PhD THESIS DECLARATION

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Thesis title: *Empirical Essays on Firm Behavior*

PhD in *Economics & Finance*
Cycle *26th*
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Year of thesis defence *2016*

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Date *31 January 2016*

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Acknowledgements

First and foremost I want to thank my adviser Antonella Trigari, an incredible passionate researcher and teacher that I look up to immensely. I am grateful for your support, help, and advice throughout the years!
My first chapter profited from valuable discussions and advice from Alberto Alesina, Aldo Rustichini, Laura Bottazzi, Nicola Pavoni, Paolo Epifani, and Tito Boeri. Furthermore, I am grateful to the Research Data Centre (FDZ) of the German Federal Employment Agency (BA) at the Institute for Employment Research (IAB) in Nuremberg for their hospitality as well as all the helpful comments from the staff. I am also thankful for financial support from the PhD school at Bocconi University as well as the *Research Thesis Grant* of the Cariplo foundation for the research project of my first chapter.
For the last chapter I am very thankful to Martin Münzel who gave me many insights and important support at the early stages of the project. I am also grateful for his data related to his dissertation on the members of the Jewish economic elite in Germany. Furthermore, I profited from discussions and suggestions from Alberto Alesina, Hannes Wagner, Maristella Botticini, and Nicolas Serrano-Velarde.
I would like to thank Bocconi University for their support. Without its people, a university is merely an institution. It is impossible to name all the people that filled this place with life throughout the years. Therefore, I would like to thank my officemates as representatives of the Bocconi crowd. Thank you for your support and discussions throughout the years. Thank you Agnese, Alexandra, Alexey, Annaig, and Emiliano!
I want to thank my friends and family for supporting me throughout the years.
And last and most important: Thank you Mariam for your love, patience and sometimes also your impatience :-). You helped me survive these years and I dedicate my work to you.

Abstract

This PhD thesis is composed of three chapters on firm behavior on a range of topics of international trade, labor economics, and economic history.

The first chapter exploits the IAB establishment dataset for Germany to investigate the volatility and cyclicality of job flows within exporters and non-exporters. On average, exporters face a lower employment volatility, even after controlling for size, which suggests a diversification of sales across markets. A closer look at the export share reveals, however, that the employment volatility is increasing in the export share for small firms, while it is decreasing for large firms. Thus, large firms seem to gain from more diversification of a higher export share, while small firms face more volatility when exporting a higher share. The findings can be rationalized by small firms with a high export share entering and exiting foreign markets more frequently due to destination specific fixed costs.

The second chapter focuses on cyclical job flows in the United States based on the Business Dynamics Statistics with an emphasis on the Great Recession. Cyclical properties of job flows of young versus more mature and smaller versus larger firms are investigated, as well as their contribution to aggregate employment fluctuations.

By means of a variance decomposition of the cyclical components of job creation, job destruction and net job creation, it is shown that while younger – and in particular young small firms – are relatively more volatile in their job flows, more mature firms contribute substantially more to aggregate fluctuations. That is, their larger weight in overall employment – mature firms employ around 80 percent of the labor force – more than compensates for their smaller cyclicality.

The third chapter investigates the heterogeneous stock market performance of "Jewish" and "non-Jewish" corporations at the Berlin stock exchange in 1933. It exploits recently collected information on religious affiliations of individual members of the executive and supervisory board of listed corporations. Based on the 1932 composition of boards, "Jewish" firms underperformed the Berlin stock exchange by about 6 to 9 percent during the first months of 1933. This result is mainly driven by firms in which Jews represented a substantial part of the executive board.

Already right away in 1933 – before many of the atrocious and inhumane policies against Jews were implemented– about one third of the Jewish elite members were removed to avoid conflicts with the new rulers of the country. Between 1932 and 1933 the average share of Jewish board members dropped from 16 to 11 percent (6 to 3 percent for executive board members and 19 to 14 percent for supervisory board members). Interestingly, those "Jewish" firms that strongly underperformed the market removed their Jewish board members almost entirely. This might be a reaction to the public pressure associated with the stigma of being "Jewish" under the new rule.

1. Introduction

This PhD thesis covers a wide range of topics related to international trade, labor economics, and economic history. It is centered around the empirical investigation of firm behavior. The first chapter investigates the association between volatility and cyclicality of job flows in Germany, the second chapter the cyclical job flows in the United States with a particular emphasis on the Great Recession.[1] The last chapter goes back to 1933 when the Nazi movement took over Germany.

The first two chapters investigate the role of job flows in heterogeneous firms. We document a significantly lower employment volatility for German exporters. The relation, however, is not monotone. While small exporters are on average less volatile than domestic establishments, their volatility increases with their export intensity. Large plants, instead, seem to insure by trading internationally as their employment volatility is further decreasing in their export intensity.

For the United States we research the job flows over the period 1982-2013. In particular, the age of firms is found to be crucial when thinking of cyclical job flows. Young firms were hit harder during the recent Great Recession. Overall, however, they contribute much less compared to employment fluctuations, because their employment share is only around 10-20 percent.

Going from the Great Recession to the times of the Great Depression leads us to the third chapter. We delve into the Germany of the 1930's and investigates the performance of Jewish firms in Nazi Germany. Stocks of firms with many Jewish board members significantly under-performed the Berlin stock exchange, even before the first boycotts against Jewish businesses started in April 1933. It suggests that investors expected a worsening of the situation of Jewish businesses in Germany right when the Nazis seized power. Part of the explanation could be also given by political connection that suddenly became worthless. The subsequent removal of Jewish board members is most likely driven by political and economic pressure. Sadly, within five years Germany lost about a quarter of its economic elite members.

[1] While the first and third chapter are single-authored, the second chapter is co-authored with Andrea Colciago and Antonella Trigari.

2. The Volatility and Cyclicality of Job Flows in German Exporters and Non-Exporters

Abstract

This paper exploits the IAB establishment dataset for Germany to investigate the volatility and cyclicality of job flows within exporters and non-exporters. On average, exporters face a lower employment volatility, even after controlling for size, which suggests a diversification of sales across markets. A closer look at the export share reveals, however, that the employment volatility is increasing in the export share for small firms, while it is decreasing for large firms. Thus, large firms seem to gain from more diversification of a higher export share, while small firms face more volatility when exporting a higher share. The findings can be rationalized by small firms with a high export share entering and exiting foreign markets more frequently due to destination specific fixed costs.

Similar to previous findings for the closed economy, the lion's share of these employment fluctuations is of idiosyncratic nature and aggregate fluctuations play only a minor role. Nevertheless, exporters and particularly large exporters are cyclical more sensitive than non-exporters. This result is in line with aggregate exports being highly pro-cyclical and suggest that exporters specialize in the production of goods and services that are more cyclical. The contribution of exporters to the variance of aggregate flows however is limited and only about one third, which corresponds approximately to their employment share.

2.1 Introduction

Firms differ in their engagement in global activities. While the majority of firms is small and produces only for the domestic market, a small fraction of highly productive, mostly large firms, is serving foreign markets.[1] This heterogeneity between exporters and non-exporters stimulated recent research and is at the heart of the new new trade theory. The strand of literature following Melitz (2003) and Eaton and Kortum (2002) aims to explain differences across firms based on their engagement in international activities. A branch of this research is focusing on the impact of globalization on the labor market performance.[2] This study is related to this literature as we focus on employment dynamics. In particular, we analyze empirically the direction between the export status – and additionally the export share – and the employment volatility. In addition we focus on the cyclical behavior of exporters and non-exporters.[3] In the analysis, the role of size will be taken into account as crucial component. Size is positively correlated with exporters and at the same time, employment volatility is found to be decreasing in size (Davis, Haltiwanger, Jarmin, & Miranda, 2006; Coşar, Guner, & Tybout, 2016). Furthermore, the size of a firm is an important determinant of its cyclicality (Moscarini & Postel-Vinay, 2012). We aim to contribute to the literature in two dimensions.

We provide new facts on the relation between exporters and their employment stability, in particular related to the intensive margin of trade. Theoretically it is ambiguous, whether exporters are more or less volatile in their sales and employment volatility.[4] Recent theoretical and empirical work has shown the existence of a threshold above which exporters are more volatile than domestic firms and below which they are less volatile (Kurz & Senses, 2016; Vannoorenberghe, 2012). Based on this research, exporting seems inherently more volatile. Potential reasons might be shocks to exchange rates, shocks to the political or legal system, or shocks to transport costs. We confirm the non-monotonic relation between export engagement and employment volatility for German exporters. But once we add size to the picture, results change. While it is true that the employment volatility of small firms increases in the export share, the opposite is true for large firms.

[1] Around 30% of all workers are employed in exporting firms. And estimates show that around 25% of all jobs are directly or indirectly dependent on exports (Yalcin & Zacher, 2011).

[2] In particular, research focuses on the relation between globalization and unemployment and the rise in inequality (Felbermayr, Prat, & Schmerer, 2011; Helpman & Itskhoki, 2010; Helpman, Itskhoki, & Redding, 2010)

[3] Obviously, there is a relation between the general employment volatility of a firm ans its cyclicality. While the cyclicality of job flows is only related to aggregate movements in the economy, the overall employment volatility of a firm is composed of both, idiosyncratic volatility and the aggregate component.

[4] The crucial components that determine the volatility are the relative size of shocks in the home and foreign countries and their co-variance. If shocks are not perfectly correlated, firms can decrease their sales volatility by choosing quantities optimally across markets. However, the relation between employment and sales volatility is not immediate.

This rises doubts of the fact that any firm can insure by trading internationally and points towards important heterogeneity between small and large exporters. A potential explanation are destination specific fixed costs that small firms cannot cover in every period, while large can. Therefore, small exporters enter and exit markets more often, which leads to a higher volatility (Vannoorenberghe, Wang, & Yu, 2014).

The second contribution relates to the cyclicality of job flows in exporters and non-exporters. Most studies in the trade literature focus on cross-sectional differences and do not consider heterogeneity in the business cycle behavior of firms. But exporters are not static objects, but exposed to various fluctuations in the domestic and foreign markets. Exporters might be acyclical, because foreign shocks are not necessarily related to the domestic business cycle. At the same time, exporters specialize in the production of durable goods, which are strongly pro-cyclical (Engel & Wang, 2011). Thus, international trade bears the potential to insure against domestic fluctuations or to increase the responsiveness to domestic fluctuations.[5] Closed economy macro studies such as Moscarini and Postel-Vinay (2012) found an important role of firm size in various countries. They argue that due to poaching of workers, more productive firms are still able to hire when labor markets are tight (Moscarini & Postel-Vinay, 2013). The result is a stronger cyclical sensitivity of large compared to small firms – in particular in upturns. International trade theories of heterogeneous firms incorporate the self-selection of more productive firms into the export market. So there are reasons to assume that the findings are not so much about size, but about the export activities of firms. So we ask the question if exporters and non-exporters differ in their cyclical job flows in Germany. The findings reveal that the net job creation rate of exporters is cyclically more sensitive – contemporaneous with GDP while leading the fluctuations in the unemployment rate. Both, job creation as well as job destruction contribute to this pattern. Overall, however, the contribution of exporting plants is relatively low and amounts to about one third of aggregate volatility in job flows, which is approximately their employment share in the economy.

The paper is organized as follows. Section 2 discusses the literature and highlights potential mechanisms, while section 3 overviews the dataset and describes the construction of measures. A first glance at descriptive statistics is included as well. Section 4 presents the empirical methodology for the results in section 5. Section 6 provides robustness of

[5] We do not focus on the role of international trade on the aggregate volatility of a country. There is an ongoing discussion about the effects of international trade on aggregate volatility in a country. In a recent study, Caselli, Koren, Lisicky, and Tenreyro (2015) find that international trade actually lowers the aggregate volatility of GDP in countries. This is in contrast of earlier research such as Newbery and Stiglitz (1984) who argued theoretically that trade can increase the aggregate volatility in a country. Based on industry-level data, di Giovanni and Levchenko (2009) found that international trade is associated with a specialization in sectors which are more volatile and hence increase aggregate volatility. The effect, however, is dampened, because these sectors are less correlated with the rest of the economy.

the results, while the last section concludes.

2.2 Related Literature and Mechanisms

Theoretical work related to the dynamic behavior of exporters in the labor market focuses primarily on the labor market dynamics after trade shocks and not so much on the business cycle dynamics of exporters. Similarly, the empirical trade literature is focused more on cross-sectional findings than on different dynamics of exporters and non-exporters.[6]

2.2.1 Firm-Level Volatility

Empirical work has shown heterogeneity between firms along the export dimension. In general, exporters are found to be larger, more productive, and pay higher wages (Bernard, Jensen, Redding, & Schott, 2012). One of these dimension is the heterogeneity in firm-level sales and employment volatility between exporters and non-exporters.[7] Because better firm-level datasets are available in recent years, the scientific interest grew to investigate the association of firm-level volatility and international trade. The idea that firms could actually stabilize their sales through international trade stems back to at least the seminal work of Hirsch and Lev (1971).[8] The idea is that shocks across markets are not perfectly correlated and firms that engage in international trade can choose where to sell their products to exploit international risk sharing of their sales.[9]
Buch, Döpke, and Strotmann (2009) provide evidence that in German manufacturing plants firm-level output volatility is reduced due to exporting. However, they investigate only the extensive margin of whether firms engage in international trade and leave out the

[6] An exception is the literature that focus on the relations between real exchange rate fluctuations and labor market dynamics. The founding articles are written by Gourinchas (1998, 1999). In there, he investigates the labor reallocation after changes in competitiveness through real exchange rate changes. Klein, Schuh, and Triest (2003) provided further evidence for the United States, while Moser, Urban, and di Mauro (2010) investigated the German economy. They find that real exchange rate changes affect mainly the job creation margin in Germany.

[7] In addition to the volatility that is related to exports there might be fluctuations rooting in the importing of firms, but we abstain from this source due to lack of data in this respect. Nguyen and Schaur (2012) investigate the channel of firm-level import and export linkages and find that domestic sales volatility of Danish exporters as well as importers is significantly higher by 13 and 15 percent.

[8] Testing the hypothesis of international risk sharing through export market diversification, Hirsch and Lev (1971) finds a positive correlation between the sales stability and the export diversification for firms in Denmark, the Netherlands, and Israel.

[9] There is also a small branch in the strategic management literature that looks at the potential to stabilize cash flows by insuring through international trade. Campa and Shaver (2002) research Spanish manufacturing firms and find a higher stability of cash flows for exporters. These cash flows are related to subsequent more stable capital investments of exporters compared to non-exporters.

intensive margin of the export intensity.[10] Vannoorenberghe (2012) formalizes the idea that firms engage in trade across markets with different volatility. He tests the implications of a partial equilibrium model with market-specific shocks and convex adjustment costs. He shows that firms react to shocks in the short run by substituting their sales across markets. A negative relation between domestic sales and foreign sales arises and there exist a threshold for which sales of exporters are more volatile than comparable domestic firms. Vannoorenberghe (2012) finds empirical evidence for this non-monotonicity of sales for French firms. In a similar style, Kurz and Senses (2016) provide empirical evidence for a non-monotonic relation between international engagement of firms and their employment volatility in the United States. They show that on average trading firms are less volatile than non-trading firms. While the frequency of trading in terms of years is negatively associated to the employment volatility, there are other factors, which lead to a higher volatility. The employment volatility increases in the export share, suggesting that trade is inherently more volatile. Thus, up to a certain degree firms insure when interacting with international markets, while they cannot insure if they engage too much in trade.[11]

This evidence suggests that there is additional heterogeneity among exporters itself along the dimension of the export intensity. Lawless (2009) shows that larger Irish firms are exporting to more markets than small firms. However, the entry and exit into markets is much more volatile than the decision to export in general. This means that many exporters do not constantly serve their destination markets. For Chinese firms Vannoorenberghe et al. (2014) find heterogeneity between small and large exporters. Interestingly, the diversification across markets does not hold for small exporters, while it does for large. Small exporters face an increasing volatility in their exports if they sell to a more diversified set of countries. In contrast, large exporters decrease their volatility as the outlined argument from portfolio theory suggests. A theoretical explanation for this pattern is suggested by destination specific fixed costs (Vannoorenberghe et al., 2014). These costs cause small exporters to enter and exit markets more often as they cannot cover the fixed costs, while large exporters serve these markets permanently. This leads to a higher volatility of sales for small compared to large exporters.[12]

[10] In addition they only investigate manufacturing plants from the State of Baden Württemberg.

[11] One very obvious explanation that is taken care of by respective controls is based on firm size. Findings of firm-level volatility in the closed economy set-up show a negative relation between firm size and employment volatility (Davis et al., 2006; Comin & Philippon, 2006). Larger firms are closer to their optimal size and do not have to grow much any more.

[12] Note that small and large in this context is related to the firm size. However, it turns out that the export intensity is positively related to the size of a firm.

2.2.2 Cyclicality

Cyclical fluctuations in aggregate exports are studied in Engel and Wang (2011). In their work the authors verify for OECD countries that exports as well as imports are more volatile than GDP and pro-cyclical. Only net exports are counter-cyclical. Further, they show that a large fraction of exports takes place in durable goods – in Germany 69% of imports and 71% of exports. To explain these findings, the authors construct a model that features trade in investment goods as well as durable consumption goods. When a positive productivity shock hits the economy, the demand for domestic and foreign investment goods increases, leading to an increase in imports. At the same time, the increased supply of the export good lowers its price and leads to increasing exports, because of the higher demand from abroad. The durable consumption sector helps to increase volatility of durable goods, because agents expect higher future income and this wealth effect leads to an increase in the consumption of durable consumption goods. The main argument for the pro-cyclicality of exports is threfore based on the type of goods that are traded and produced by exporters.[13]

The recent strand of literature on cyclical labor market dynamics of firms generally abstracts from international engagement of firms. Moscarini and Postel-Vinay (2013), for example, emphasize the importance of job-to-job transitions due to labor poaching of more productive firms. Because more productive firms can attract workers through higher wages even when the labor market is very tight, i.e. in booms, more productive firms will be larger on average and more sensitive to the cycle compared to small firms. This is in line with their empirical findings for the United States and some European economies (Moscarini & Postel-Vinay, 2012).[14] Since new-new trade theory is built on a one-to-one relationship between productivity, size, and selection into the export market, the theoretical argument of worker poaching could explain differences between exporters and non-exporters as well.[15]

In principle, exporters and non-exporters can differ in their elasticity of factor demand and supply. Lichter, Peichl, and Siegloch (2014) find that the unconditional own-wage elasticity in German exporters is higher than in non-exporters. This suggests that exporters are more responsive to a given shock. In this case, the cyclical employment volatility should be higher at the firm-level for exporters compared to non-exporters.

[13] At the same time, di Giovanni, Levchenko, and Mejean (2016) show that exporters are closer linked to the aggregate shocks of their destination country and might therefore transmit shocks to the domestic economy. Because Germany is a very open economy in general, a larger part of the domestic cycle could be actually driven by an international cycle.

[14] Actually the paper in hand is closely related to their empirical paper.

[15] Trade, however, could be not the cause of the cyclical job flows, but rather a coincidence, because more productive firms select themselves into the export market. However, the existence of small exporters does not fit into this picture.

There are also other explanations that are observationally equivalent with a higher cyclical sensitivity of exporters compared to non-exporters.[16]

2.3 Data, Measures, and Descriptive Statistics

2.3.1 Dataset

The main data source is given by the IAB-Establishment Panel, provided by the German Institute for Employment Research ("*Institut für Arbeitsmarkt- und Berufsforschung*"). The dataset contains annual survey information on establishments in East and West Germany, but is unbalanced over time.[17] The unit of observation is therefore given by the establishment.[18] Out of the universe of all establishments in Germany with at least one worker subject to social security contributions, establishments are randomly drawn and interviewed according to strata defined over federal state, industry, and size.[19] In this process, large firms are oversampled to ensure that enough respondents of this group are in the sample. To guarantee representativeness, sample weights are computed by comparing the sample of establishments with the population of establishments in the given strata cells.[20] In general, the statistics are representative for about 80% of all employed persons

[16]It could also well be the case that the domestic business cycle is endogenous and generated by the behavior of exporting firms. Based on the idea of Gabaix (2011) that the law of large numbers does not hold and large firms can actually cause aggregate fluctuations, di Giovanni and Levchenko (2012) show that this mechanism is particularly relevant for exporters. Based on a selection mechanism into trade according to Melitz (2003), they argue that opening up to trade leads to an increase in size of exporters and in turn increases their importance to aggregate fluctuations. For detailed French data they provide also evidence that firm-specific components contribute substantially to aggregate fluctuations(di Giovanni, Levchenko, & Mejean, 2014). A similar idea of why large firms might be important for aggregate fluctuations is proposed by Acemoglu, Carvalho, Ozdaglar, and Tahbaz-Salehi (2012). They base their argument on a network mechanism in which shocks to the final good producers are transmitted through linkages to the suppliers of intermediate goods. However, this mechanism is only testable with detailed input linkages between firms and a large sample of firms. The data used in the study in hand do not allow for this.

