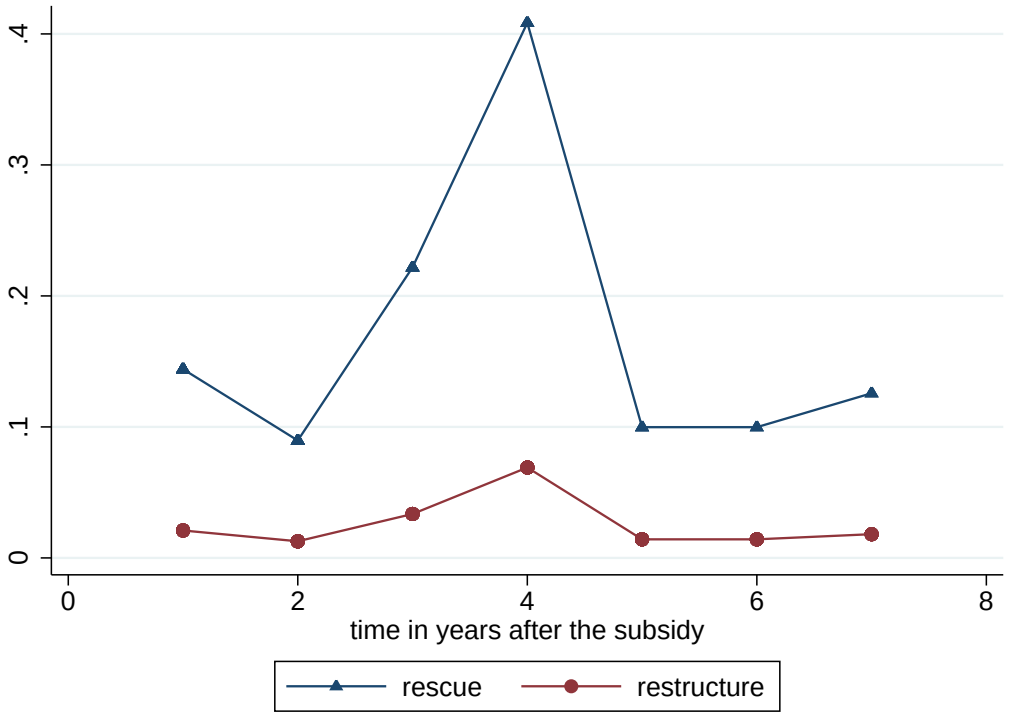


Figure 2: Predicted hazard functions for the first 7 years.

3.3 Policy implications

Comparison to Chapter 11 protection

The objective of R&R aid is the same objective as the objective of Chapter 11 of the Bankruptcy Act in the United States passed in 1978: to prevent exit of the firm and the losses of jobs and know-how. However, Chapter 11 involves no public money. Instead, it provides businesses in distress with protection against their creditors. The negotiations between the firm in trouble and its creditors take place in a bankruptcy court. As a result, the debt is often reduced and some of the assets are transferred to the creditors. During the years 2001-2004, the average number of fillings for Chapter 11 protection in the US reached 10 675.[23]

Studies on Chapter 11 define the analyzed event as an exit from Chapter 11 protection, which means return to vitality in nearly all cases (Li (1998)). Li(1999) applies a log-logistic hazard model with Bayesian analysis on a sample of 83 firms filling for protection in the years 1980-1994, 79 of which exit the protection before August 1994. His results show that bigger firms, with lower firm value, and running legal disputes stay longer under Chapter 11 protection. His estimated hazard function has an inverted U-shape, it grows during the first 21 months and then decreases to zero.

[23] 3.12.2004 News Release, Administrative Office of the U.S. Courts.

Bandopadhyaya (1994) in contrast uses the Weibull distribution specification with the sample of 74 firms in trouble from years 1979-1990, 43 of which emerged after Chapter 11 protection as a viable business. The results suggest that the higher outstanding interest in the firm and the higher capacity utilization in the industry, the shorter time spent under Chapter 11 protection. The estimated probability of leaving Chapter 11 as a vital business increases with time.

For R&R subsidies the result is opposite: the probability of exit increases in the first four years. This is an alarming signal of shortcomings in the European bailout policy. Many firms manage to extract public funds and delay their exit. The difference between these opposite outcomes is most likely related to the difference in the incentives the two programs create. Chapter 11 protection is costly to the firm in trouble by the cost of legal services, by the cost of lost clients and contracts that look for a more stable business partner and by the lost equity which creditors get in return for cancelling some unpaid credits. Therefore, firms have incentives to quickly drop out of the protection program. In contrast, it is not costly for firms in trouble to take part in a state subsidy program. It is rather an advantage. The firms get aid and do not give any equity away. In this way, incentives to apply for aid are created also for those firms, which could survive without aid, or those, which have no chance to survive.

European bailout control

All bailouts in the data set were granted by European governments and accepted by the Commission as compatible with the common market. A compatible bailout should have high chances for survival. Therefore, I can asses the Commission's performance by counting how many times the Commission approved a bailout which had low probability of survival predicted by my hazard rate model (I use model 1 from table 9). This is the so-called type II error in the decision process: a failure to prohibit a non-compatible aid. Prohibition of compatible aid (type I error) does not exist in my data set, since the Commission usually does not prohibit notified aid cases. However, I argue in this section that the Commission should be more tough in the aid approval process. This would allow to avoid a number failing bailouts.

Since the first four years show the highest mortality, it makes sense to measure success or failure of a bailout by the probability of surviving at least the first four years. I predict this probability for every firm in the population and count the number of firms for which the predicted probability is lower than a given threshold. Out of these firms, I count the number of firms, which went bankrupt ex post. Table 10 presents the results.

Table 10: European bailout control.

Policy goal	Approved bailouts missing the goal	
prob. of surviving > 4	Total	Failed ex post
90%	43	13
80%	17	9
70%	8	6
50%	7	5

The policy goal is the required minimal probability of survival for at least 4 years, which is used by the Commission when deciding about compatibility of a bailout. Applying the most loose definition and putting the policy goal at the level of 50% gives 7 (from the total 86) subsidy approvals, which should not have been granted. In that case, 5 ex post bankrupt beneficiaries would not have been supported, although the remaining two ex post survivors would not have been subsidized as well. In case of the most strict approach of the required 90% survival probability, every second bailout should not have been approved. That would allow to avoid 13 subsidies to firms exiting later. The best policy goal seems to be 70%: prohibition of these 8 bailouts would allow to avoid subsidizing 6 ex post bankrupt firms, leaving at the same time 2 ex post surviving firms without help.

Bankruptcies of bailed-out firms are rather frequent. And the real scale of mistaken decisions is higher than that, since my error assessment does not cover another type of error in the decision-making process of the Commission. If a firm survives but does not achieve bailout's objectives, the bailout also fails. An example of such situation is when the restructuring process is not satisfactory and the firm needs continuing state support, like in the cases breaking the *one time -last time* principle. For this reason, I find that decision-making process in the European bailout control shows significant shortcomings. Its effectiveness in terms of helping the firms to survive could be improved by eliminating cases with too low survival probability. In the assessment of this probability, firms should be required to survive at least four years. My estimates suggest that the most likely to go bankrupt are firms receiving rescue aid and firms from manufacturing, mining, construction, trade and services sectors.

4 R&R aid and industrial policy: how governments bail out

One of the results of the previous section is that the subsidy type is a very important bankruptcy determinant. Rescue aid generates lower survival chances than restructuring aid. It is therefore of greatest interest to identify determinants of governments' decisions to grant rescue vs. restructuring

subsidy[24].

When governments decide to bail out a firm in difficulty, they choose one of the two types of R&R subsidies: rescue aid, which is limited in time, amount and form, and restructuring aid, which is long-term, can be granted in any form and is high enough to facilitate the restructuring process. Therefore, a firm receiving restructuring aid gets substantially more support from the state than a firm receiving only rescue aid.