[17]An overview of the dataset can be found in Ellguth, Kohaut, and Möller (2014).

[18]The vast majority of establishments are single-establishment firms at the same time, but some belong to multi-establishment firms as well. The dataset does not allow to aggregate information on the firm level, but contains information on whether the establishment is the single-unit of operations or whether there are more establishments in the same firm. We will control for the structure of the firm and check for robustness in section 2.6.3 by simply constraining on single-plant firms.

[19]The panel is well distributed across regions and industries. Nevertheless, we will include industry and state dummies to guarantee that our results are not driven by the unequal sampling of firms across heterogeneous industries.

[20]An implication is that we cannot test whether the weights are representative in the export dimension as well. Thus, one crucial assumption is that the sample is assumed to be representative with respect to all dimensions used in this paper, in particular the export dimension. This assumption is usually not

in Germany.[21] Therefore, the panel covers also plants outside the private sector. We decided to drop the plants in public administration to make sure that hiring decisions are driven by motives of the private economy.

The collected data from the personal interviews with plant managers contains information on – among others – total employment, total revenues, share of revenues from abroad (export intensity), industry, total wage bill, and bargaining arrangements. In certain years, the panel includes also answers to questions on institutional features such as short-time work or the credit conditions during the Great Recession.[22]

The sample period in this study is restricted to 1996 to 2012, because prior to 1996 only data for West Germany is available. A further restriction comes from the fact that the export measure is reported for the previous year and therefore information on exports are missing for the most recent year. The number of interviewed establishments is increasing from 8,342 establishments in 1996 to 15,857 in 2012.

The IAB-Establishment panel allows to compute job flows as described in section 2.3.1.[23] When we compute semi-aggregated job flows, the sample shrinks slightly, because only firms that change their employment stock within two subsequent periods are taken into account as required by the definition of job flows.

Size and Export Status

We group firms according to their employment size and export status. Both measures are highly correlated as it is common the empirical trade literature (Bernard et al., 2012) and explained by the Melitz model. As more productive firms grow larger and at the same time self-select themselves into the export market, large firms are exporters, while small firms stay non-exporters. In reality, the size distribution of exporters and non-exporters is overlapping and only on average, exporters are larger than non-exporters.

clearly stated in previous studies on the dataset. Note however that even if problems of representativeness might emerge all results are obviously correct for the actual sample of firms used in this study. Thus, the problem boils down to a potential problem of representativeness.

[21] Excluded categories are mainly civil servants, workers in marginal employment, and family workers.

[22] Unfortunately, the dataset does not include information on the import share. Only in three years there is information on used material from abroad.

[23] In a previous version of this study, worker flows were analyzed as well. But since the research focus was narrowed down, we decided to drop the analysis of worker flows and leave it for future research. In principal, the IAB-Establishment Panel contains information on worker flows. However, only on accessions and separations in the first half of the year. Instead, worker flows are available as an extension file for the Establishment History Panel (BHP). Since the establishments contained in the IAB-Establishment Panel are a subset of the BHP panel, this extension file can be easily merged with the IAB-Establishment Panel as well. Recently, Baumgarten (2015) analyzed the relation between worker flows and international trade at the plant-level for Germany. He finds unconditional evidence for lower worker flows in trading compared to non-trading establishments. However, once plant fixed effects are taken into account, this relation loses statistical significance.

By assuming that productivity is not the only source of heterogeneity, but firms face additionally idiosyncratic export costs, an overlapping size distribution can be generated (Armenter & Koren, 2015).[24]

Based on their beginning of the period employment, establishments are defined as *Small* (0-50 employees), *Medium* (50-500 employees), and *Large* (>500 employees).[25] Whenever useful we will also use the continuous employment measure, given by the number of employees. The discrete size measure mainly helps to relate to findings in the literature and get stylized facts on small and large plants.

The main variable of interest for us is the export status of an establishment along with its export intensity, i.e. the share of exports in total revenues. The export status is defined according to the reported share of revenues from abroad. Zeros or non-respondents are defined as non-exporters, positive values indicate exporters.[26] In contrast to the size categorization, establishments are classified as exporters or non-exporters according to their current engagement in international activities.[27] The revenue share from abroad was already used in many other studies on Germany to distinguish between exporters and non-exporters.[28]

Table 2.1 provides evidence on the correlation between size and export status. Both, the continuous measures, i.e. export share and employment, as well as the discrete measure, i.e. export dummy and size groups, are correlated and highly significant. The correlation between the discrete measures is about twice as high as the correlation of the continuous measures.

[24]The mechanism of Armenter and Koren (2015) leads to an outcome in which some high productive firms face too restrictive export costs and stay non-exporter and some low productive firms get a lucky export cost draw and serve the foreign markets as well.

[25]Thus, when using these size classes we always have in mind the employment stock of a firm. In principle, one could also use similar definitions for firms that export a large share or a small share, but we will use other descriptions for those cases.

[26]Counting the non-respondents as non-exporter could bias our results. In case many of the non-responding plants are actually exporting, our effects are under-estimated. We will take this bias serious in the robustness checks, but prefer to have a larger sample for the baseline scenario.

[27]Due to this classification, the panel loses one year of observations. But since the actual interest for the cyclical analysis is related to the current performance, the status in the respective period is relevant. For the general volatility measures there is no difference, because only the export status over time divides the sample into non-exporter, part-time exporter, and exporter.

[28]Schank, Schnabel, and Wagner (2007), for instance, used it to analyze wage differences between exporters and non-exporters. Baumgarten (2013) used the variable to research the impact of exporting activity on the risen residual wage inequality in Germany. And we mentioned already the study of Moser et al. (2010) who investigate the role of changing competitiveness due to exchange rate movements on job flows.

Table 2.1: Correlation between Size and Export Measure

Continuous Measures	Discrete Measure
0.19	0.34
(0.00)	(0.00)

The table reports correlation coefficients and p-values for the correlation between the size and the export measure.

But it is not only the export status that is correlated with size, but also the export intensity. Figure 2.1 reveals this interesting pattern. The export share is increasing in the size of exporters. For a dynamic model this suggests that exporters grow more than proportional in the export market.

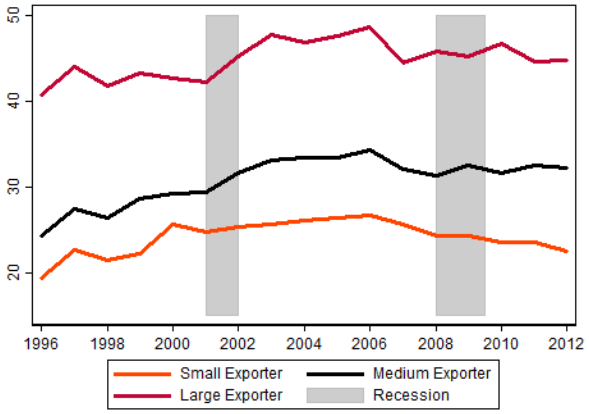


Figure 2.1: Weighted Export Share by Size Group

Along with this distinction between exporters and non-exporters come transition probabilities for plants that change their export status over time. Table 2.2 reports the share of plants that change their status within a year. Actually, the entry and exit into the export market does not play a major role over the cycle, but rather the intensity of exports varies over time. In many parts of the analysis we therefore abstain from the entry and exit into the export market or simply consider always exporters, part-time exporters, and always non-exporters.

Table 2.2: Transitions between Non-Exporting and Exporting

	Non-Exporter$_{t+1}$	Exporter$_{t+1}$
Non-Exporter$_t$	95%	5%
Exporter$_t$	10%	90%

The table reports the transition probabilities between exporting and non-exporting status for the pooled sample of plants (1996-2012).

Part of the analysis will exploit the continuous dimension of the export share. We report the pooled distribution of those establishments with positive export revenues in table 2.3. Conditional on being an exporter, the international engagement of establishments is quite heterogeneous. While many establishments earn only a relatively small fraction of their revenues from abroad, a substantial part of firms report a large export share. 33% of all exporting plants earn 1-10% of their revenues from abroad, while 23 % of exporters export more than 50% of their sales and are strongly dependent on developments in other markets.

Table 2.3: Distribution of Export Intensity (in percent)

Export Share	1-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91-100
Observations	9019	4134	3034	2596	2211	1808	1490	1275	858	615
Percentage	33%	15%	11%	10%	8%	7%	6%	5%	3%	2%

The table reports the pooled (1996-2012) number of establishments within certain export share groups and their distribution as percentages. Over the whole sample period 29% of plants exported.

Unfortunately, only for few years information on the destinations of the exports is available and therefore cannot be used in a more rigorous analysis. In the questionnaire establishments are asked about the destination region. For those years in which data is collected, we can observe some heterogeneity between small and large exporters. We will only focus on the export share to the euro area as a share of overall exports.[29] Table 2.4 reports the share of exports to the euro area broken down by size of exporters. In addition, the rightest four columns report the export share of those exporters that export overall a share above and below 30% or 50%.
On average, 60% of the exports are shipped to the euro area. Small exporters export 62% towards the euro area, while 57% of the sales of large plants come from the euro area.

[29]The panel contains information on exports to the countries of the currency union for the years 1997-2006. The group of countries contain the 10 other founding members of the euro area and from 2000 onwards Greece.

This difference, however, seems to be driven by compositional effects. Overall, the share of goods shipped to the currency union is decreasing in the overall export intensity. When comparing the plants that earn more than 30% of their revenues from abroad with the one below we see a decrease in the share of the exports that are shipped to the euro area. The average share shipped to the euro area drops to 54%. For those plants that ship more than half of their products abroad, the share of the exports that stays in the euro area drops even to 48%. We do not observe strong differences between exporters of different size in this respect. When taking into account the mass of exporters, however, we see that the fraction of large exporters that exports more than 50% of the overall exports is higher compared to small exporters (204 out of 425, compared to 131 out of 525). Therefore, the differences between the average small exporter and the average large exporter are of compositional nature. The increase in the overall export share in plant size is in line with the findings of Lawless (2009). She finds a positive relation between the size of a firm and the number of markets it serves.

Table 2.4: Export Intensity and the Export Share to the Euro Area

	Export Share	Euro Area	Overall Export Share <30%	>30%	<50%	>50%
Small	0.32	0.62	0.69	0.53	0.67	0.49
N	756	525	298	227	394	131
Medium	0.36	0.61	0.68	0.54	0.66	0.46
N	1366	1087	513	574	787	300
Large	0.46	0.57	0.67	0.54	0.64	0.50
N	468	425	104	321	221	204
Overall	0.37	0.60	0.68	0.54	0.66	0.48
N	2590	2037	915	1122	1402	635

The table reports the shares of exports shipped to the euro area. The complementing share is shipped to the rest of the world. The numbers refer to the average share for all years in which the measure is available (1997-2006).

Job Flows Rates

In the IAB Establishment Panel, plants report their stock of employees with respect to the 30th of June in the current as well as the previous year.[30] These information on the employment count will be used to construct two types of measures in the spirit of Davis, Haltiwanger, and Schuh (1996).[31] The first one is based on the establishment and will correspond to a net job creation rate. It is similar to the usual employment growth measure, just bounded between -2 and 2. The second one will be a semi-aggregated measure for the six size/exporter groups defined above. While the plant level variable will be used to construct a plant-specific volatility measure as well as for panel regressions, the semi-aggregate measure for job flows will be exploited for a correlation analysis and the variance decomposition.

The net job creation rate for establishment i in period t is specified as

$$njcr_{i,t} = \frac{E_{i,t} - E_{i,t-1}}{\frac{1}{2}\left(E_{i,t} + E_{i,t-1}\right)}, \tag{2.1}$$

where $E_{i,t}$ corresponds to the number of workers in establishment i at period t.

The semi-aggregated measure of job flows classifies establishments either as job creators or as job destroyers, depending on the net employment change in a given period. The net job creation rate for group S in time t is defined as:

$$NJCR_t^S = \underbrace{\frac{\sum_{i \in S^+} \omega_{i,t} \cdot (E_{i,t} - E_{i,t-1})}{\sum_{j \in S} \frac{1}{2}(E_{j,t} + E_{j,t-1}) \cdot \omega_{j,t}}}_{JCR_t^S} - \underbrace{\frac{\sum_{i \in S^-} \omega_{i,t} \cdot (E_{i,t-1} - E_{i,t})}{\sum_{j \in S} \frac{1}{2}(E_{j,t} + E_{j,t-1}) \cdot \omega_{j,t}}}_{JDR_t^S}, \tag{2.2}$$

where S^+ (S^-) defines those subset of plants, belonging to size/export group S, that on net create (destroy) jobs. The first term sums all created jobs for a group and rescales it by the average employment of this group. During this process of aggregation, we take into account the strata weights ω to guarantee representativeness for the overall economy.[32]

[30] Since the panel of establishments is not readily available, but has to be constructed from individual waves, there are slight differences in the reported number of employees. Some establishments report a certain labor force in period t-1 for period t-1, but report a different labor force in period t for period t-1. Different computation procedures were implemented and revealed that all results are robust.

[31] Note that in general the measures of job flows are based on head-counts and neglects the intensive margin, i.e. the adjustment via hours worked. The IAB Establishment Panel does not report information on the hours worked in an establishment. Thus, a problem might arise with the head-count measure during the Great Recession, because most of the adjustment came through the intensive margin compared to the extensive margin. Boeri and Brücker (2011) show that exporting establishments rely more on short time work compared to non-exporting plants. Thus, we would expect less action on the extensive margin for those establishments, i.e. less employment volatility, but also less cyclical sensitivity of exporters.

[32] As already mentioned above, the panel contains oversampled large establishments that in turn have to be down-weighted in their importance compared to small establishments.

The second term defines the group-specific job destruction rate and the difference between both terms is defined as the net job creation rate.

Business Cycle Measures

To analyze the cyclical role of job flows additional data series for the aggregate fluctuations in Germany are necessary. Therefore, data for aggregate output, exports, and unemployment is merged to the dataset. Data on real GDP for Germany is taken from the Monthly Economic Indicators of the OECD.[33] This time series is aggregated on an annual basis from July of the previous period to June in the current period to assure an overlap with the sample period of the IAB-Establishment panel. Only for illustrative purposes, real exports are included as well to get an impression on the cyclicality of overall exports. The timing is consistent with the timing of GDP.
The monthly unemployment rate comes from the Federal Employment Agency (BA).[34] The measure is based on the number of dependent employees and is not seasonally adjusted. However, when taking yearly averages a seasonal adjustment is obsolete in the context of this paper.[35] The measure is constructed as an average of the unemployment rate between July in the previous period and June in the current period.
Figure 2.2 plots the aggregate measures over time. In addition to GDP and the unemployment rate, which are the two main aggregate measures used in the further analysis, the real export component of the GDP series is included in the plots. The left panel shows that aggregate exports grew strongly during the period under observation, while unemployment slightly fell.[36] All series underlie business cycle fluctuations, which are depicted in the right panel. The HP-filtered rates highlight a strong pro-cyclicality of exports. During booms and recession periods exports over-shoot, meaning that they grow or drop stronger than overall GDP. These findings are in line with Engel and Wang (2011) who found a 2.86 higher standard deviation of real exports compared to GDP. As an explanation they proposed the large fraction of durable goods in overall exports, which they measure to be 71% for German exports. Consumers invest in these durable goods more in booms and postpone purchases of durable goods during recession periods instead.

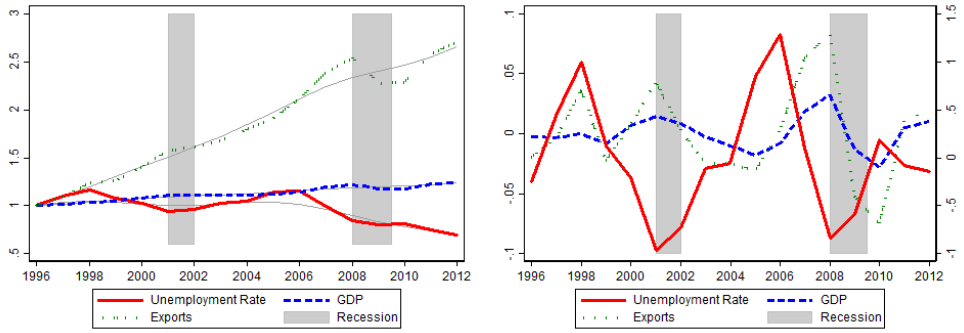
[33] Edition January 2015

[34] Data is taken from table 2.1.2 of "*Arbeitslosigkeit im Zeitverlauf - Januar 2013*".

[35] Obviously, the average unemployment rate could be lower (higher) in case the seasonal adjustment would lead to decrease (increase) the reported unemployment rate in certain months if there was a time varying pattern in the seasonality. Assuming a constant seasonal pattern over time, the potential mistake due to leaving out seasonal adjustment does not impact changes of the average annual measure over time.

[36] Imports, which are not shown in the plots, grew over the period as well. The net exports are still increasing over this period, but not as dramatically as suggested by our plot. But what matters for us in this context is the cyclicality and not the trend component of the data series.

Figure 2.2: Unemployment, GDP, and Exports over Time



In the left panel, variables are indexed to 1 in 1996. In addition to the reported data series, trends from an HP filter with parameter 6.25 are included. The right panel depicts the HP-filtered series of all three variables.

Table 2.5 reports correlations (and significance levels) between the three plotted measures and confirms that exports are strongly positive correlated with GDP over the cycle. Moreover, GDP and unemployment are negatively correlated as expected.

Table 2.5: Correlation between Unemployment, GDP and Exports

Unemployment – log GDP			Unemployment – log Exports			log GDP – log Exports		
Raw Data	HP	FD	Raw Data	HP	FD	Raw Data	HP	FD
-0.72	-0.50	-0.41	-0.64	-0.19	-0.08	0.99	0.93	0.90
(0.00)	(0.04)	(0.11)	(0.01)	(0.45)	(0.77)	(0.00)	(0.00)	(0.00)

The table reports correlation coefficients and p-values for the correlation between the respective variables between 1996 to 2012. The specifications are given by the raw data series, HP-filtered (parameter 6.25) series, and series in First Differences.

2.4 Specifications and Estimation Method

We are interested in volatility and cyclicality of job flows. First, we want to investigate the establishment-level employment volatility across non-exporters and exporters and potential heterogeneity along the intensity of exporting. We will control also for exporters of different size. Second, we analyze the cyclicality of job flows in exporters and non-exporters. While the first question is mainly based on a standard OLS regression framework, the second question on the cyclicality is answered with a correlation analysis as well as a variance decomposition.

2.4.1 Plant-Level Employment Volatility

Our dependent variable will be a time invariant volatility measure for the period 1996 to 2012. We constrain on establishments with employment information of at least 5 years over this period. The volatility measure is based on the residual approach of Vannoorenberghe (2012); Kurz and Senses (2016). This means that we construct the volatility measure from a residual of a panel regression.
In a first step we run the $njcr_{i,t}$ of establishment i in period t on a plant-fixed effect α_i and an industry-time dummy $\gamma_{j,t}$. By doing so, we take into account the plant specific average net job creation rate as well as industry wide time varying fluctuations.

$$njcr_{ijt} = \alpha_i + \gamma_{jt} + \varepsilon_{it}, \tag{2.3}$$

The error term ε_{it} represents the deviation from the plant-level average as well as from sector specific shocks at time t. While the within-plant effects could be taken care of by simply demeaning the net job creation rate, we cannot adequately control for industry specific fluctuations without imposing a balanced panel.[37]
In a second step, we compute our primary volatility measure σ_{njcr} as the standard deviation of the residual from the previous regression over the time window ω as:

$$\sigma^{\omega}_{njcr,i} = \sqrt{\frac{1}{\omega - 1}\sum_{\tau=0}^{\omega} \varepsilon^2_{i,\tau}} \tag{2.4}$$

To ensure the robustness of the results, we construct a second volatility measure $\sigma njcr_2$. It is defined as the standard deviation of the demeaned net job creation rate.