The choice of the subsidy type is an outcome of the government's bailout policy. I identify determinants of this policy by estimating a discrete choice model with the dependent variable TYPE_i as defined in (5). When TYPE_i equals zero, the government gives firm i only a chance to look for other support by subsidizing current expenses for six months. But when TYPE_i is of unit value, the government engages in the firm much more by paying for the restructuring process. This choice reveals government's industrial policy preferences: certain firms get more public funds than other firms.

I estimate a probit model

$$Pr(\text{TYPE}_i = 1) = \Phi(\beta' X_i), \tag{7}$$

where $i = 1, ..., 79$ is a firm index, Φ is a c.d.f. of a standard normal distribution and X is a vector of exogenous explanatory variables. A few explanatory variables are considered, each representing a theoretical argument for a particular government's choice.

OWNERSHIP. The literature on soft-budget constraints claims that public firms are more likely to face soft public crediting than private firms (for a survey, see Maskin and Xu (2001)). As an owner and a creditor in one body, the government has too little bargaining power to refuse risky credits. Public firms are also likely to be more efficient in lobbying the government than private firms. To measure the impact of public ownership on governments' bailout decisions, I add to the vector X the dummy variable PUBLIC_i. I expect its coefficient to be positive.

EMPLOYMENT. Bigger firms are likely to get more support than small firms, since their bankruptcy would result in a higher social cost of many unemployed workers. Big firms are also often highly unionized, so that their workers are a stronger partner to negotiate with. From the government's point of view, however, there are big differences between public and private employment.

[24]Theoretically, I could compare the populations of firms bankrupt without aid with R&R aid beneficiaries to examine criteria of the government's choice of aid beneficiaries. However, it seems to be an infeasible task, since I am not aware of a data set with bankrupt firms across Europe.

For political economy reasons, governments might be interested in supporting public employment more than private employment (Frey and Pommerehne, 1982). Public employees have a higher participation rate in elections than the rest of the electorate and are known to support higher public expenditures. In addition, unions in big public firms are better organized and hence workers have a strong bargaining power against the government. I use the variables SIZEPUBLIC$_i$ and SIZEPRIVATE$_i$ to distinguish between these two types of employment. I expect both coefficients in the regression to be positive.

INDUSTRY EFFECTS. To avoid negative externalities in the economy, firms in certain sectors could be getting more support. For example, railways or electricity generation and supply provide infrastructure to the rest of the economy. They are often monopolists and their bankruptcy could paralyze economic activity in the whole country. This gives them a strong bargaining power against governments, which they can exploit in bailouts (see Segal (1998) on soft-budget constraints in monopolies). Large banks are called "too-big-to-fail", since the negative externality of a bank's bankruptcy are not only lay offs, but also lost deposits of firms and private customers (see, for example, Hughes and Mester (1993)). I measure this effect by including a dummy variable INFRASTR$_i$ equal to one if firm i is active in electricity, transport or financial services sector. A dummy for mining and manufacturing MINMAN$_i$ and a dummy for trade and services SERVICE$_i$ are also included. Construction sector is left out as a reference category.

COUNTRY EFFECTS. To allow for cross-country differences in the bailout policy I include dummies for five countries with the highest number of bailouts: Germany, Italy, France, Spain and Austria.

RECENT. Table 1 indicated that in the year 2001 there was a flip in the proportions of rescue versus restructuring cases in the total subsidy number. This was most likely caused by political pressure at the European level to limit R&R aid. I include a variable RECENT equal to 1 for subsidies granted in years 2001-2003 and 0 otherwise to account for possible time effects. I expect its estimated coefficient to be negative.

I report marginal effects calculated for the average value of each variable in table 11. Only 65 firms are used in the estimation, due to the fact that for the remaining 14 firms data on variables PUBLIC or employment size are missing. To facilitate an interesting insight, I include two models with different covariates representing employment.

The most significant marginal effect of -68.5% is noted for the RECENT dummy. Firms

Table 11: Estimates of marginal effects in industrial policy equation.