[37]The reason is simple. Imagine two establishments, A and B, with identical low volatility in an industry that is hit by a severe shock in period t. The only difference between A and B is that A is observed in period t, while B is only observed from $t+1$ onwards. By simple demeaning the industry wide shock would be counted as idiosyncratic shock to A. Not even the industry dummy in a regression could account for the shock, because A and B are in the same industry.

$$\sigma^{\omega}_{njcr_2,i} = \sqrt{\frac{1}{\omega - 1}\sum_{\tau=0}^{\omega} njcr_{i,\tau} - \overline{njcr_{i,\omega}}} \tag{2.5}$$

In addition to the employment volatility measures we will construct equivalent measures for sales volatility. Table 2.6 gives a brief overview of the averages across size and export groups. On average, exporter report a lower volatility for employment as well as sales volatility in both measures. In addition, the table confirms the finding of Davis et al. (2006) that employment volatility is decreasing in size. While small establishments report a standard deviation of 0.17-0.20 for σ_{njcr}, large plants report only a standard deviation of $0.13 - 0.09$.

Table 2.6: Volatility by Size/Export Status

	σ_{njcr}		σ_{njcr_2}		σ_{SALES}		σ_{SALES_2}	
	NE	E	NE	E	NE	E	NE	E
Small	0.20	0.17	0.18	0.15	0.23	0.21	0.24	0.24
Medium	0.15	0.10	0.13	0.09	0.20	0.19	0.22	0.24
Large	0.13	0.09	0.11	0.07	0.23	0.16	0.25	0.22
Total	0.19	0.12	0.17	0.10	0.22	0.19	0.24	0.22

The table reports average standard deviations for the respective groups.
"NE" stands for non-exporter, "E" for exporter.

Table 2.7 reveals a high correlation of 0.98 for the measures for employment volatility. Similarly, the measures for sales volatility are strongly correlated with a coefficient of 0.80. However, the correlation between employment volatility and sales volatility is not as high with around 0.27. It suggests that sales volatility is not directly mapped one for one into employment volatility.

Table 2.7: Correlation of Volatility-Measures

	σ_{njcr}	σ_{njcr_2}	σ_{SALES}	σ_{SALES_2}
σ_{njcr}	1			
σ_{njcr_2}	0.98	1		
σ_{SALES}	0.27	0.26	1	
σ_{SALES_2}	0.27	0.27	0.80	1

The table reports the correlation coefficients between the establishment-level volatility measures.

Table 2.8 reports again the employment volatility of exporters and non-exporters, but

further divides exporters according to their export intensity. Either above and below 30% or above and below 50% of their sales, analogous to the distinction for the export share in the Euro area in table 2.4. This allows us to get an idea about the potential heterogeneity of exporters in terms of their volatility. We have seen already that the volatility is decreasing in size. Among exporters from 0.17 of small exporters to 0.09 of large exporters. Table 2.8 reveals additional differences along the export intensity. The volatility of exporters increases from 0.15/0.16 to 0.19/0.20 when comparing those establishments below and above an export share of 30/50%. This is in line with the recent findings of Kurz and Senses (2016) on the United States. When looking at large exporters, however, the pattern is flipped. The employment volatility is actually decreasing in the export intensity, from 0.11/0.10 to 0.08/0.08 for plants below and above 30/50%.

Table 2.8: Volatility of Small and Large Exporters and their Export Intensity

	Non-Exporter	Exporter	Export Share			
			<30%	>30%	<50%	>50%
Small	0.20	0.17	0.15	0.19	0.16	0.20
N	6962	756	438	318	575	181
Medium	0.15	0.10	0.10	0.11	0.10	0.10
N	1635	1366	658	708	988	378
Large	0.13	0.09	0.11	0.08	0.10	0.08
N	290	468	117	351	245	223
Overall	0.19	0.12	0.12	0.12	0.12	0.12
N	8887	2590	1213	1377	1808	782

The table reports the standard deviations and underlying number of observations for the respective size and export groups. Exporters are further split with respect to their export intensity.

We want to investigate the robustness of this association between our time invariant volatility measure and the different types of plants. Therefore, we will estimate a specification similar to Kurz and Senses (2016), but emphasizing the heterogeneity between small and large exporters. The OLS regression for establishment i is described by:

$$\ln \sigma_i = \alpha + \beta_1 Exp_i + \beta_1 Exp_i \times Size_i + \beta_2 Expshare_i \times Size_i + \gamma X_i + \nu_i, \qquad (2.6)$$

where Exp_i a dummy for exporting establishments, $Expshare_i$ the export intensity, and $Size_i$ is a set of dummies for $Small$, $Medium$, and $Large$. X_i is a vector of firm level controls and additional dummies. Due to the construction of the data set, the most obvious control variables are along the dimension of the stratification, i.e. industry, size, and state. We construct industry dummies according to the classification in appendix

A.1.2. The size of establishments is controlled for by the logarithm of the employment stock.[38] Dummies for the 16 German states are included to make sure that the sampling does not bias the results. The logarithm of total sales is included as an additional control for plant size. Furthermore, a measure for the average wage is constructed by dividing the total wage bill by the number of employees. This variable can help to capture the productivity of establishments. Both, sales and the average monthly gross wage are converted into Euro before 2002 and deflated with the CPI, downloaded from OECD.Stat. In addition, a dummy controls if the plant is subject to an industry-wide wage agreement. The structure of the company can be controlled for by the information on whether the establishment belongs to a single-plant firm, is the place of business, the head office, or the middle-level authority.[39] The age of the firm will be proxied by a dummy that takes the value 1 if a plant is less than 5 years old, and 0 otherwise. The idea is that young plants face an up or out dynamic in which they either grow and create many jobs or leaving the market when failing with their business idea. In principle, one could also control for initial investment and the usage of intermediate inputs as well. But too few establishments reported values for these variables and the sample size would shrink too much. Therefore, they are not used as control variables.

2.4.2 Cyclicality of Job Flows and Variance Decomposition

To investigate the cyclicality of job flows we construct semi-aggregated job flows in the spirit of the Business Employment Dynamics (BDS) dataset or the Business Employment Dynamics (BED) for the US. Recent research in the field of macro labor has used such datasets extensively.[40]

The cyclical measure is based on HP-filtered semi-aggregated job flows as defined above.[41] Then, we compute correlations between the cyclical components of job flows and our aggregate measures. So for example, we can estimate a correlation between GDP growth and the NJCR as:

$$Corr(\widetilde{\log(GDP_t)}, \widetilde{NJCR_t}) \tag{2.7}$$

We report also the associated p-values for the significance level of the correlations.

To judge about the relative importance of cyclical job flow rates of certain groups of firms, the overall variance of job flows is decomposed into individual contributions of

[38] We also tried the specification with our size dummies and results did not change.

[39] For the years before 1998 we adjust the given answers as they were changing order in the survey interview.

[40] For instance Moscarini and Postel-Vinay (2012), Fort, Haltiwanger, Jarmin, and Miranda (2013) or Colciago, Lindenthal, and Trigari (2016) researched the cyclical role of establishment size and age.

[41] However, applying the HP-filter to a short time series might cause trouble due to the end points that can bias the results. To verify the cyclical results, the data series are also first differenced. First differencing, however, is not a perfect method either, because it generates very volatile series.

size/export classes. Since we have to take into account employment weights we follow the decomposition of Colciago et al. (2016) based on a Taylor expansion of job flows around their trend.[42]

Denoting the deviations from trend with a tilde and the trend itself with a bar, the variance of any aggregate job flow rate $V(\widetilde{X}_t)$ can be decomposed into individual contributions.

$$V(\widetilde{X}_t) = \sum_{i \in size/exporter} Cov\left(\overline{\omega_{i,t}} X_t^i\right) + Cov\left(\overline{X_t^i}\widetilde{\omega_{i,t}}\right), \tag{2.8}$$

where $\omega_{i,t}$ refers to the employment weight of group i in time t. Size/exporter groups are the six previously defined categories given by small, medium, and large establishments and their further split into non-exporters and exporters.

$$1 \approx \sum_{i \in size/exporter} \frac{Cov(\widetilde{X}_t, \overline{\omega_{i,t}}\widetilde{X_t^i})}{V(\widetilde{X}_t)} + \frac{Cov(\widetilde{X}_t, \overline{X_t^i}\widetilde{\omega_{i,t}})}{V(\widetilde{X}_t)} \tag{2.9}$$

2.5 Results

2.5.1 Employment Volatility

Before estimating the actual model described in equation (2.6), we estimate two additional models. Column (1) reports the association of being an exporter and employment volatility, column (2) investigates the non-monotonicity between exporting and overall employment volatility, while column (3) is the fully specified model. In the full model we control for the size of exporters and allow for a heterogeneous response of the export intensity across exporters of different size. We want to test empirically the descriptive evidence of additional heterogeneity across exporters, outlined in table 2.8 above.

Table 2.9 reports the results of the baseline specification. On average, exporters face a 11.9% lower employment volatility as can be seen from column (1). This underlines the idea that it is likely that exporters differ from non-exporting plants in the magnitude of shocks they face as well as their frequency and volatility.

The regression in column (2) shows the non-monotonic relation between the international engagement of firms and the employment volatility, which was found by Kurz and Senses (2016); Vannoorenberghe (2012). While exporters face a 17.2% lower employment volatility, this volatility is increasing in the export share. However, the actual threshold in terms of the export share at which exporters are more volatile than domestic producers is quite high with 87%.

[42] Remember that the overall job flows are employment weighted job flows of individual groups. For example, the net job creation rate of small exporters is given by $\frac{NJC_t^{s,e}}{\frac{1}{2}[E_t^{s,e}+E_{t-1}^{s,e}]}$, while its contribution to the overall net job creation rate is $\frac{\frac{1}{2}[E_t^{s,e}+E_{t-1}^{s,e}]}{\frac{1}{2}[E_t+E_{t-1}]} \frac{NJC_t^{s,e}}{\frac{1}{2}[E_t^{s,e}+E_{t-1}^{s,e}]}$.

The model of column (3) reveals additional heterogeneity among the exporters. Small exporters are on average 11.2% less volatile than non-exporters, but once they have a larger export share than 37.3% they are overall more volatile than a non-exporter. Large exporters in contrast are not only on average 11.2% less volatile, but their employment volatility is also decreasing in the export share.[43]

Table 2.9: Plant-Level Employment Volatility

	$\log(\sigma_{njcr})$		
	(1)	(2)	(3)
Exporter	-0.119***	-0.172***	-0.112**
	(0.00)	(0.00)	(0.02)
Medium Exporter			-0.147**
			(0.02)
Large Exporter			0.088
			(0.47)
Export Share		0.002**	0.003***
		(0.01)	(0.00)
Medium Export Share			-0.002
			(0.11)
Large Export Share			-0.005**
			(0.02)
log(Employment)	-0.073***	-0.071***	-0.063***
	(0.00)	(0.00)	(0.00)
njcr	0.209**	0.205**	0.194**
	(0.02)	(0.02)	(0.03)
log(Sales)	-0.053***	-0.056***	-0.054***
	(0.00)	(0.00)	(0.00)
log(Average Wage)	-0.006	-0.006	-0.016
	(0.72)	(0.74)	(0.35)
Skill Composition	-0.003***	-0.003***	-0.003***
	(0.00)	(0.00)	(0.00)
Young	0.226***	0.223***	0.223***
	(0.00)	(0.00)	(0.00)
Industry-wide	-0.141***	-0.140***	-0.136***
wage agreement	(0.00)	(0.00)	(0.00)

Continued on next page

[43]The effect of the export intensity is the combined effect of the general export share (-0.003) and the export share for large exporter (0.005), i.e. 0.002.

Table 2.9 – *Continued from previous page*

Constant	-0.718***	-0.696***	-0.671***
	(0.00)	(0.00)	(0.00)
State dummies	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes
Organizational dummies	Yes	Yes	Yes
Observations	10107	10107	10107
R^2	0.144	0.145	0.147

1,2, and 3 stars represent the 10%, 5%, and 1% significance level respectively.

Furthermore, the regressions show that the employment volatility is generally negatively associated with the size of an establishment as found by Davis et al. (2006). This is true for both measures of size, log(Employment) as well as log(Sales). Plants with a higher skilled labor force have also a significantly lower employment volatility. Surprisingly, also the industry-wide wage agreement is negatively associated with the employment volatility. At the same time employment growth and younger plants are positively associated to volatility.

2.5.2 Impact of Sales Diversification and Sales Volatility

The idea that firms trade with multiple countries to insure against shocks is mainly centered around the actual sales of firms. The transmission channel from sales volatility to employment volatility is not researched so far and it is not clear how firms adjust their labor stock as response to shocks in foreign countries. The IAB Establishment Panel includes self-reported annual revenues, which we use to construct a sales volatility measure equivalent to the employment volatility measure, described in section 2.4.1. This allows us to investigate the role of sales diversification to employment volatility.
We will include the measure of sales volatility as additional plant-level control and run the same set of regressions as before.[44] We saw already from the correlation of the volatility measures a correlation of around 0.27. The regressions confirm this relation. More volatile sales map in more volatile employment as shown by table 2.10. They do not offset the negative relation between exporters and their employment volatility. The reason can be twofold. On the one hand, the sales measure is self-reported and might not capture the actual sales of an establishment. In particular, for establishments that belong to multi-unit firms it might be difficult to report their exact revenues in a given year.

[44]When running the same set of regressions on σ_{SALES} we find additional support for the non-monotonic relation between being an exporter and the export intensity. Plants are on average 17.7% less volatile, but exporters with an export intensity above 35.4% are more volatile than domestic firms. However, we do not find heterogeneity across exporters of different size.

The head-count employment measure, in contrast, is much easier to identify as it only involves the knowledge of the number of employees in a given location and a given date. On the other hand, the exporter dummy might capture additional heterogeneity among plants that are rather related to productivity than to their export behavior. This means that given a certain level of sales volatility, exporters adjust their employment less than non-exporters as they want to sustain the match with their workers.
The inclusion of the sales volatility weakens the non-monotonic relation for exporters in column (2). Exporters are still less volatile compared to domestic producers, but the former increase in employment volatility due to an increase in the export intensity vanishes. This suggests that the intensive margin of trade is associated with a lower sales volatility that in turn maps into a lower employment volatility.
Nevertheless, there is still some heterogeneity found across exporters in column (3). In particular, the export share is still associated with different levels of employment volatility, which are not associated to sales volatility.

Table 2.10: Plant-Level Employment Volatility with Sales Volatility

	$\log(\sigma_{njcr})$		
	(1)	(2)	(3)
Exporter	-0.116***	-0.135***	-0.070
	(0.00)	(0.00)	(0.12)
Medium Exporter			-0.153**
			(0.02)
Large Exporter			0.054
			(0.66)
Export Share		0.001	0.002**
		(0.36)	(0.04)
Medium Export Share			-0.002
			(0.18)
Large Export Share			-0.005**
			(0.03)
log(Sales Volatility)	0.236***	0.235***	0.235***
	(0.00)	(0.00)	(0.00)
log(Employment)	-0.029**	-0.029**	-0.021
	(0.03)	(0.03)	(0.12)
$njcr$	0.228**	0.226**	0.214**
	(0.01)	(0.01)	(0.02)

Continued on next page

Table 2.10 – *Continued from previous page*

log(Sales)	-0.069***	-0.069***	-0.068***
	(0.00)	(0.00)	(0.00)
log(Average Wage)	-0.007	-0.007	-0.018
	(0.66)	(0.67)	(0.29)
Skill Composition	-0.003***	-0.003***	-0.003***
	(0.00)	(0.00)	(0.00)
Young	0.184***	0.183***	0.183***
	(0.00)	(0.00)	(0.00)
Industry-wide	-0.116***	-0.116***	-0.113***
wage agreement	(0.00)	(0.00)	(0.00)
Constant	-0.213	-0.206	-0.183
	(0.12)	(0.13)	(0.18)
State dummies	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes
Organizational dummies	Yes	Yes	Yes
Observations	9802	9802	9802
R^2	0.196	0.196	0.198

1,2, and 3 stars represent the 10%, 5%, and 1% significance level respectively.

2.5.3 Cyclicality of Job Flows

Even though we found a negative relation between the employment volatility and the international engagement of plants, we want to investigate the cyclical role of job flows in exporters and non-exporters.[45] The previous results were plant-level evidence, but the share of aggregate fluctuations that explain idiosyncratic volatility is quite low. Even trends in firm and aggregate volatility can go in opposite directions as shown by Comin and Philippon (2006).

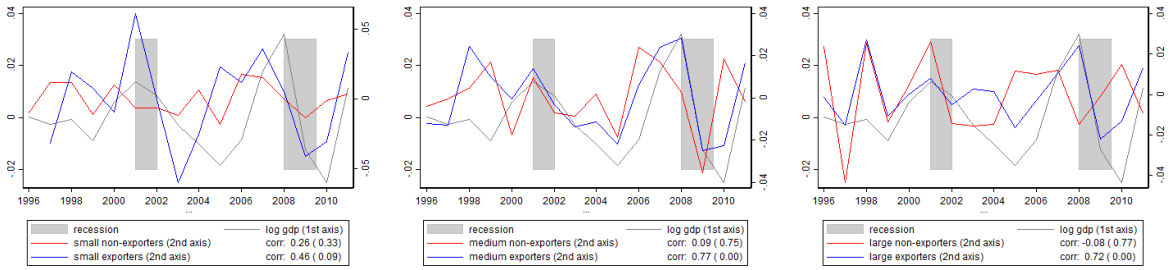
Figure 2.3 plots the cyclical net job creation rates of the groups of firms according to their size and export status.[46] All rates exhibit cyclicality as we can see from the individual plots.[47]

[45] While we focus on correlations between job flows of specific size/export groups and the aggregate business cycle, we implement a second approach based on a panel estimation in section 2.6.5.

[46] Appendix A.2 reports the correlations and plots for size groups, i.e. neglecting the distinction between exporters and non-exporters.

[47] We do not report the pure rates in this chapter. They reveal some level differences in the rates across size/export groups. Smaller establishments feature higher net job creation rates compared to larger plants. When comparing exporters and non-exporters, only the category of small establishments bears a level difference – a result that confirms the averages that were reported in the previous section. But as

Figure 2.3: Cyclical Net Job Creation Rate according to Size and Export Status



Rates are HP-filtered with parameter 6.25.

The cyclical pattern of small and large establishments differs between exporters and non-exporters. In particular, small exporters react much stronger to the recessions compared to small non-exporters. For large establishments, the behavior during the recent Great Recession differs strongly. While large non-exporters did not set free much of their labor force, large exporters reacted as in the previous recession with a decrease in their net job creation rate.

Table 2.11: Correlations between Net Job Creation Rate and log GDP

Definition		HP-Filtered			First Differences		
		GDP_{t+1}	GDP_t	GDP_{t-1}	GDP_{t+1}	GDP_t	GDP_{t-1}
Non-Exporter	Small	**0.50**	0.27	**-0.49**	0.36	0.20	**-0.55**
		(0.06)	(0.31)	(0.06)	(0.21)	(0.47)	(0.04)
	Medium	**0.62**	0.11	**-0.51**	**0.51**	0.05	**-0.48**
		(0.01)	(0.69)	(0.05)	(0.06)	(0.85)	(0.08)
	Large	0.30	-0.07	-0.24	0.10	-0.10	-0.22
		(0.29)	(0.79)	(0.38)	(0.72)	(0.73)	(0.45)
Exporter	Small	0.45	**0.46**	-0.35	0.31	**0.46**	-0.16
		(0.11)	(0.09)	(0.21)	(0.30)	(0.10)	(0.59)
	Medium	0.35	**0.77**	-0.16	0.26	**0.77**	-0.15
		(0.19)	(0.00)	(0.57)	(0.36)	(0.00)	(0.62
	Large	0.07	**0.73**	-0.12	0.00	**0.71**	-0.18
		(0.82)	(0.00)	(0.67)	(1.00)	(0.00)	(0.54)

The table reports correlation coefficients and their respective p-values. All correlations that are significant on a 10% significance level are indicated in bold.

Table 2.11 reports the correlations between the net job creation rate with leads and lags of log GDP for the pure rates and the two cyclical measures – HP-filtered rates as well as first differenced rates. As expected, the contemporaneous correlation between

mentioned before, this section is concerned with cyclical differences and not the level differences.

cyclical GDP and the net job creation rate is positive in almost all categories. This means that a boom is accompanied by a rise in employment, while a recession sheds labor. The significance, however, is strongest for exporters. Results based on HP-filtering as well as first differencing do not deviate much and indicate that large exporters are more cyclically sensitive than small exporters and all non-exporters. The difference between large and medium size exporters is not pronounced. When controlling only for size as shown in appendix A.2, the ranking between large and small plants is the same as in Moscarini and Postel-Vinay (2012). This suggests that the actual finding that large plants are more sensitive to the cycle is largely due to exporters and not simply a finding about size. The net job creation rate of exporters is stronger correlated with aggregate fluctuations compared to non-exporters. Small exporters, however, reveal a lower correlation compared to large exporters. This ranking is not visible for non-exporters, which are even a-cyclical.
When taking into account results from appendix A.3.2, one can observe that the correlation pattern changes. Since unemployment and GDP are negatively correlated, it is no surprise that net job creation rates are negatively correlated to the cyclical unemployment fluctuations. However, it is not so much the contemporaneous correlation that matters, but the correlation with future unemployment fluctuations. This suggests that the net job creation rate is leading the unemployment rate. This can be explained by the fact that the job flows measure flows while the unemployment rate measures a stock. For example, the net hirings between period $t-1$ and period t do not impact so much current unemployment, but lead to a change in next periods unemployment rate.
Because the net job creation rate is simply the difference between job creation rate and job destruction rate, it is instructive to check which component is driving the results. Appendix A.3 reports the respective tables and reveals that for exporters both, cyclical job creation rates as well as the job destruction rates are highly correlated with aggregate GDP fluctuations. While the pattern for job destruction does not differ much across exporters, the job creation rate of small exporters is not cyclical and is the reason why the net job creation rate for small exporters is less significant and less correlated.

2.5.4 Relative Contributions to Aggregate Fluctuations

The variance decomposition in table 2.12 shows that the lion's share of aggregate variance is explained by non-exporters. In particular, small and medium size non-exporters contribute to fluctuations in all job flow rates. Large establishments are generally less important. The most obvious difference between exporters and non-exporters consists in the contribution of small establishments. This can be related to the fact that small exporters do not face the usual up or out dynamic that especially small young firms experience.

Table 2.12: Variance Decomposition of Cyclical Job Flows

Definition		Emp	JCR	JDR	$NJCR$
Small	Total	**0.36**	**0.48**	**0.36**	**0.31**
Non-	Rate		0.37	0.30	0.32
Exporter	Weight		0.09	0.05	0.00
Medium	Total	**0.22**	**0.15**	**0.30**	**0.30**
Non-	Rate		0.16	0.28	0.29
Exporter	Weight		-0.02	0.02	0.00
Large	Total	**0.08**	**-0.02**	**0.02**	**0.03**
Non-	Rate		0.00	0.03	0.03
Exporter	Weight		-0.01	0.00	0.00
		0.66	**0.61**	**0.68**	**0.64**
Small Exporter	Total	**0.07**	**0.10**	**0.05**	**0.09**
	Rate		0.08	0.05	0.08
	Weight		0.02	0.00	0.00
Medium Exporter	Total	**0.16**	**0.26**	**0.16**	**0.18**
	Rate		0.23	0.15	0.18
	Weight		0.03	0.01	0.00
Large Exporter	Total	**0.12**	**0.04**	**0.12**	**0.09**
	Rate		0.03	0.09	0.09
	Weight		0.00	0.02	0.00
		0.35	**0.40**	**0.33**	**0.36**

The table reports the variance decomposition of HP-filtered rates.

Exporting plants contribute less to the aggregate volatility in absolute terms, but relatively more compared to their employment share. Among exporters, medium size establishments contribute most to aggregate volatility. The contributions of rates and weights do not necessarily add up to the overall contribution as the computation is based on a taylor approximation around the trend.

2.6 Robustness

In this section we will investigate the robustness of our previous findings on the heterogeneity of employment volatility across firms of different engagement in exporting activities. By doing so, we will cover a variety of potential problems that could cause biases in the results. First of all, we will check for the robustness of our measure of employment volatility. As our measure was based on the "residual approach" we will consider the volatility of the de-meaned net job creation rates instead. Moreover, we will constrain our sample on the manufacturing plants and on single-unit plants. Because our findings are mainly about heterogeneity among exporters, we verify also that our findings hold if we constrain on the sample of exporters only. To save space, we do not report the coefficients for control variables in this section, but they are available on request. In the last part of the robustness checks, we check that the stronger cyclicality of exporters compared to non-exporters also holds when estimating a panel, in which we investigate the plant-specific cyclicality.

2.6.1 Alternative Employment Volatility Measure

The results of the baseline regressions reveal a negative association between exporters and employment volatility. To verify that this relation is not simply do to the construction of the measure, we take into account also the employment volatility according to σ_{njcr_2}, i.e. the employment volatility of the demeaned net job creation rate according to equation (2.5). In general we decided not to use this measure, because the residual measure allows for a better comparison of plant-level volatility for our unbalanced sample.
Overall, the point estimates are lower, suggesting that the volatility that is controlled for in the residual approach is more relevant for exporters than for non-exporters. Because it is mainly aggregate volatility on the industry level this finding is in line with a pro-cyclicality of exporters.
Column (1) of table 2.13 shows that on average exporters have a 6% lower employment volatility. This volatility is decreasing once the export share is taken into account as well in column (2). Again we find support of a non-monotonic relation between exporters and employment volatility. While exporters exhibit 14.5% lower employment volatility it is increasing in the export intensity. Exporters that ship more than 48.3% of their sales abroad are even more volatile compared to domestic plants.

Table 2.13: Plant-Level Employment Volatility – Alternative Measure

	$\log(\sigma_{njcr_2})$		
	(1)	(2)	(3)
Exporter	-0.060***	-0.145***	-0.157***
	(0.00)	(0.00)	(0.00)
Medium Exporter			-0.027
			(0.61)
Large Exporter			0.435***
			(0.00)
Export Share		0.003***	0.004***
		(0.00)	(0.00)
Medium Export Share			-0.002*
			(0.10)
Large Export Share			-0.006***
			(0.00)
Controls	Yes	Yes	Yes
State dummies	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes
Organizational dummies	Yes	Yes	Yes
Observations	9678	9678	9678
R^2	0.352	0.354	0.357

1,2, and 3 stars represent the 10%, 5%, and 1% significance level respectively.

2.6.2 Volatility in the Manufacturing Sector

The results Kurz and Senses (2016) are based on a sample of manufacturing firms, while our baseline estimations were executed on a sample of plants from different sectors. The manufacturing sector plays a crucial role in our sample, because a large share of establishments is operating manufacturing. To investigate which role the individual industries might play, we constrain on manufacturing plants in this section and check for robustness of our results. By doing so, we answer also to a potential critique that size classifications should not be the same across sectors. Our classifications could lead to a bias if most of large plants are in the manufacturing sector. Now instead we can compare small and large manufacturing plants directly.

As shown in table 2.14, the results of the baseline regressions are confirmed. Point estimates are quite close to the baseline scenario. Again, we find a difference in the effect of

the export share between small and large exporters. The point estimates, however, are quite close.

Table 2.14: Plant-Level Employment Volatility - Manufacturing

	$\log(\sigma_{njcr})$		
	(1)	(2)	(3)
Exporter	-0.136***	-0.190***	-0.159***
	(0.00)	(0.00)	(0.01)
Medium Exporter			-0.095
			(0.20)
Large Exporter			0.134
			(0.27)
Export Share		0.002**	0.004***
		(0.01)	(0.01)
Medium Export Share			-0.002
			(0.16)
Large Export Share			-0.005*
			(0.06)
Controls	Yes	Yes	Yes
State dummies	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes
Organizational dummies	Yes	Yes	Yes
Observations	3320	3320	3320
R^2	0.212	0.214	0.218

1,2, and 3 stars represent the 10%, 5%, and 1% significance level respectively.

2.6.3 Single Plant Establishments

Our level of analysis is based on establishment-level information. Unfortunately, we cannot aggregate information on the firm level. Therefore, we constrain our sample on those plants for which we know that they are the only unit of the firm. By doing this, we do not have a difference between the establishment and the firm level. However, we will bias our sample towards smaller firms as many of the bigger firms, particularly in manufacturing, are composed of multi establishments.

The results confirm a lower volatility of exporters in column (1) and also the non-monotonicity in column (2). However, the statistical power for a heterogeneous effect

among exporters of different size vanishes. Though, the problem is that constraining on single-plant establishments biases our sample towards smaller firms. Therefore, we cannot really investigate the heterogeneity among small and large exporters. The point estimate, however, still reveals the same pattern as in the baseline case. It overturns the positive effect on the export share (with -0.006 compared to 0.004).

Table 2.15: Plant-Level Employment Volatility – Single Plant Establishments

	$\log(\sigma_{njcr})$		
	(1)	(2)	(3)
Exporter	-0.092***	-0.161***	-0.109**
	(0.00)	(0.00)	(0.03)
Medium Exporter			-0.141*
			(0.05)
Large Exporter			0.197
			(0.34)
Export Share		0.002***	0.004***
		(0.00)	(0.00)
Medium Export Share			-0.002
			(0.31)
Large Export Share			-0.006
			(0.17)
Controls	Yes	Yes	Yes
State dummies	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes
Organizational dummies	Yes	Yes	Yes
Observations	8404	8404	8404
R^2	0.135	0.136	0.138

1,2, and 3 stars represent the 10%, 5%, and 1% significance level respectively.

2.6.4 Results for Exporters

In the baseline set-up of the estimation, we compare non-exporter and exporter even though we mainly focus on the heterogeneity among exporters. The baseline estimation is useful to set the grounds and relate to other studies. Furthermore, it increases the statistical power of the analysis as it is based on a larger number of observations. Nevertheless, we expect to find the heterogeneity between small and large exporters also in a

set-up in which we constrain on exporters only.

The results in table 2.16 indicate that in general the export share is positively associated to the employment volatility. This effect, however, is reversed for large exporters as can be seen in column (3). Nevertheless, only the inclusion of additional size dummies yields the result. This suggests that controlling by log(Employment) is not sufficient, but there is additional heterogeneity among small and large plants. While the volatility for small and medium size exporters is only increasing according to column (3), there is a dampening effect for large exporters. By doing the back-of-the-envelope calculations, it turns out that there is no additional non-monotonicity among exporters.[48]

Table 2.16: Plant-Level Employment Volatility – Exporters Only

	$\log(\sigma_{njcr})$		
	(1)	(2)	(3)
Medium Exporter			-0.063
			(0.39)
Large Exporter			0.281**
			(0.05)
Export Share	0.002***	0.003***	0.003**
	(0.01)	(0.00)	(0.01)
Medium Export Share		-0.003***	-0.001
		(0.01)	(0.38)
Large Export Sharee		-0.001	-0.005**
		(0.63)	(0.04)
Controls	Yes	Yes	Yes
State dummies	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes
Organizational dummies	Yes	Yes	Yes
Observations	1656	1656	1656
R^2	0.217	0.223	0.227

1,2, and 3 stars represent the 10%, 5%, and 1% significance level respectively.

[48]The effect of the export share for large exporters is given by the difference between the standard export share and the additional coefficient for the large plants, i.e. 0.003 - 0.005 = 0.002. Dividing the 0.281 by 0.002 yields an export intensity above 100%.

2.6.5 Plant-Level Cyclicality

In this section we will implement an additional plant-level panel regression to study the cyclicality of job flows. By doing so, we focus only on the net job creation rate. If instead we took into account the job creation and job destruction rates as well, we would not get well defined plant-specific time series.[49] Using panel regressions to estimate the plant-level cyclicality increases the explanatory power, because more data points can be used compared to the correlations on the semi-aggregate level. And the set up allows to control for idiosyncratic differences between plants. However, the plant-level net job creation rate and the semi-aggregated net job creation rate are quite different objects as we have seen in the construction of the data series in section 2.3.1.
In general, the net job creation rates are regressed on changes of the aggregate measure, interacted with size and exporter dummies according to equation (2.10). The specification is in the spirit of Fort et al. (2013) who regress rates on the changes of cyclical indicators. The estimation is based on an unbalanced panel, because the sample of establishment that participated in the interviews increased over time and not many establishments report observations for every year in the sample period. The exact specification is given by:

$$njcr_{i,t} = \alpha_i + \beta_1 \Delta GDP_t + \beta_2 \Delta GDP_t \times Size_i + \beta_3 \Delta GDP_t \times Size_i \times Exp_i + \beta_4 X_i + \varepsilon_{i,t}, \quad (2.10)$$

where α_i is the plant-fixed effect, ΔGDP is the change in aggregate GDP, $Size_i$ are the size dummies $Small$, $Medium$, and $Large$, Exp_i is a dummy for being an exporter, and X_i is a set of controls.[50] Thus, β_1 captures the general cyclicality of plants, which is supposedly positive, β_2 captures potential differences of plants of different size, while β_3 captures different cyclical behavior of plants in terms of size and export status.[51] Fluctuations of GDP are measured as deviations from an HP-trend.
We estimate the specifications as a panel with plant-fixed effects.[52] Because of the plant fixed effects we will only use the growth rate of sales as control control for idiosyncratic

[49] Take for example two establishments, one increases its employment in three subsequent periods by +2 +4 +2. This means that the establishment is a job creator in all periods and the change in the job creation rate is +2 and -2. The second establishment faces an employment change by +2 -1 +2. So it counts as job creator in two periods and job destroyer in one period. One cannot easily link the change in job creation or job destruction to the aggregate measures in this case, because the establishment should face changes in the job creation rate by -2 and +2 and in the job destruction rate by +1 and -1. Therefore, the analysis abstains from changes in individual rates.

[50] In the main specification we only use the growth rate of sales as control variable, because all other variables of interest are time invariant.

[51] We constrained on always exporter or never exporter so that Exp_i is fixed over time. The results are robust to include the continuous measure of plant size instead of the size dummies.

[52] Estimating the specifications with pooled OLS would likely bias the results, because the error component consists of an unobserved time invariant firm component. It would lead to an endogeneity of the regressors. This time invariant component might be the personal abilities of the managers or the

changes over time. We expect a positive association between the net job creation rate and the growth rate of sales as it proxies the overall state of the plant. Furthermore, it is not clear whether the the time varying component of the error term is iid. To overcome the problem, the standard errors are clustered on the establishment level.

Table 2.17: Panel Estimations for Cyclical $njcr$ in Germany

	$njcr_i$		
	Size	Export	Size/Export
	(1)	(2)	(3)
ΔGDP	0.224***	0.149**	0.168**
	(0.00)	(0.01)	(0.01)
$\Delta GDP \times Medium$	0.323***		-0.041
	(0.00)		(0.74)
$\Delta GDP \times Large$	0.139		-0.505
	(0.42)		(0.11)
$\Delta GDP \times Exp$		0.857***	
		(0.00)	
$\Delta GDP \times Exp \times Small$			0.676***
			(0.00)
$\Delta GDP \times Exp \times Medium$			0.996***
			(0.00)
$\Delta GDP \times Exp \times Large$			1.231***
			(0.00)
Sales Growth	0.120***	0.120***	0.120***
	(0.00)	(0.00)	(0.00)
Constant	-0.001***	-0.001***	-0.001***
	(0.00)	(0.00)	(0.00)
Plant fixed effects	Yes	Yes	Yes
Additional Controls	Yes	Yes	Yes
Number of clusters	10759	10759	10759
Observations	72542	72542	72542
R^2	0.196	0.197	0.197

1,2, and 3 stars represent the 10%, 5%, and 1% significance level respectively.

productivity of the establishment, i.e. components that cannot be controlled for. In principle, one could estimate the model also with a panel tobit, because the outcome variable is constructed to be bounded between -2 and 2. When looking at the distribution of the outcome variables, however, one can see that there is almost no mass near to the truncation points. Thus, the truncation does not play a role.

The results in table 2.17 confirm the previous findings. We run three different regressions. In column (1) we only do not include the interaction dummies with size and export, in column (2) we do not include dummies for size, but only control for export status, and in column (3) we estimate the full specification of equation (2.10).
The regressions indicate a positive association between changes in aggregate GDP and the net job creation rate on the plant level for all estimations. This confirms the procyclicality of the net job creation rate. In specification (1) we do not see major differences in the cyclical behavior in terms of size. Only medium size plants are more sensitive to the cycle compared to small and large. This is in contrast to the previous findings of Moscarini and Postel-Vinay (2012) for the United States. However, the result could be simply driven by the fact that we investigate the plant-level and not the firm level. As many larger firms are composed of multiple plants, we cannot measure the actual firm size correctly.
When controlling for exporter status interacted with aggregate fluctuations we find a strong positive relation. This indicates that exporters are more cyclical sensitive than non-exporters. However, this still leaves out the question of size.
The results of column (3) confirm the previous results of the correlation analysis. While the net job creation rate is generally positively associated to the aggregate fluctuations, this effect is amplified for exporters. Among the exporter, we also see a size differential with point estimates for Small as 0.676 and for large as 1.231.
A major shortcoming of the estimation is that we cannot control for productivity. It might well be that productivity of plants is the crucial determinant of the cyclicality. As we know from other research that productivity is positively correlated with export status, our findings could simply pick up an effect of productivity.

2.7 Conclusion

Many differences of firms in terms of size and productivity can be attributed to the distinction between domestic and exporting firms. We add with this study two further dimensions. On the one hand, we document heterogeneity in employment volatility along the export intensity. And on the other hand, we provide dynamic differences between exporters and non-exporters.

German establishments that are selling abroad are on average found to be 11% less volatile compared to purely domestic producers. This confirms previous findings of Buch et al. (2009). When taking into account the export intensity, however, it is shown that exporting can actually increase the employment volatility if plants are engaged too much in international activities. Interestingly, this does not seem to be true for large exporters. While the employment volatility is increasing in the export intensity for small exporters, it is decreasing further for large exporters. Small exporters that export more than 37% of their sales are more volatile relative to comparable non-exporters. The transmission mechanism, however, is not clear as the data does not allow to identify destinations. A potential explanation is that exporters face country-specific fixed-costs. Those firms, which appear to be small, that are closer to the threshold of covering these fixed costs, are more often entering and exiting markets. Because of these discrete jumps in sales they face a higher overall volatility. The IAB Establishment Panel allows to investigate the role of sales volatility. When controlling for plant-specific sales volatility, previous findings are weakened, but not fully offset. Thus, firms do not transmit sales volatility fully into employment volatility.

The second finding relates to the cyclicality of job flows in exporters and non-exporters. We find that cyclical job flows are strongly pronounced in Germany and reveal that establishments are creating more jobs in booms and destroy more in recessions. By exporting to foreign economies, these plants are exposed to other shocks, which are orthogonal to the domestic cycle. But at the same time, exporters specialize in the production. Often they produce durable goods, which in turn are more cyclical and could explain the stronger cyclical sensitivity in their job flows.

Nevertheless, when evaluating the contribution of exporters to aggregate fluctuations in job flows, the findings suggest only a limited role. They contribute about one third of aggregate fluctuations in the rates, what is slightly more than their share of overall employment.