Dependent variable: SUBSIDY TYPE

Variable	**Model 1**	p-values	**Model 2**	p-values
Firm characteristics				
recent	-0.685***	0.000	-0.685***	0.000
public	0.291*	0.057	-0.781*	0.060
employment	-0.015	0.769		
sizeprivate			-0.091	0.205
sizepublic			0.081	0.329
Industry and country effects				
infrastr	0.218	0.377	0.123	0.679
service	0.138	0.644	-0.007	0.986
minman	-0.078	0.718	-0.211	0.362
Germany	-0.029	0.906	-0.120	0.653
Italy	-0.358	0.204	-0.515**	0.042
France	-0.305	0.372	-0.463	0.138
Spain	0.050	0.851	0.014	0.962
Austria	-0.021	0.954	-0.149	0.700
N	65		65	
pseudo-R2	0.277		0.307	
log-likelihood	-30.936		-29.667	
chi2	23.739		26.277	
p	0.014		0.010	

Population: Cross-section. ***(**,*) denotes significance with 1% (5%, 10%) level in a two-tailed Wald test.

subsidized after the year 2000 had a 68.52% lower chance of getting a restructuring subsidy than firms subsidized before 2001, ceteris paribus. This time effect is very strong, suggesting that bailout policy of governments has starkly changed in the recent years. The Lisbon Strategy announced in 2000 might be a driver of this change.

In both specifications the marginal effect of public ownership is statistically significant, however it has opposite signs. In the first model, the estimate reaches 29%. In the second model, when I control for public and private employment separately, the effect of public ownership turns into −78.1%. The coefficients on both types of employment in model 2 are not significant. Still, p-values are not too high, so it is worth to interpret the marginal effects. The effect of private employment is negative and the effect of public employment is positive. How to think of these results? Public ownership alone does not increase chances for restructuring of aid, in contrary to what I expected, but it decreases these chances dramatically. What makes governments to spend more money on a bailout is actually public employment. The bigger public firms, the more likely restructuring aid. Employment in private firms has the opposite effect: the bigger a private firm, the less likely restructuring aid. That puts the argument of the prevention of job losses by bailouts in a doubtful light: public jobs are indeed supported more, but private jobs are disadvantaged.

Industry effects are highly insignificant. Among country effects, ITALY effect is significant, negative and pretty large. Holding everything else constant, Italian firms were less likely to receive restructuring aid by about 51%. The effect of France is is close to significant and, surprisingly, negative.

Robustness

Several robustness checks were performed. First, I redefine the variable RECENT as time trend, time squared, logarithm of time and annual or biannual dummies. The results were robust to these changes in sign and significance, but the model with the dummy had the highest joint-significance χ^2 statistics. Therefore, I use RECENT as the best trend-indicator. Second, I estimate the equation using the logit model. Results are very similar as the probit estimates, suggesting the model's stability. Third, I use firms' age as a regressor. Age is measured in years between incorporation and the subsidy. The coefficient was insignificant in the regression and I decided to omit it because of numerous missing data in this variable.

Privatization and old public firms

Two important variables were perfectly predicting the subsidy choice. The first one is privatization. Privatization through bailouts means that a public firm was bailed out and, after receiving the subsidy, it was sold to private owners. Among all bailouts in years 1992-2003, privatization was involved in 13 cases. In a few cases, it was a requirement of the Commission in the approval process, but usually it was an initiative of the governments themselves. All 13 privatized firms got restructuring aid, implying that governments used substantial public funds to increase the value of the firm before the subsequent sale.

The second perfect predictor is age for public firms. All 8 public firms older than 100 years received exclusively restructuring aid, suggesting that governments supported old public brands.

Summary

Summing up, the time dummy has the most important impact on the governments' choice of the subsidy type. The estimates suggest that there was a structural change in the bailout policy: after the year 2000 governments chose rescue subsidies with a higher probability than restructuring aid, and the opposite is true for the earlier years. Public firms get more restructuring aid mainly due to governments' preference to support public employment. Industrial sectors do not matter in the policy choice. Italian governments grant rescue aid somewhat more often than restructuring aid, while other governments do not have a special policy.