There are many paths for future related work. In general, there is still little understanding of the exact insurance mechanism. In particular, one could test whether it is true that small exporters enter and exit markets more often and therefore face a higher volatility. Potentially certain destinations are more volatile than others. An interesting question with respect to sales and employment volatility is how firms optimize. Do they prefer

a low volatility or are there trade-offs involved so that they accept a higher volatility in return of other gains? Future work could also focus on the analysis of worker flows and in particular job-to-job transitions which could help to understand how exporters recruit their workers. In addition, matches might be more valuable for exporters, which could explain a lower employment volatility.

A. Appendix

A.1 Dataset

A.1.1 Variable Description and Data Source

Table A.1: Variable Description and Data Sources

Variable	Definition	Source
GDP	Logarithm of quarterly GDP for Germany in constant prices. Annual values are computed by changing the timing to 3rd quarter of the previous year to 2nd quarter of the current year.	OECD Monthly Economic Indicators - Edition February 2013
Unemployment	Monthly unemployment rate. Annual measures are averaged from July of the previous year to June of the current year.	Arbeitslosigkeit im Zeitverlauf - Januar 2013, table 2.1.2
Small	Dummy equal to 1 if the establishment has less than 50 employees, 0 otherwise	IAB Establishment Panel
Medium	Dummy equal to 1 if the establishment has more than 50 and less than 500 employees, 0 otherwise	IAB Establishment Panel
Large	Dummy equal to 1 if the establishment has more than 500 employees	IAB Establishment Panel, 0 otherwise
Exporter	Dummy equal to 1 if the establishment reports revenues from abroad in all period when included in the panel, 0 otherwise	IAB Establishment Panel
log(Average Wage)	Logarithm of the total wage bill of an establishment divided by the number of employees	IAB Establishment Panel
log(Sales)	Logarithm of annual revenues of an establishment	IAB Establishment Panel
Structure	Distinguishes whether an establishment is (1) single-plant firm, (2) place of business, (3) the head office, or (4) the middle-level authority.	IAB Establishment Panel

Industry-wide wage agreement	Dummy equal to 1 if the establishment is subject to an industry-wide wage agreement, 0 otherwise	
Young	Dummy=1 if establishment younger than 5 years	BHP

A.1.2 Classification of Industries

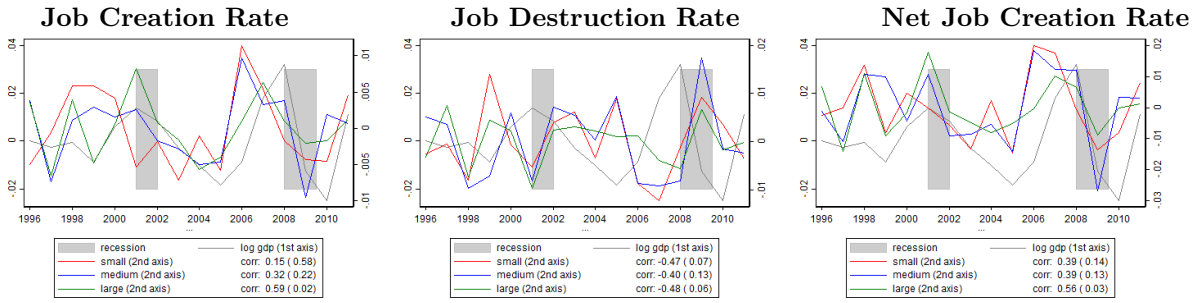
Table A.2: Correspondence Table of Industrial Classification over Time

Code	Industry	1993-1999	2000-2003	2004-2008	2009	2010-2012
1	Agriculture	1	1	1	1	1
2	Mining and Energy	2	2	2	2	2
3	Manufacturing	4,5	3-6	3-6	3-6	3-6
4	Construction	6	7	7	7	7
5	Retailing	7	8	8	8	8,9
6	Logistics	8	9	9	9	10
7	Banking, insurance	9,10	10	10	12	13
8	Restaurants	11	11	11	11	12
9	Education	12	12	12	14	15
10	Health care	13	13	13	15	16
11	Services	14-15	14-19	14-16	10,13,16-17	11,14,17,18
12	Public administration	16	20	17	18	19

Note that plants in the sector of “public administration” are excluded from the analysis since only private companies are taken into account.

A.2 Results for Size Classification

This appendix reports results based on size classes alone, not taking into account the export behavior of establishments. The size classification is the same as in the main part, i.e. **small** (0-50 employees), **medium** (50-500 employees), and **large** (>500 employees).



Rates are HP-filtered with parameter 6.25.

Figure A.1: Cyclical Job Flows according to Size Classes

Table A.3: Correlations between Job Flows and log GDP

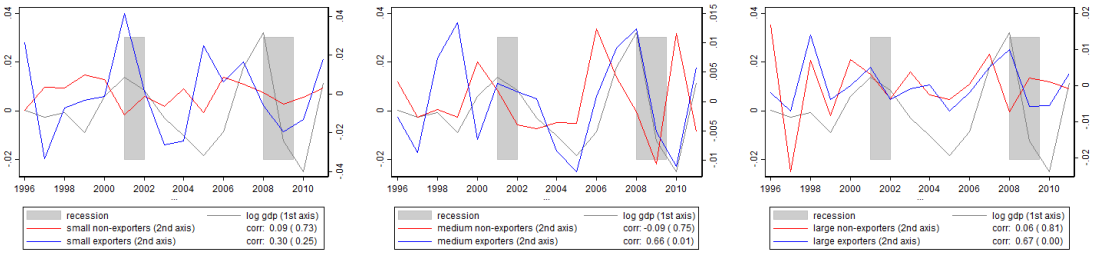
		HP-Filtered			First Differences		
Definition		GDP_{t+1}	GDP_t	GDP_{t-1}	GDP_{t+1}	GDP_t	GDP_{t-1}
NJCR	Small	**0.56**	0.39	**-0.52**	0.38	0.31	**-0.51**
		(0.03)	(0.13)	(0.05)	(0.18)	(0.26)	(0.06)
	Medium	**0.59**	0.41	**-0.46**	0.43	0.36	-0.44
		(0.02)	(0.12)	(0.08)	(0.13)	(0.18)	(0.11)
	Large	0.33	**0.57**	-0.10	0.16	**0.44**	-0.18
		(0.22)	(0.02)	(0.72)	(0.57)	(0.10)	(0.54)
JCR	Small	**0.53**	0.14	**-0.52**	0.41	0.12	-0.45
		(0.04)	(0.60)	(0.05)	(0.15)	(0.66)	(0.11)
	Medium	**0.64**	0.33	**-0.48**	0.42	0.25	**-0.50**
		(0.01)	(0.21)	(0.07)	(0.14)	(0.37)	(0.07)
	Large	0.43	**0.59**	-0.05	0.27	0.43	-0.11
		(0.11)	(0.02)	(0.86)	(0.36)	(0.11)	(0.71)
JDR	Small	**-0.44**	**-0.49**	0.39	-0.27	-0.36	0.44
		(0.10)	(0.06)	(0.15)	(0.36)	(0.19)	(0.11)
	Medium	**-0.50**	-0.41	0.42	-0.38	-0.39	0.39
		(0.06)	(0.11)	(0.12)	(0.18)	(0.15)	(0.17)
	Large	-0.22	**-0.50**	0.13	-0.08	-0.41	0.21
		(0.43)	(0.05)	(0.63)	(0.80)	(0.13)	(0.47)

The table reports correlation coefficients and their respective p-values. All correlations that are significant on a 10% significance level are indicated in bold.

A.3 Job Creation and Job Destruction Margins

A.3.1 Job Creation Rate

Figure A.2: Cyclical Job Creation Rate according to Size and Export Status



Rates are HP-filtered with parameter 6.25.

Table A.4: Correlations between Job Creation Rate and log GDP

Definition		HP-Filtered			First Differences		
		GDP_{t+1}	GDP_t	GDP_{t-1}	GDP_{t+1}	GDP_t	GDP_{t-1}
Non-Exporter	Small	0.42	0.09	-0.41	0.35	0.08	-0.41
		(0.12)	(0.74)	(0.13)	(0.22)	(0.78)	(0.15)
	Medium	**0.76**	-0.06	**-0.59**	**0.61**	-0.12	**-0.63**
		(0.00)	(0.82)	(0.02)	(0.02)	(0.67)	(0.01)
	Large	0.20	0.07	-0.13	0.08	-0.00	-0.16
		(0.48)	(0.80)	(0.65)	(0.79)	(1.00)	(0.60)
Exporter	Small	0.40	0.30	-0.32	0.24	0.24	-0.16
		(0.14)	(0.26)	(0.25)	(0.40)	(0.38)	(0.57)
	Medium	0.20	**0.65**	0.11	0.13	**0.58**	0.12
		(0.48)	(0.01)	(0.70)	(0.66)	(0.02)	(0.68)
	Large	0.03	**0.68**	-0.02	-0.05	**0.65**	-0.08
		(0.91)	(0.00)	(0.95)	(0.88)	(0.01)	(0.78)

The table reports correlation coefficients and their respective p-values. All correlations that are significant on a 10% significance level are indicated in bold.

A.3.2 Aggregate Unemployment Fluctuations

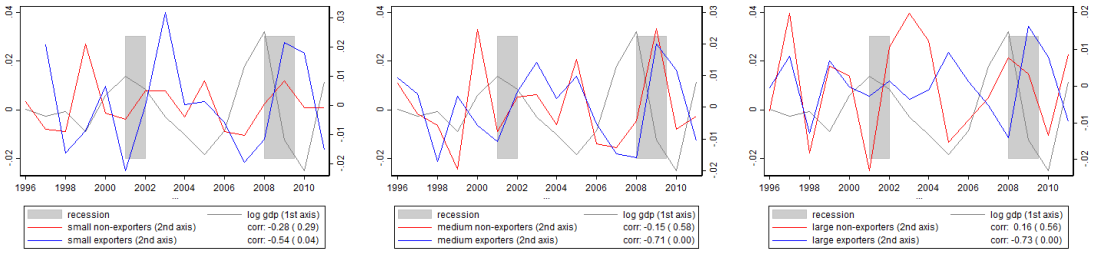
Table A.5: Correlations between Net Job Creation Rate and Unemployment

Definition		HP-Filtered			First Differences		
		u_{t+1}	u_t	u_{t-1}	u_{t+1}	u_t	u_{t-1}
Non-Exporter	Small	-0.23	0.41	**0.45**	-0.28	0.22	0.22
		(0.42)	(0.11)	(0.09)	(0.33)	(0.42)	(0.44)
	Medium	-0.25	0.32	**0.57**	-0.26	0.19	**0.49**
		(0.37)	(0.23)	(0.02)	(0.37)	(0.50)	(0.07)
	Large	-0.27	0.10	0.33	-0.37	0.07	0.23
		(0.34)	(0.70)	(0.23)	(0.20)	(0.81)	(0.43)
Exporter	Small	-0.34	0.05	**0.60**	-0.16	-0.01	**0.52**
		(0.23)	(0.86)	(0.02)	(0.60)	(0.98)	(0.06)
	Medium	**-0.62**	-0.00	**0.67**	**-0.53**	-0.05	**0.59**
		(0.01)	(0.99)	(0.01)	(0.05)	(0.86)	(0.02)
	Large	**-0.49**	-0.07	0.39	**-0.50**	-0.07	0.32
		(0.06)	(0.79)	(0.15)	(0.07)	(0.81)	(0.27)

The table reports correlation coefficients and their respective p-values. All correlations that are significant on a 10% significance level are indicated in bold.

A.3.3 Job Destruction Rate

Figure A.3: Cyclical Job Destruction Rate according to Size and Export Status



Rates are HP-filtered with parameter 6.25.

Table A.6: Correlations between Job Destruction Rate and log GDP

Definition		HP-Filtered			First Differences		
		GDP_{t+1}	GDP_t	GDP_{t-1}	GDP_{t+1}	GDP_t	GDP_{t-1}
Non-Exporter	Small	-0.36	-0.30	0.35	-0.23	-0.22	0.45
		(0.19)	(0.26)	(0.20)	(0.44)	(0.44)	(0.11)
	Medium	-0.40	-0.16	0.34	-0.36	-0.12	0.29
		(0.14)	(0.55)	(0.21)	(0.21)	(0.66)	(0.31)
	Large	-0.29	0.15	0.26	-0.11	0.15	0.21
		(0.29)	(0.58)	(0.35)	(0.72)	(0.60)	(0.47)
Exporter	Small	-0.35	**-0.54**	0.28	-0.22	**-0.55**	0.12
		(0.22)	(0.04)	(0.31)	(0.48)	(0.04)	(0.67)
	Medium	-0.40	**-0.72**	0.32	-0.29	**-0.75**	0.30
		(0.14)	(0.00)	(0.24)	(0.31)	(0.00)	(0.29)
	Large	-0.09	**-0.74**	0.19	-0.04	**-0.73**	0.24
		(0.75)	(0.00)	(0.49)	(0.90)	(0.00)	(0.41)

The table reports correlation coefficients and their respective p-values. All correlations that are significant on a 10% significance level are indicated in bold.

3. Who Creates and Destroys Jobs over the Business Cycle?

(joint with Andrea Colciago and Antonella Trigari)

Abstract

We study the cyclical properties of job flows of young versus mature and small versus large firms, as well as their contribution to aggregate employment fluctuations, with a particular emphasis on the Great Recession. For the period of the Great Recession we document that young firms are hit harder than mature firms. In contrast to previous studies we find that size differences among firms do not play a major role in explaining heterogeneity in job flows in the Great Recession.

The general business cycle behavior for the period 1982-2013 is depending on the data treatment. While results for linear de-trending are confirming the findings for the Great Recession, HP-filtered results do not show conclusive evidence.

The overall contribution of young firms to employment fluctuations, however, is limited. The larger employment weight of mature firms – mature firms employ around 80 percent of the labor force – more than compensates for their smaller cyclicality.

3.1 Introduction

Among economists and policymakers the belief of small businesses being the engine of job creation and innovation is widely spread.[1] In 1953 the Small Business Administration (SBA) was founded as an independent agency of the federal government with the goal to "aid, counsel, assist and protect the interests of small business concerns". Discussions about heterogeneous effects on firms are often dominated by the distinction between small and large businesses, neglecting the role of firm age.

We do not challenge the conventional view about small businesses per se,[2] but rather contribute to the discussion on the cyclical sensitivity of small and large firms. In particular, we contribute to this discussion by emphasizing the awareness of firm age as important determinant for cyclical job flows of firms. We ask the general question of who creates and destroys jobs over the business cycle? And in particular who is hit harder during the Great Recession?

This study contributes to two separate, but related questions on the cyclicality of job flows and the contribution of different groups of firms to employment fluctuations. First, we investigate which group of firms in terms of age and size is more sensitive to the cycle. There is a growing scientific interest in determining the cyclicality of large versus small and young versus mature firms. While Moscarini and Postel-Vinay (2012) show that large firms are more sensitive compared to small firms in periods of high and low unemployment, Fort et al. (2013) highlight the importance of firm age and argue that firm age is of particular importance when it comes to small firms. Our findings are closer to the latter ones. We find that young firms are more sensitive to the cycle compared to mature firms. Second, we research the contribution to aggregate fluctuations by means of a variance decomposition. Even though young firms are more sensitive to the cycle, their contribution to employment fluctuations is moderate. The reason is that most workers are employed in mature firms. We show that employment shares are crucial in understanding the contribution to employment fluctuations.

By better understanding the cyclical behavior of firms in terms of age and size, policymakers might revise their beliefs and policies. Most policies to support troubled businesses are related to the size of firms, while the economic arguments are rather related to the age of the firms and their growth potential. Furthermore, knowing the actual contributions of different firms to aggregate employment fluctuations helps to evaluate costs and benefits of certain measures to stabilize employment. Very volatile firms might be sensitive to

[1] An important and interesting analysis of small businesses is provided by Hurst and Pugsley (2011). They argue that the conventional view on small businesses in economic models has important caveats. In particular, many small business owners are neither interested in growing large nor innovating, but rather provide an existing service to an existing market.

[2] In particular, we cannot add to the discussion on the general behavior of small businesses as we focus on the business cycle only.

the cycle, but contribute only little to the aggregate fluctuations due to a little weight in the economy. Thus, depending on the goals and costs it might be better to support less sensitive firms as they contribute more to the cyclical fluctuations.

Our main findings are that for the period of the Great Recession there is no heterogeneous behavior of small and large firms. The main source of heterogeneity is the firm age instead. We find that firms younger than 5 years are hit harder than mature firms. However, when measuring the actual contribution to overall employment volatility the findings revert. Because of their small employment share young firms contribute relatively little to overall employment fluctuations. Instead, mature firms contribute the lion's share.

Results for the period from 1982 to 2013 are partially driven by the data treatment. Linearly de-trended job flows confirm our findings for the Great Recession and show that young firms are more sensitive than mature firms. The HP-filtered flows, in contrast, reveal inconclusive evidence.

Moreover, we document that the job creation and destruction due to actual entry and exit of establishments is relatively less important compared to the expansion and contraction of existing establishments.

The paper is structured as follows. The following section discusses the data as well as relevant measures and the empirical strategy for the analysis. The third section discusses results for the cyclical behavior of different groups of firms and their contribution to aggregate fluctuations with a particular emphasis on the Great Recession. The fourth section briefly discusses existing policies, while the last section concludes.

3.2 Data, Measures, and Empirical Strategy

The main dataset that is used in this study is the Business Dynamics Statistics (BDS) database. The BDS is often used to analyze cyclical labor flows despite being on an annual frequency. Because it covers a long period, starting from the late 1970's, it allows to analyze several business cycles.[3]

We classify firms according to size and age. We define size as follows: Small firms are those with employees of less than 50, medium size firms are those with employees between 50 and 1000, and large firms those with more than 1000 employees. As shown in table 3.1, our classification is in line with the size classification applied by Moscarini and Postel-Vinay (2012). Fort et al. (2013), in contrast, define the small firms more restrictive by applying lower size cut-offs.[4] The age definition is as follows: Young firms are those of age 0 to 5 years, mature firms are older than 6 years.

[3]Some studies relate also to the Business Employment Dynamics (BED) database provided by the US Bureau of Labor Statistics. It comes on a quarterly frequency, but is not suitable for our purposes as it does not report the age of firms and covers a shorter period, starting from 1992.

[4]Appendix B.9 reports results with these alternative size cut-offs of Fort et al. (2013).

Table 3.1: Overview of AGE and SIZE Classification in the Literature

Study	Age	Size	Treatment of Cyclical Job Flows
Moscarini and Postel-Vinay (2012)	No Age	Small: 0-49 Medium: 50-999 Large: 1000+	HP-Filter (parameter: 390,625)
Fort et al. (2013)	Young: 0-4 Mature: 5+	Small: 0-19 Medium: 20-499 Large: 500+	Pure Rates
Pugsley and Şahin (2015)	Young: 0-10 Mature: 11+	Small: 1-19 Medium: 20-499 Large: 500+	Linear Trend

The table gives a brief overview of age and size definitions of other studies in the literature. Furthermore, it reports the treatment that was applied when analyzing cyclical job flows.

Throughout the analysis we use three groups – $GROUPS = \{SIZE, AGE, AGE/SIZE\}$ – to investigate the role of size and age. The individual groups are composed of the following set of firms:

- $SIZE = \{SMALL, MEDIUM, LARGE\}$
- $AGE = \{YOUNG, MATURE\}$
- $AGE/SIZE = AGE \times SIZE$[5]

3.2.1 Business Dynamics Statistics (BDS)

The administrative BDS dataset is provided by the US Census and covers approximately 98 percent of the nonfarm private-sector employment in the United States.[6] It is based on the Longitudinal Business Database (LBD) and contains information on establishment-level job flows and employment stocks for continuing as well as entering and exiting establishments at an annual frequency for the period 1976 to 2013.[7] The data can be broken down by location and industry of the establishment, as well as by age and size of

[5]The group of $YOUNG/LARGE$ is dropped from the analysis as will be discussed in section 3.2.2.

[6]An extensive description is available on the website of the Census at http://www.census.gov/ces/dataproducts/bds.

[7]The BDS tabulations can change over time, because new longitudinal information on the underlying LBD is becoming available. The 2013 version of the dataset is improving in the accuracy, because it ends with a Economic Census year in which the quality of the underlying microdata is higher.

the parent firm. A firm is thereby simply defined as a collection of all its establishments. The age of a firm is defined by the age of its oldest establishment. Firm size is measured as the sum of all employees in its establishments.

Two notions of firm size are reported in the BDS: On the one hand, size is measured by *initial firm size*, which captures the size of firms at the beginning of a period, i.e. $t-1$, before job flows take place. It is our preferred measure as it is not subject to the *reclassification bias*.[8] On the other hand, size is reported as the *average firm size* between year $t-1$ and year t.[9]

Employment for each establishment is measured by the number of employees reported at March 12 for each year. Therefore, the job flows for a given year t are measured between the employment stock of year $t-1$ year t.

Establishment age is computed by taking the difference between the current year of operation and the birth year and readily available in the BDS. Given that the LBD series starts in March 1976 observed age is by construction left censored. Given our age threshold we can only start in 1982, which allows us to distinguish between firms of age 5 and those that are 6 years and older. Thus, our sample period is restricted to the years 1982 to 2013.

In principle, the BDS allows to use all information broken down by initial firm size as well as age. The only exception are the new born firms, which are reported according to their end of period size. We follow Moscarini and Postel-Vinay (2012) and re-classify new firms according to their beginning of period size, i.e. 0 employees. This consistency in defining all firms with their initial period size comes with the drawback that by definition all new firms are considered small.

Firms can change their employment stock either on the extensive margin by opening and closing establishments or on the intensive margin by expanding and contracting the labor force in already existing establishments. Gross job gains include the sum of all jobs added between year $t-1$ and year t at either opening or expanding establishments. Gross job losses include the sum of all jobs lost during a given year in either closing or contracting establishments. The net change in employment or net job creation is the difference between gross job gains and gross job losses. Thus, if a firm expands one establishment

[8] The *reclassification bias* is also known as the *size distribution fallacy* and stems from the fact that the job flows are not correctly attributed to the right firms. As soon as firms are changing between size groups outcomes differ depending on whether flows are attributed to the size groups at the beginning of the period or to the groups defined by the current size. Davis et al. (1996, p. 62ff.) provide a further discussion including numerical examples of this issue.

[9] To investigate the potential *regression bias* (Davis et al., 1996, p. 66ff.), one could use both size measures for comparison. The regression bias emerges when a given firm is constantly oscillating between two size groups and therefore systematically biasing the smaller group upward and the larger group downward. Moscarini and Postel-Vinay (2012) have shown that this bias is not strongly pronounced for the BDS at the cyclical frequency.

and contracts another one, it will contribute to both, gross job gains and gross job losses, while the net job creation will represent the actual number of jobs created or destroyed by the firm.[10]

The BDS exploits information on ownership of multiple establishments owned by the same firm, thus allowing for two notions of entry and exit. On the one hand, one can think of establishment entry and exit, and on the other hand of firm entry and exit. Entering and exiting firms necessarily operate on the extensive margin by opening and closing establishments and the jobs they create and destroy are therefore by definition a subset of all jobs created and destroyed by establishment entry and exit.

3.2.2 Job Flow Measures

There is no dominant measure for cyclical job flows in the literature. Both measures, job flows as levels and as rates are commonly used. For our purposes, however, and in particular the cyclical analysis we are interested in the behavior of employment growth rates of different firms, without taking into account their overall employment share in the economy. Thus, for us, the appropriate measure is given by the job flow rates as defined below. This measure also allows for comparisons with recent studies of Moscarini and Postel-Vinay (2012) and Fort et al. (2013).

The net job creation rate ($NJCR$) for $s \in SIZE$ – and similar for AGE and $AGE/SIZE$ – is defined as the difference between the job creation rate (JCR_t^s) and the job destruction rate (JDR_t^s), i.e. simply the difference between all establishments with net job gains and those with net job losses in a given group of firms s:

$$NJCR_t^s = \underbrace{\frac{\sum_{e \in S^+} \left(E_{e,t}^s - E_{e,t-1}^s\right)}{\frac{1}{2}\left(E_t^s + E_{t-1}^s\right)}}_{JCR_t^s} - \underbrace{\frac{\sum_{e \in S^-} \left(E_{e,t-1}^s - E_{e,t}^s\right)}{\frac{1}{2}\left(E_t^s + E_{t-1}^s\right)}}_{JDR_t^s}, \tag{3.1}$$

where E_t^s represents the employment at time t within an establishment that belongs to group s.[11] Depending on whether an establishment is increasing or decreasing its workforce it is counted as job creator (belonging to set S^+) or job destroyer (belonging to set S^-).

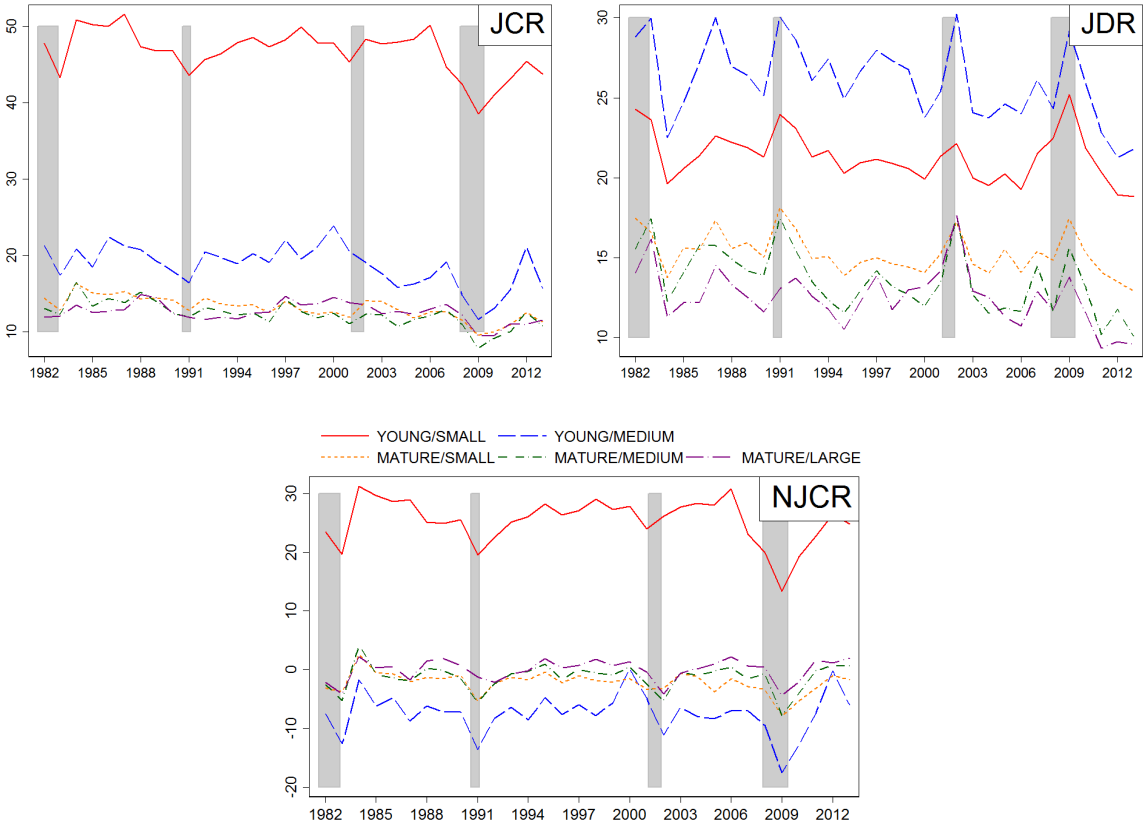
Thus, for each of the six $AGE/SIZE$ categories of firms – and of course for any of the more aggregated $SIZE$ or AGE categories – we generate series of job flow rates. The disaggregated $AGE/SIZE$ series are quite stable over time and vary mainly over the cycle as shown in figure 3.1. The only exception is the group of $YOUNG/LARGE$ firms, which

[10] This example underlines that there is no netting out of job flows within a firm. Since we use establishment-level data a firm can contribute to both, job creation and job destruction at the same time.

[11] By dividing through the average employment in group s, this measure provides a symmetric growth rate for each period t. In principle, it is well-defined for entrants and exiters as well, because the denominator will be always positive.

we drop from the sample. Their rates are very jumpy, because there are not many firms entering the market with more than 1000 workers. This problem is further aggravated because the BDS does not disclose information in many years, because the data would rely on too few firms. Therefore, we decided to drop all job flow rates and employment of the $YOUNG/LARGE$ category from our analysis. As a consequence, we re-compute all aggregates, neglecting the existence of $YOUNG/LARGE$ firms in the economy.[12]

Figure 3.1: Job Flows by AGE/SIZE over Time



The graph plots the BDS job flow rates by AGE/SIZE. NBER recessions are plotted in shaded gray areas. The group of $YOUNG/LARGE$ firms is dropped from the analysis.

Figure 3.1 shows that the job flow rates for $MATURE$ firms are within a small bandwidth.[13] On average they are negative, meaning that employment is decreasing once firms are growing older. This finding is in line with the findings of Pugsley and Şahin (2015) who show an increase in the employment share of $MATURE$ firms. It indicates that firms grow when they are $YOUNG/SMALL$ and in particular when they enter the market and destroy jobs on average afterwards. When we investigate this issue further

[12]This does not bias our results much as they account for only about 1 percent of overall job flows and employment.

[13]This finding is not dependent on the size cut-offs. Figure B.13 in appendix B.9 reveals the same patterns for the size cut-offs of Fort et al. (2013).

by dropping the job flows due to entering firms, we observe that all net job creation rates are on average negative as shown in B.4 in appendix B.3. This finding highlights the importance of the entry margin for overall job creation.
Nevertheless, the average job flows of different groups of firms are not at the focus of this study. We are only interested in their cyclical properties. Figure 3.1 shows that most series are relative stable, but slight trends are visible as well. Therefore, we generally de-trend the data series – unless specified differently. Our preferred method is to linearly de-trend the series, but we also apply an HP-filter with the common parameter of 6.25 for annual rates.[14] For any job flow rate X_t, denote $\overline{X_t}$ the trend, we define the cyclical component as deviation from the trend, i.e.:

$$\widetilde{X_t} = X_t - \overline{X_t} \tag{3.2}$$

3.2.3 Entry and Exit

A particular emphasis is given to the job creation and destruction due to entry and exit as they account for a substantial part of overall job flows.[15] When economists or politicians think of entry and exit they usually have in mind firms that enter or exit the market. We extend this view and add an additional margin as will be clear soon. The BDS reports establishment-level job flows in entering and exiting establishments. But in addition we know whether these establishments belong to continuing firms or to firms that enter and exit the market as well. This helps to further break down job flows.
All jobs created at entering establishments in period t are captured by JCR_t^{NEW}.[16] Part of these job flows are created by brand new firms, $JCR_t^{NEW,FIRMS}$, and the remaining share by existing firms that set up new establishments, $JCR_t^{NEW,ESTABS}$. The analogue holds for job destruction flows. Thus, we label flows associated with actual firm entry and exit with $FIRMS$, while those flows that are related to the creation and destruction

[14]Moscarini and Postel-Vinay (2012) in contrast use a much higher smoothing parameter of 390.625, which is related to the work of Shimer. They argue that this filter is necessary to make sure that no cyclicality is visible in the trend. Our results for HP-filtered rates both, on the cyclicality as well as on the variance decomposition, are robust to this higher smoothing parameter.

[15]While having only an average employment share of around 3.1 percent and 2.6 percent, they contribute 37 percent to job creation and 35 percent to job destruction respectively.

[16]Note that for job flows of entrants and exiters, the previous definition of equation (3.1) is slightly changed. Instead of dividing by the average employment of the specific group of firms, we divide by the average number of employment in the economy. The rates can be seen as weighted where the weight is given by the employment share in the economy. Take for instance JCR_t^{NEW}, which is defined as $\frac{JC_t^{NEW}}{\frac{1}{2}(E_t+E_{t-1})} = \frac{\frac{1}{2}(E_t^{NEW}+E_{t-1}^{NEW})}{\frac{1}{2}(E_t+E_{t-1})} \frac{JC_t^{NEW}}{\frac{1}{2}(E_t^{NEW}+E_{t-1}^{NEW})}$. The latter term is 2 by definition (employment of NEW in period $t-1$ is 0), while the former term yields the employment share of new establishments in the economy.

of establishments by existing firms are labeled $ESTABS$.[17]

$$JCR_t^{NEW} = JCR_t^{NEW,FIRMS} + JCR_t^{NEW,ESTABS} \quad (3.3)$$

$$JDR_t^{DEAD} = JDR_t^{DEAD,FIRMS} + JDR_t^{DEAD,ESTABS} \quad (3.4)$$

The literature usually neglects this distinction between $FIRMS$ and $ESTABS$ and looks at the job flows of all entrants or exiters, i.e. JCR^{NEW} and JDR^{DEAD}.[18] But there are good reasons for why these two entry/exit margins are not identical, such as financial constraints that are very different for expanding existing firms or entering firms.
In a further step, we decompose the actual entry of establishments into an entry rate and a average size with respect to the existing establishments in the economy, i.e. a decomposition into an extensive and an intensive margin.[19]. The entry rate, $entry_t$ is simply defined as the number of establishments of the respective group that enter divided by the number of all existing establishments in the economy. Similar, the average size, $size_t$, is given by the average number of employees in a new establishment divided by the average number of employees in establishments in the overall economy. By construction the average size of entrants is therefore given by half their end of period size. The job creation rate of the two types of entrants can be decomposed as:

$$JCR_t^{NEW,FIRMS} = entry_t^{NEW,FIRMS} \frac{size_t^{NEW,FIRMS}}{size_t} \quad (3.5)$$

$$JCR_t^{NEW,ESTABS} = entry_t^{NEW,ESTABS} \frac{size_t^{NEW,ESTABS}}{size_t} \quad (3.6)$$

In the same way, we decompose the job destruction rate of exiting firms into an exit rate and an average size. The exit rate is given by the number of establishments that exit over the overall number of establishments in the economy. The average size is determined by the average number of jobs destroyed by exiting establishments divided by the average

[17]Note that even though some job flows are labeled with $FIRMS$ they are still reported on the establishment-level.

[18]A notably exception is the work of Pugsley and Şahin (2015). They make a distinction between entrants and focus on what we label $JCR_t^{NEW,FIRMS}$ as they are interested in "true firm startups rather than new locations of an existing firm".

[19]An alternative decomposition is to decompose the job creation of NEW and $DEAD$ firms at the firm level, similar to Pugsley and Şahin (2015). As we are interested in differences between newly opened establishments by new versus existing firms, the establishment level is the right measure, but a decomposition on the firm level reveals the same pattern as shown in appendix B.4. Note further that when computing the contribution to employment growth, Pugsley and Şahin (2015) define a startup growth rate as $g_t^s = \frac{E_t^0 - E_{t-1}^0}{E_{t-1}^0}$ that is very different compared to our cyclical measure, which is $\widetilde{JCR}^{NEW,FIRMS}$. The most important difference is that our measure will reveal percentage point differences from the trend while their measure shows percentage differences from last period.

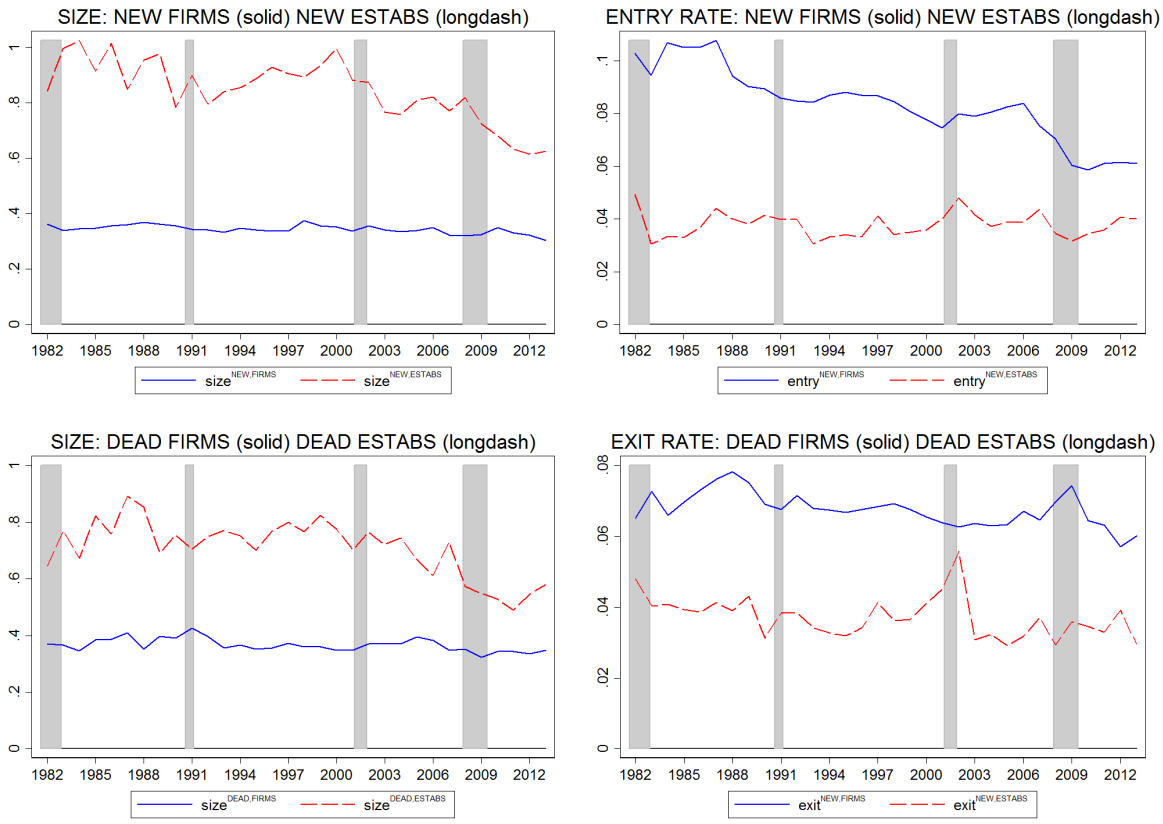
size of establishments in the economy.[20]

$$JDR_t^{DEAD,FIRMS} = exit_t^{DEAD,FIRMS} \frac{size_t^{DEAD,FIRMS}}{size_t} \tag{3.7}$$

$$JDR_t^{DEAD,ESTABS} = exit_t^{DEAD,ESTABS} \frac{size_t^{DEAD,ESTABS}}{size_t} \tag{3.8}$$

Figure 3.2 plots the decompositions of job creation and job destruction rates of entering and exiting establishments broken down into the components as defined above.

Figure 3.2: Average Size and Entry/Exit Rates



The figure plots the average size and the entry/exit rates of establishments by new/dying firms and continuing firms based on BDS data. The actual definition of the series are defined in equation (3.5) to (3.8).