5 Endogenous subsidy choice

In section 3, I estimated a hazard rate equation and noted that the subsidy type variable is likely to be endogenous. In section 4, I examined the choice of the subsidy type by the government. In this section, I finally estimate both equations from the previous sections simultaneously. This will allow us to correct for potential endogeneity in the hazard equation. It is also a useful robustness check for the earlier results.

Since estimators for a simultaneous model in which one equation is a discrete-time hazard rate are to my knowledge not available, [25] I translate the hazard rate equation into a time-invariant binary outcome equation with one observation per firm. Duration dependence will then be captured by adding the RECENT dummy.

[25]For a continuous-time hazard, a full information maximum-likelihood estimator was recently proposed by Boehmke et al.(2006).

The problem has a recursive nature: first the government decides which type of aid to grant and then competition in the market forces the firms to exit or not. The error terms in both equations could be correlated if there are unobservable factors that have an impact both on the subsidy type choice and the bankruptcy chances. Examples of such factor are the degree of firms' unionization, politicians having private information about firms, or financial variables like debt size. In the equations, I do not control for them directly, but I take them into account by adding error terms. The econometric model which best fits this situation is a bivariate probit (see Maddala (1983) or Green (2003)). I will therefore estimate the following model:

$$\begin{cases} \text{TYPE}_i & = \mathbb{I}(\beta_1' X_{1i} + \epsilon_{1i} > 0) & IndustrialPolicy \\ \text{BANKR}_i & = \mathbb{I}(\alpha \text{TYPE}_i + \beta_2' X_{2i} + \epsilon_{2i} > 0), & Bankruptcy \end{cases} \tag{8}$$

where i is a firm index, vector (ϵ_1, ϵ_2) has a bivariate normal distribution with mean zero, unit variances and $\text{corr}(\epsilon_1, \epsilon_2) = \rho$. I apply conditional maximum likelihood method.

Table 12 presents the results. To facilitate a comparison, I include estimates of coefficients for several models. Models 1, 2, 4 and 5 are the results of single equation probit estimations. Models 3 and 6 are the simultaneous specifications. In models 1-3 I control for employment in general, while in models 4-6 I distinguish between private and public employment.

The log-likelihood of the simultaneous models is higher than the sum of the log-likelihoods for the two equations estimated separately. The likelihood ratio test indeed rejects the hypothesis that $\rho = 0$ (for model 3: test statistics $\chi^2(1) = 6.7956$, p-value 0.0091, for model 6: $\chi^2(1) = 6.04384$, p-value 0.0140). According to Monfardini and Radice (2006), the likelihood-ratio test is the right method to test correlation of equations in case of small samples. Therefore, the results indicate that the equations in model (8) are correlated: unobserved factors influencing the chance for a restructuring aid have impact on the probability of bankruptcy.

Simultaneous estimation of both equations (models 3 and 6) does not change the coefficients' estimates too much, but suggests that the endogeneity issue is important for the results. In the bankruptcy equation of the simultaneous models, the coefficient on TYPE decreases when compared with the independent estimation. This is the impact of the correct specification, which takes the endogeneity of this variable into account. The exogenous treatment of the subsidy type (models 2 and 5) underestimates its real effect on the bankruptcy probability.

In the industrial policy equation of model 3, the positive coefficient of PUBLIC becomes smaller and less significant than in model 1, but its p-value of 0.157 is still not too high. This result

Table 12: Estimates of coefficients in the bivariate probit model.

	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**
Industrial policy						
recent	-2.031***		-1.921***	-2.040***		-1.737***
	(0.003)		(0.003)	(0.006)		(0.003)
public	0.821*		0.582	-2.532		-3.220
	(0.077)		(0.157)	(0.250)		(0.118)
employment	-0.042		-0.097			
	(0.769)		(0.513)			
sizeprivate				-0.246		-0.438**
				(0.204)		(0.026)
sizepublic				0.219		0.110
				(0.326)		(0.576)
infrastr	0.649		0.883	0.346		0.676
	(0.433)		(0.259)	(0.694)		(0.336)
service	0.409		0.345	-0.019		-0.279
	(0.679)		(0.710)	(0.986)		(0.782)
minman	-0.211		-0.150	-0.581		-0.395
	(0.720)		(0.823)	(0.377)		(0.562)
Germany	-0.077		-0.207	-0.318		-0.693
	(0.906)		(0.726)	(0.650)		(0.215)
France	-0.788		-0.462	-1.237		-1.072
	(0.382)		(0.504)	(0.207)		(0.151)
Italy	-0.931		-1.130	-1.406		-1.750**
	(0.227)		(0.108)	(0.101)		(0.042)
Spain	0.139		-0.114	0.037		-0.386
	(0.854)		(0.857)	(0.962)		(0.568)
Austria	-0.055		-0.221	-0.385		-0.796
	(0.953)		(0.781)	(0.694)		(0.342)
constant	0.989		1.48	2.871		4.321**
	(0.444)		(0.281)	(0.111)		(0.030)
Bankruptcy						
Subsidy type		-1.496***	-2.679***		-1.491***	-2.611***
		(0.001)	(0.000)		(0.002)	(0.000)
recent		-1.339**	-1.845***		-1.479**	-2.026***
		(0.018)	(0.000)		(0.014)	(0.000)
public		-0.053	0.301		1.487	1.153
		(0.894)	(0.412)		(0.405)	(0.490)
employment		-0.018	-0.028			
		(0.879)	(0.798)			
sizeprivate					0.101	0.048
					(0.579)	(0.777)
sizepublic					-0.118	-0.081
					(0.478)	(0.603)
service		-0.327	-0.498		-0.180	-0.295
		(0.711)	(0.512)		(0.841)	(0.694)
minman		0.296	0.130		0.372	0.244
		(0.460)	(0.720)		(0.367)	(0.523)
constant		0.673	1.639*		-0.143	1.042
		(0.480)	(0.059)		(0.914)	(0.397)
N	65	65	65	65	65	65
pseudo-R2	0.277	0.190		0.307	0.200	
log-likelihood	-30.936	-32.489	-60.403	-29.667	-32.090	-58.359
chi2	23.74	15.26	68.65	26.277	16.061	68.308
p	0.013	0.000	0.018	0.010	0.025	0.000

Population: Cross-section. P-values in parenthesis.
***(**,*) denotes significance with 1% (5%, 10%) level in a two-tailed Wald test.

suggests that public firms have a better chance to receive restructuring aid than private firms. The coefficient of PUBLIC in the bankruptcy equation is, however, not significant, suggesting that public firms are not better in survival than private firms. Therefore, governments' preference for public firms cannot be explained by these firms' higher probability of fulfilling bailouts' goals.

The effect of SIZEPRIVATE in model 6 becomes significant and much lower than in model 4. That suggests that the bigger a private firm, the less likely restructuring aid. The size of public firms is less important for the subsidy choice. This observation supports the earlier claim that governments discriminate between public and private employment to the disadvantage of the latter.

The coefficient's estimates for the RECENT variable increase in the industrial policy equation of the simultaneous models, and decrease in the bankruptcy equation. Coefficients for country effects become more significant. Italian governments clearly stand out as using more rescue aid than other governments.

6 Conclusions

The objective of this paper is to assess bailouts' effectiveness in preventing exit of firms in trouble and to identify the determinants of the governments' subsidy decisions. For this purpose, I construct a unique data set for the population of all 86 bailout cases approved by the European Commission during the period 1995-2003.

The estimated hazard rate in the population of bailed-out firms suggests that roughly one-third of firms used the subsidy to postpone the inevitable exit by up to four years. A comparison of this outcome with the hazard rate of firms protected by Chapter 11 of the US Bankruptcy Act suggests that R&R aid is less effective in preventing firms' exit than Chapter 11. Firms getting restructuring aid and firms from transportation, electricity and banking services sectors had the highest survival chances. I find that public firms receive more support due to the preference to support firms for privatization, old public firms and public employment. At the same time, public firms are not better in survival than private firms. Private employment is supported with rescue rather than restructuring aid. The tendency to grant more rescue than restructuring aid is noted in the years after 2000, suggesting that political pressure to limit this kind of aid was effective. Finally, I show that the subsidy choice is an endogenous variable in the analysis of the hazard rate. Treating it as exogenous underestimates its real impact on the bankruptcy probability.