When we focus on the left plots of the figure we observe that the average size of establishments differ depending on whether they belong to a continuing firm or to a firm that enters or exit the market. On average the size of plants that belong to continuing

[20] Again the definition implies that the average size of the exiting establishments is only one half of their employment. However, the employment is measured at the beginning of the period, while employment of entrants was measured at the end of the period. Thus, the only way to get a consistent measure for both job flows is to take into account the average size of establishments in a given period.

firms is much closer to the average size in the economy. If we assume that all entering establishments reach roughly the average size at some point this indicates a limited growth potential of $NEW, ESTABS$ compared to $NEW, FIRMS$. Existing firms seem to set up new establishments already with their optimal size. The size difference between the exiting establishments can be related to the up or out dynamic in which many young firms either grow or fail and exit the market. Therefore, part of the difference is due to the firms that did not reach their optimal size yet, but failed in the process.
At the same time, entry and exit rates of establishments belonging to entering or exiting firms are higher. But the time series reveal also some trends. In particular the entry rate for $NEW, FIRMS$ indicate a strong decline in the dynamics of startups as discussed by Pugsley and Şahin (2015). The entry rate roughly halved over the period of observation. Last, we add the job creation and destruction rates for the continuing establishments to those of the entering and exiting establishments. Those establishments that increase their employment stock are called EXP, while those that decrease their number of employees are called $CONT$. The overall job creation or destruction rate is then given by the following equations:

$$JCR_t = JCR_t^{NEW} + JCR_t^{EXP} \tag{3.9}$$
$$JDR_t = JDR_t^{DEAD} + JDR_t^{CONT} \tag{3.10}$$

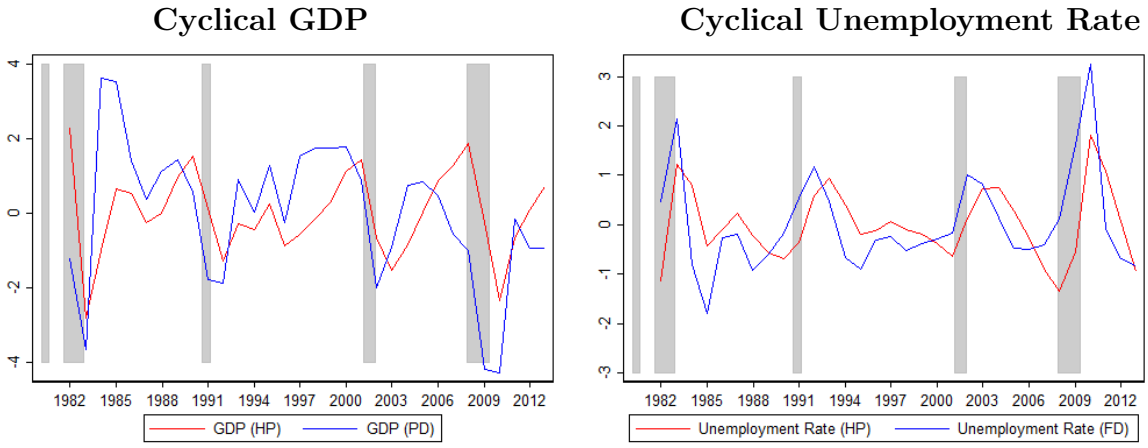
3.2.4 Cyclical Indicators

We measure the cyclicality of job flow rates in terms of their correlations with either GDP or the unemployment rate as cyclical indicators. In general we are interested in the differential behavior of heterogeneous types of firms, either in terms of AGE, or in terms of $SIZE$, or both. Therefore, we correlate the difference of the de-trended job flows with the aggregate cyclical indicator. In doing so, we focus on the contemporaneous correlations and compute the significance of the correlations. An implicit assumption is that the life-cyle dynamics and the business cycle properties of our groups of firms are virtually unchanged over the time period as shown by Pugsley and Şahin (2015). Instead, only compositional changes occurred in which more mature and large firms increased their overall share in employment. These long terms trends are captured by the trend.
For output we use the seasonally adjusted GDP in chained 2005 prices from FRED (series code: GDPC96).[21] Data is reported on a quarterly level. To get a comparable time horizon, GDP in period t is defined as the annual value between the second quarter in $t-1$ and the first quarter in t (remember that the BDS uses the 12th of March as reporting date). The actual numbers are arithmetic means of the four respective quarters (The US reports GDP as yearly values so one does not have to add up four quarters). Cyclical

[21] https://research.stlouisfed.org/fred2/series/GDPC96

GDP is represented by growth rates or percentage deviations from the HP-trend as shown in figure 3.3. For the latter measure, GDP is HP-filtered with the respective smoothing parameter.
Following Moscarini and Postel-Vinay (2012), the unemployment rate in time t is defined over the period March $t-1$ to February in period t. The data comes from FRED and is averaged over the year (series code: UNRATE).[22] The cyclical unemployment rate is described by the first differenced data series or the absolute deviations from the HP-trend and plotted in figure 3.3.

Figure 3.3: Aggregate Cyclical Indicators



The left graph plots the HP-filtered real GDP (parameter 6.25) as well as the growth rates of real GDP. The growth rates are de-meaned. The right graph shows the HP-filtered unemployment rate (parameter 6.25) as well as the first differences of the unemployment rate. Data are annual and downloaded from FRED. Exact sources and computations are written in the accompanying text.

When checking for dynamic correlations between the unemployment rate and GDP, we find that the usual lead of GDP with respect to unemployment is not strongly pronounced on an annual frequency. In our sample the contemporaneous correlation is by far larger with a coefficient of -0.88 (compared to -0.54 for the lead of GDP).

[22] https://research.stlouisfed.org/fred2/series/UNRATE

3.2.5 Variance Decomposition

To study the contributions of individual rates to aggregate fluctuations we decompose the variance into contributions of individual components. For most decompositions – such as decompositions into individual AGE, $SIZE$, and $AGE/SIZE$ contributions – one has to deal with employment weights.[23] For example, decomposing the sum $X = (\omega_1 X^1 + \omega_2 X^2 + \omega_3 X^3)$ involves the time varying weights ω as well:[24]

$$V(X) = \sum_{i=1}^{3}\sum_{j=1}^{3} Cov(\omega_i X^i, \omega_j X^j) = \sum_{i=1}^{3} Var(\omega_i X^i) + \sum_{i\neq j} Cov(\omega_i X^i, \omega_j X^j) \tag{3.11}$$

If the shares were constant, one could simply take them out of the terms and compute the contributions of the variables of interest, but in principle weights can fluctuate over the cycle. To overcome this problem, we apply the first order Taylor expansion of X around the trend $\overline{X}$ as:

$$X_t \approx \overline{X_t} + \sum_{i=1}^{3}\left[\overline{\omega_{i,t}}(X_t^i - \overline{X_t^i}) + \overline{X_t^i}(\omega_{i,t} - \overline{\omega_{i,t}})\right] \tag{3.12}$$

Rearranging terms leads to

$$\widetilde{X_t} = \sum_{i=1}^{3} \overline{\omega_{i,t}}\widetilde{X_t^i} + \overline{X_t^i}\widetilde{\omega_{i,t}} \tag{3.13}$$

The overall variance of $\widetilde{X_t}$ is therefore approximated by:

$$V(\widetilde{X_t}) \approx \sum_{i=1}^{3} Cov(\widetilde{X_t}, \overline{\omega_{i,t}}\widetilde{X_t^i}) + Cov(\widetilde{X_t}, \overline{X_t^i}\widetilde{\omega_{i,t}}) \tag{3.14}$$

$$1 \approx \sum_{i=1}^{3} \underbrace{\frac{Cov(\widetilde{X_t}, \overline{\omega_{i,t}}\widetilde{X_t^i})}{V(\widetilde{X_t})}}_{\beta_{\overline{\omega_{i,t}}\widetilde{X^i},t}} + \underbrace{\frac{Cov(\widetilde{X_t}, \overline{X_t^i}\widetilde{\omega_{i_t}})}{V(\widetilde{X_t})}}_{\beta_{\overline{X_t^i}\widetilde{\omega}_{i,t}}} \tag{3.15}$$

Our main decomposition exploits the fact that the net job creation rate is composed of the difference of individual job creation and destruction rates, i.e.

$$NJCR = JCR^{NEW} + JCR^{EXP} - JDR^{DEAD} - JDR^{CONT},$$

and all these individual rates can be decomposed further into the contributions of our previously defined $AGE/SIZE$ group. We will neglect the contribution of the weights, i.e.

[23] For example, the net job creation rate is defined as $\frac{NJC_t}{\frac{1}{2}[E_t+E_{t-1}]} = \omega^s \frac{NJC_t^s}{\frac{1}{2}\left[E_t^s+E_{t-1}^s\right]} + \omega^m \frac{NJC_t^m}{\frac{1}{2}\left[E_t^m+E_{t-1}^m\right]} + \omega^l \frac{NJC_t^l}{\frac{1}{2}\left[E_t^l+E_{t-1}^l\right]}$, where the employment share ω^x is defined as $\frac{\frac{1}{2}\left[E_t^x+E_{t-1}^x\right]}{\frac{1}{2}[E_t+E_{t-1}]}$.

[24] For decompositions in which the weights do not play a role, we can just think of $\omega = 1$ in the following equations.

$\beta_{\overline{X_t^i}\widetilde{\omega_{i,t}}}$, throughout the analysis, because their contribution is empirically not meaningful as we show in appendix B.8.

$$1 \approx \sum_{i \in AGE/SIZE} \underbrace{\frac{Cov\left(\widetilde{NJCR}, \overline{\omega^i}\widetilde{JCR^{NEW,i}}\right)}{V\left(\widetilde{NJCR}\right)}}_{\beta_{\overline{\omega^i}\widetilde{JCR^{NEW,i}}}} + \underbrace{\frac{Cov\left(\widetilde{NJCR}, \overline{\omega^i}\widetilde{JCR^{EXP,i}}\right)}{V\left(\widetilde{NJCR}\right)}}_{\beta_{\overline{\omega^i}\widetilde{JCR^{EXP,i}}}} - \underbrace{\frac{Cov\left(\widetilde{NJCR}, \overline{\omega^i}\widetilde{JDR^{DEAD,i}}\right)}{V\left(\widetilde{NJCR}\right)}}_{\beta_{\overline{\omega^i}\widetilde{JDR^{DEAD,i}}}} - \underbrace{\frac{Cov\left(\widetilde{NJCR}, \overline{\omega^i}\widetilde{JDR^{CONT,i}}\right)}{V\left(\widetilde{NJCR}\right)}}_{\beta_{\overline{\omega^i}\widetilde{JDR^{CONT,i}}}} \tag{3.16}$$

This decomposition will yield 20 (5 categories[25] of firms times four rates) coefficients for the contributions to overall fluctuations in the net job creation rate. Out of these 20 coefficients, we can construct all relevant contributions by aggregating and re-basing.
For example, the group of $YOUNG/SMALL$ contributes through EXP, NEW, $CONT$, and $DEAD$ to the overall net job creation rate. If we want to measure the contribution of $YOUNG/SMALL$ to the net job creation we therefore add the four individual contributions. If instead we are interested in the contribution of $YOUNG/SMALL$ to the job creation rate we have to add the contributions of EXP and NEW, but also re-base the variable. Thus, for the denominator we compute the contribution of all groups to job creation, i.e. summing the ten $AGE/SIZE$ contributions to EXP and NEW. As will be clear from the tables of the variance decomposition later on, we can easily compare the contributions across all $SIZE$ and AGE groups in this way.[26]
We deviate from this strategy only for the decomposition of JCR^{NEW} and JDR^{DEAD} into *size* and *entry/exit* rates of firms and establishments. For those rates we run separate decompositions instead of summing individual components.

3.3 Results

3.3.1 Cyclicality in the Great Recession

During the Great Recession many jobs were destroyed and fewer jobs than usual were created, leading to a net loss of jobs. What we want to understand better is what type of firms are particularly hit in terms of the net job creation rate, the job creation rate,

[25] Keep in mind that we dropped the group of $YOUNG/LARGE$ firms from the analysis. Therefore, we only take into account 5 groups.

[26] Alternatively we could directly decompose the job creation rate into the $YOUNG/SMALL$. By doing this we would get different approximation errors for every decomposition and the contributions would not exactly add up.

and the job destruction rate. Among other frictions, financial constraints might have had heterogeneous effects on firms. The data allows us to distinguish effects of size and age so that we can contribute to the discussion on whether small firms or rather young small firms are hit harder. In addition, we will investigate the job creation and job destruction due to entry and exit as well. Unfortunately, the empirical analysis is limited to few annual observations available for the period of the Great Recession. In a first part we focus on plots of differential job flow rates between different groups of firms and their correlation with aggregate measures. In a second part we evaluate the importance of individual types of firms for the aggregate fluctuations in job flows. In each part we focus separately on the role of age and size as well as entry and exit.

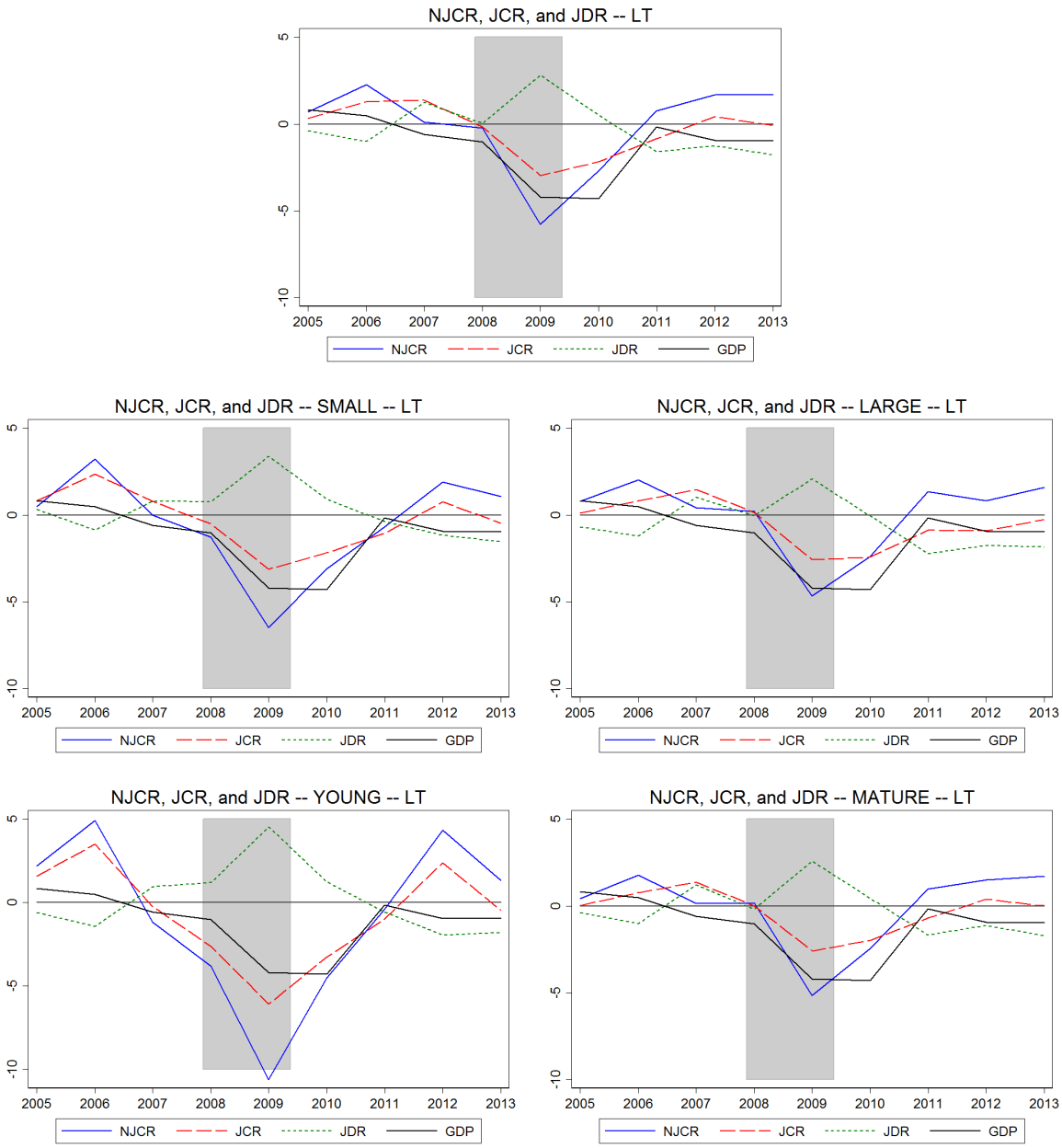
The Role of Age and Size

Based on the BDS we plot job flow rates for the period 2005 to 2013 in figure 3.4. We focus on deviations of the job flow rates from their linear trend, computed over the entire sample period from 1982 to 2013.[27] By doing so we construct a counter-factual series for each job flow rate that takes into account long term trends. Apparently these trends play only a minor role as we have seen already in figure 3.1 in section 3.2.2. Therefore, simple de-meaned results are very similar, but in our view still inferior as they are not capturing any longer term trends and are stronger impacted by the job flows during the recession period. The official NBER recession period is graphed by a shaded gray area and lasts from December 2007 to June 2009. The overall figure reveals the patterns for the general job flows in the United States as well as job flows broken down by $SIZE$ and AGE.
Figure 3.4 indicates that the behavior of the general job flow rates is in line with the behavior of the job flow rates broken down by $SIZE$ and AGE. All series are peaking in 2009 at the trough of the Great Recession. The net job creation rate as well as the job creation rate go down, while the job destruction rate spikes up, indicating a pro-cyclical behavior for the former rates and a counter-cyclical behavior for the latter rate.

When comparing the plots for $SMALL$ and $LARGE$ we observe that $SMALL$ reveal a slightly stronger reaction in their job flows during the Great Recession. The difference, however, seems more pronounced when comparing $YOUNG$ and $MATURE$ firms.
The heterogeneous behavior of firms can be better understood by plotting the differential job flows instead of comparing job flows across graphs. We therefore compute the differentials by taking the difference between the de-trended job flows of the respective

[27] Alternatively one could focus on deviations from an HP-trend. However, we would face the end point problem of the HP-filter, which could become relevant as we only focus on the last nine years of the sample. We will show in appendix B.5 that the job flows do not differ between linear de-trended, HP-filtered, and de-meaned data series. The cyclical correlations, however, give different predictions as we will discuss later on.

Figure 3.4: Job Flows during the Great Recession



The graph plots the Job Creation Rate of different groups of firms. From the first top left to bottom right panel we look at $SIZE$, AGE, $SIZE$ conditional on $AGE = MATURE$, AGE conditional on $SIZE = SMALL$, and $MATURE/LARGE - YOUNG/SMALL$. All series are linearly de-trended.

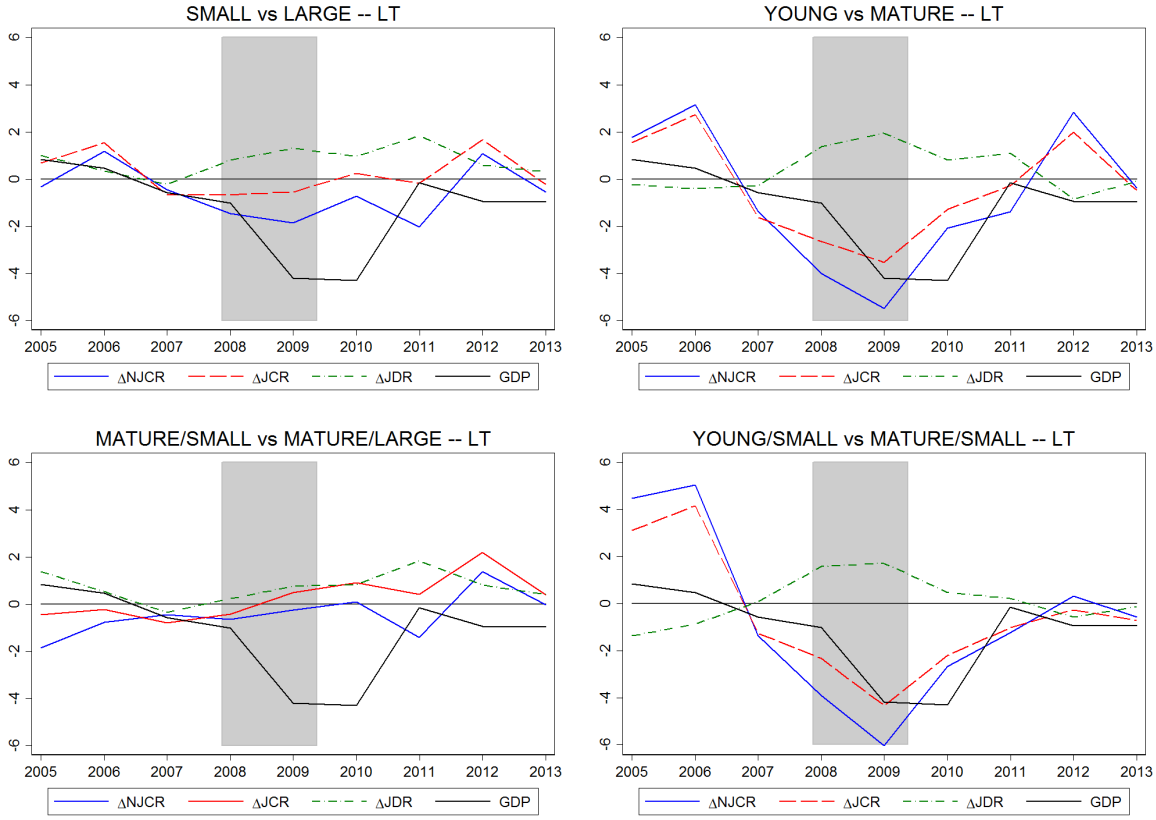
groups.[28] Therefore, we direct the attention towards four differentials in figure 3.5. From the top left to the bottom right we compare

- $SMALL$ and $LARGE$ firms to investigate the role of $SIZE$

[28] Note that due to the linearity we could also take the differences of the job flows first and then de-trend with the linear trend. However, this is not true for the HP-filtered differentials for which it is important to first HP-filter before taking the differences.