The results drive a few policy conclusions. First, a stricter European bailout control could

reduce the number of failing bailouts. A simple strategy could be, for example, not to allow rescue aid in manufacturing, mining, construction, trade and services sectors. According to my estimates, they had the highest probability of only postponing the inevitable exit. Rescue aid was generally highly ineffective, with only about 50% chance of survival.

Second, replacing R&R aid with a bankruptcy regulation closer to Chapter 11 could be more effective in preventing firms' exit. In case of R&R aid, public money is used and delay of exit for one-third of firms is observed. Under Chapter 11 protection, taxpayers don't contribute to the bailout and still most of firms manage to survive (Li(1998)). The crucial difference is in the incentives that both systems create. R&R aid beneficiaries get support for free, while firms under Chapter 11 protection have to agree with the creditors and usually give away some of their equity. Therefore, managers are attracted by the first option, but they rather avoid the second one. One could also think of remedies in R&R aid to change this incentive effect.

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Appendix

Data set construction

The data set contains information on R&R subsidy cases in the European Union in years 1995-2003. It is a unique data set created from four data sources. Subsidy information comes from the texts of the European Commission's decision and the report by London Economics (2004) provided by Competition Directorate General. Financial and ownership information on firms from sectors other than financial comes from AMADEUS database provided by Bureau van Dijk Electronic Publishing. For firms from the financial sector I use annual reports, if available. Other firm-level data comes from newspapers.

I construct three data sets. A cross-section of decisions is a set with a decision as a unit of observation, it entails 86 observations in total. A cross-section of firms is a set with a firm receiving R&R aid as a unit of observation, it entails 79 observations in total. Finally, a panel is a two-dimensional set with aid receivers observed across time.

I build a panel based on the following principles. Subjects in the panel are all R&R subsidy beneficiaries, whose surviving status is known in at least one year. This amounts to 75 firms. Each firm was observed from the year it was bailed out until 2003 or its earlier bankruptcy. Bankruptcy is defined as ceasing the major activity of a firm. 22 R&R subsidy beneficiaries went bankrupt in the time between receiving the subsidy and the end of 2003. The remaining 53 firms were observed until the year 2003 without going bankrupt. Following the survival literature, I call them right-censored or lost, but in my context they are simply firms, which from the subsidy year up to

2003 stayed in operations. All in all, for the survival analysis I have an unbalanced panel of 409 observations, with 75 firms observed during the years 1992-2003.

Table 13: Variables used and their sources.

Variable	**Definition**	**Source**
Subsidy year	Year of subsidy transfer	decision texts
Subsidy type	Rescue or restructure	decision texts
Country	Country of the subsidizing government	decision texts
State-owned	Dummy equal to 1 if the state owns more than 50% of shares	decision texts, AMADEUS, LE report
Year of incorporation	Year in which the firm started operations	AMADEUS, LE report
Year of bankruptcy	Year in which the firm went bankrupt	LE report, newspapers
Industry	Industry with the highest share in the revenue, based on NACE (see table 14)	AMADEUS, LE report
For sale	Dummy equal to 1 if after getting the subsidy the firm was sold.	LE report, newspapers
Employment	Number of employees	AMADEUS, LE report, annual reports

Industry classification

NACE (Rev.1) comes from the French term *Nomenclature statistique des Activités économiques dans la Communauté Européenne* (Statistical classification of economic activities in the European Community) and is a European industry classification system. At the 2-digit level NACE is fully compatible with ISIC.

Table 14: Two-digit NACE classification.

Industry	**NACE codes**
Mining	12-14
Manufacturing	15-37
Electricity and water supply	40-41
Construction	45
Trade	50-52
Transport	60-64
Financial services	65-67
Other services	55, 70-99

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