- $YOUNG$ and $MATURE$ firms to understand the importance of AGE
- $MATURE/SMALL$ and $MATURE/LARGE$ firms to investigate the role of $SIZE$ conditional on AGE
- $YOUNG/SMALL$ and $MATURE/SMALL$ firms to see the role of AGE conditional on $SIZE$.

Figure 3.5: Differential Job Flows during the Great Recession



The graph plots the Differential Job Flows of different groups of firms. From the first top left to bottom right panel we look at $SIZE$, AGE, $SIZE$ conditional on $AGE = MATURE$, AGE conditional on $SIZE = SMALL$, and $MATURE/LARGE - YOUNG/SMALL$. Differentials are computed by subtracting the respective series. The differentials for JCR, and $NJCR$ can be read in the same way, the one for JDR is consistent when going in the opposite direction. All series are linearly de-trended.

From these plots in figure 3.5 our first set of result for the cyclicality during the Great Recession emerges. $YOUNG$ firms react stronger than $MATURE$ firms in their job flow rates during the Great Recession. This is true for the JCR, JDR, and the $NJCR$. The result holds also independently of de-meaning or HP-filtering the rates as appendix B.5 shows. Quite surprisingly, $SIZE$ itself does not play a role. $SMALL$ firms are slightly more sensitive than $LARGE$ in the top left plot. But the differential reaction is mainly driven by AGE as becomes clear when conditioning on $MATURE$. Among $MATURE$

firms no clear difference emerges between $MATURE/SMALL$ and $MATURE/LARGE$ firms. Thus, the result on $LARGE$ firms being cyclically more sensitive than $SMALL$ firms (Moscarini & Postel-Vinay, 2012) does not hold during the Great Recession.[29] The heterogeneous reaction of $YOUNG$ and $MATURE$ firms is slightly stronger pronounced in the JCR compared to the JDR.

When looking at the contemporaneous correlations of job flow differentials with aggregate GDP and unemployment we get further support for our findings. Table 3.2 reports the correlation coefficients and their significance level. Even though we base the correlations only on nine observations, many coefficients are statistical significant. The correlations of the $SMALL - LARGE$ differential indicate that $SMALL$ are more sensitive, but with low statistical power. In contrast, the $YOUNG - MATURE$ differential reveals what we have seen in the plots before. $YOUNG$ are reacting more than $MATURE$, indicated by the positive correlation with GDP and the negative correlation with unemployment. This result can be found for the results of AGE conditional on $SMALL$ firms in the last column. The correlations of $SIZE$ conditional on $MATURE$ are not significant.

Entry and Exit

In this section we will document evidence on the behavior of job creation and job destruction at the entry and exit margin. When interpreting the rates in this section we should keep in mind that the definition of the rates deviates from the previous definitions of $SIZE$ and AGE groups. The usual definition in which we define the job flow by the average employment of a given category would yield rates of plus and minus 200 for entry and exit. Therefore, the literature defines these rates in terms of aggregate employment of the economy. When interpreting the job flow rates we can think of them as weighted rates where the weight is given by the employment share in the economy.

Before we start analyzing the job flows due to actual entry and exit we will study expanding and contracting establishments. This will help to better understand the importance of the entry and exit margin as these margins are related to the remaining source of job creation and destruction. The left plot of figure 3.6 shows the time series of the overall job creation rate and the job creation rate related to the expansion of existing establishments and the setup of new establishments. The latter two series add up to the former one by definition. In a similar way, the right graph plots the overall job destruction rate of the economy together with the destruction rate of contracting establishments as well as dead establishments. The figure shows that the lion's share of job creation and job destruction stems from firms that expand and contract existing establishments. New establishments contribute a smaller share to job creation while the exiting establishments almost do not

[29] When defining the size cut-off according to Fort et al. (2013) in section B.9.1 we verify the results conditional on $MATURE$.

Table 3.2: Contemporaneous Correlations of Differentials with GDP and Unemployment Rate – LT

		$SMALL - LARGE$	$YOUNG - MATURE$	$MATURE\ SMALL - LARGE$	$SMALL\ YOUNG - MATURE$
JCR	GDP	0.34	0.66	-0.38	0.78
		(0.38)	(0.05)	(0.31)	(0.01)
	U	-0.24	-0.51	0.20	-0.54
		(0.54)	(0.16)	(0.60)	(0.13)
JDR	GDP	-0.23	-0.60	0.10	-0.69
		(0.55)	(0.09)	(0.79)	(0.04)
	U	0.37	0.60	0.10	0.52
		(0.33)	(0.09)	(0.80)	(0.15)
$NJCR$	GDP	0.39	0.67	-0.45	0.77
		(0.30)	(0.05)	(0.23)	(0.02)
	U	-0.38	-0.56	0.13	-0.55
		(0.31)	(0.11)	(0.74)	(0.13)

The table reports correlation coefficients and p-values of differential job flow rates with the cyclical aggregate measure (Unemployment Rate or GDP). The differential is computed by simply subtracting the two respective job flow rates. Data series are linearly de-trended.

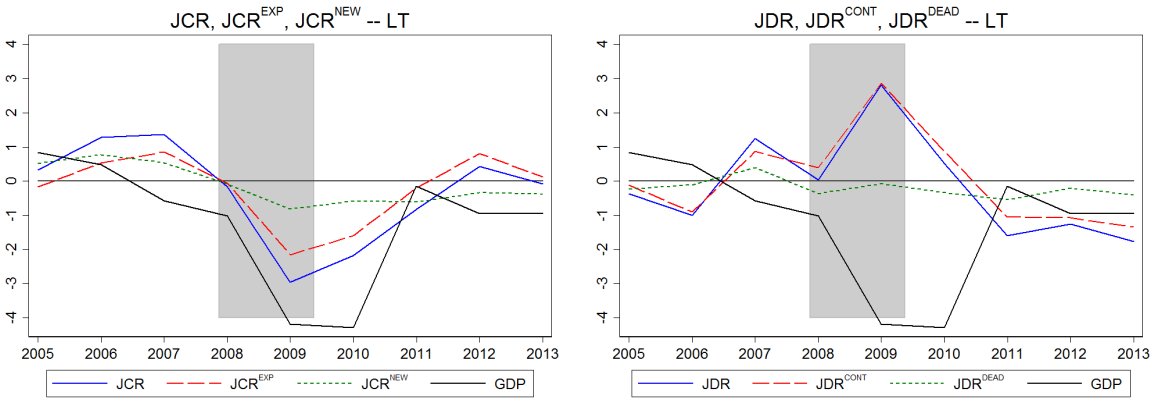
contribute to the job destruction rate. Surprisingly, the job destruction rate of exiting establishments seems very flat over time and does not increase much during the Great Recession. This could be an outcome of policies that were implemented to avoid closure of firms, but also a direct result of lower entry. In normal times the up or out dynamic contributes to the job destruction. With less entry a drop in exit is therefore an immediate consequence.

Next, we move on to the job creation and destruction due to actual entry and exit. We compare the job creation in establishments belonging to startups, $JCR^{NEW,FIRMS}$, and the job creation of establishments belonging to already existing firms, $JCR^{NEW,ESTABS}$ in the left plot of figure 3.7.

Often the differences between these types of establishments are neglected in the literature. Either job creation by entry contains both types of establishments or only the first and counting the second type as part of job flows by expanding firms.[30] The plots show that there are differences among both groups. We find that the reaction of the existing firms

[30] An example for the first treatment is given by Clementi and Palazzo (2016), while Pugsley and Şahin (2015) focus only on the entry of new firms.

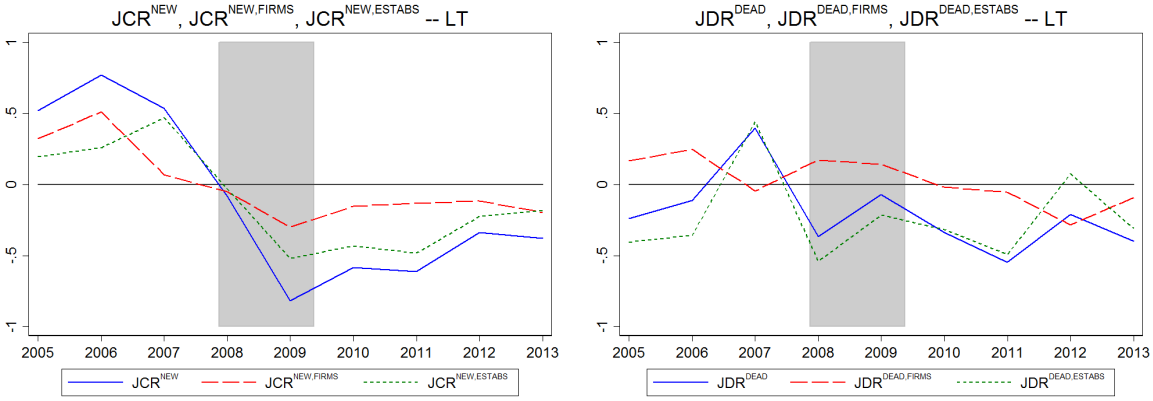
Figure 3.6: Job Creation and Job Destruction during the Great Recession



The left plot shows the JCR broken down by JCR^{EXP} and JCR^{NEW}. The right plot shows the JDR broken down by JDR^{CONT} and JDR^{DEAD}. All rates are linearly de-trended.

by setting up new establishments is more pronounced compared to brand new firms.

Figure 3.7: Job Creation of New and Job Destruction of Dead during the Great Recession



The left plot shows the JCR^{NEW} broken down by $JCR^{NEW,FIRMS}$ and $JCR^{NEW,ESTABS}$. Similarly, the right plot shows the JDR^{DEAD} broken down into $JDR^{DEAD,FIRMS}$ and $JDR^{DEAD,ESTABS}$. All rates are linearly de-trended.

The right plot indicates that the $JDR^{DEAD,FIRMS}$ went up slightly during the Great Recession while the job destruction of closing establishments of continuing firms is lower than expected during the Great Recession. However, in 2009 the rate goes up. Overall the reaction on the destruction side is much less pronounced compared to the creation side. As mentioned above, the reaction of the destruction margin might be buffered due to the lower entry. If less establishments enter the market less will fail as long as the failure rate is rather constant.

The heterogeneous behavior on the job creation as well as job destruction side can be seen also in terms of the correlations in table 3.3. The correlations verify that the job

creation rate of expanding establishments is more sensitive than the one of new establishments. The same holds true for the job destruction side where the differential between contracting and dead establishments is negatively correlated with GDP and positively with the unemployment rate. However, the differences among the new establishments and dead establishments are far from statistical significance. If at all they rather point towards a higher sensitivity of those establishments that belong to continuing firms, i.e. $NEW, ESTABS$ and $DEAD, ESTABS$.

Table 3.3: Contemporaneous Correlations of Entry/Exit Differentials with the Business Cycle – LT

	JCR		JDR	
	$EXP-NEW$	$NEW\ FIRMS-ESTABS$	$CONT-DEAD$	$DEAD\ FIRMS-ESTABS$
GDP	0.54	-0.21	-0.76	-0.07
	(0.13)	(0.59)	(0.02)	(0.85)
U	-0.72	0.38	0.72	0.17
	(0.03)	(0.31)	(0.03)	(0.67)

The table reports correlation coefficients and p-values of differential job flow rates with the cyclical aggregate measure (Unemployment Rate or GDP). The differential is computed by simply subtracting the two respective job flow rates. Data series are linearly de-trended.

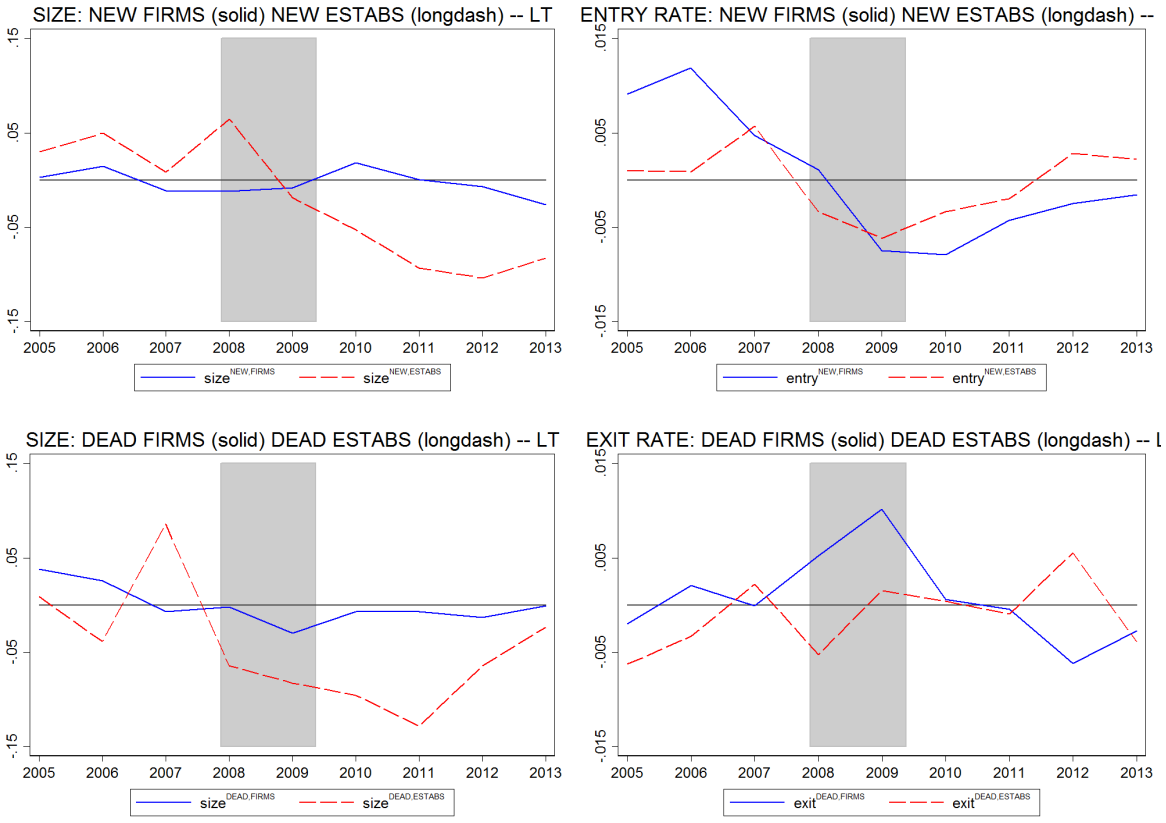
In a last step, we decompose the creation and destruction rates further into the average size and the entry and exit rates as we lined out in section 3.2.3. By doing this, we investigate the role of average size of entering/exiting establishments as well as their entry and exit rates. The linearly detrended series are shown below in figure 3.8.[31]
This further decomposition of NEW and $DEAD$ suggest a different behavior, depending on whether their parent company continues or enters/exits the market as well. When we focus on the left plots we observe that the flexibility of establishments that belong to continuing firms is higher in terms of size. Unfortunately, the data does not allow to track whether this is a selection effect or actually related to a re-scaling of operations. In principle, both explanations are in line with the plots. Depending on the aggregate state of the economy, different firms could decide to open up additional establishments, which would lead to a selection of different types of establishments.[32] However, it might well be the case that firms just vary the size of the newly set up establishments, depending on

[31] In appendix B.4 we show the time series for the entire period 1982-2013 and discuss the differences between decompositions on the establishment compared to the firm level.

[32] Because we can compare newly set up establishments by existing firms and newly set up establishment by new firms, this bias should be only relevant for the first and not the latter group.

their overall expectations. In a recession they would still open a plant, but of larger scale compared to a boom.

Figure 3.8: Average Size and Entry/Exit Rates during the Great Recession



The figure plots The plots split the JCR^{NEW} into the size of $NEW, FIRMS$ / $NEW, ESTABS$ as well as their entry rates. The product of both components corresponds to $JCR^{NEW,FIRMS}$ / $JCR^{NEW,ESTABS}$. The plots split the JDR^{DEAD} into the size of $DEAD, FIRMS/DEAD, ESTABS$ as well as their exit rates. The product of both components corresponds to $JDR^{DEAD,FIRMS}$ / $JDR^{DEAD,ESTABS}$. The series are linearly de-trended.

The result resembles Pugsley and Şahin (2015) who argue that the average size of entrants – even though they compute rates at the firm level – does not vary much over time and therefore focus only on the entry rate of startups. The actual behavior of the entry rates – computed as share of entering plants over the total population of plants – does not differ much between both types of entering establishments. Both rates go down during the Great Recession indicating that less establishments are created. In contrast, the exit rates differ. While the exit of firms goes up, the closure of establishments that belong to continuing firms does not change much.

As a last check we look at the actual correlations between the entry/exit rates and average size with the aggregate measures. As indicated in table 3.4 establishments of existing firms react stronger in their size. However, the correlations are not statistically significant. The

entry and exit rates reveal the opposite pattern, i.e. a higher sensitivity of establishments belonging to new or dead firms. But unfortunately, also these correlations are statistically not significant.

Table 3.4: Contemporaneous Correlations of Entry/Exit Differentials with the Business Cycle – LT

	$NEW\ FIRMS - ESTABS$		$DEAD\ FIRMS - ESTABS$	
	size	*entry*	*size*	*exit*
GDP	-0.27	0.56	-0.19	-0.11
	(0.48)	(0.11)	(0.63)	(0.78)
U	0.18	-0.31	0.34	0.22
	(0.65)	(0.41)	(0.37)	(0.58)

The table reports correlation coefficients and p-values of differential job flow rates with the cyclical aggregate measure (Unemployment Rate or GDP). The differential is computed by simply subtracting the two respective job flow rates. Data series are linearly de-trended.

3.3.2 Contribution to Aggregate Fluctuations in the Great Recession

The previous analysis for the cyclicality of different types of firms during the Great Recession can help to understand which firms are hit harder. A potentially more interesting question is how much the different groups of firms contribute to the aggregate employment fluctuations during the Great Recession. The most cyclical firms do not have to be those that contribute most to the aggregate fluctuations in the economy as well. It is a matter of relative and absolute contribution and it turns out that the employment weights are crucial for the contribution to employment fluctuations. This means that the cyclical analysis does not imply which firms contribute most to aggregate fluctuations during the Great Recession. It might well be that $YOUNG$ contribute more than proportional, but the bulk of variance stems from $MATURE$ simply because they represent a much larger fraction of employment in the economy. Thus, in this section the overall importance of the different categories of firms during the Great Recession is evaluated.
The approach we use is close to the actual variance decomposition that we described in section 3.2.5. But instead of computing the contribution to the variance of the overall job flows, we simply exploit the approximation of overall cyclical changes in the job flow into contributions of rates and weights. Because we show in appendix B.8 that the variation of the employment weights do not play a role for the cyclical contributions, we only plot the values for the cyclical rates, weighted by their employment shares. In this sense we could speak of "weighted" contributions as the deviations of the job flows from their linear trend are multiplied by the trend of the employment share, i.e.:

$$\widetilde{X_t} \approx \sum_{i \in GROUPS} \widetilde{\overline{\omega^i}_t X^i_t}, \tag{3.17}$$

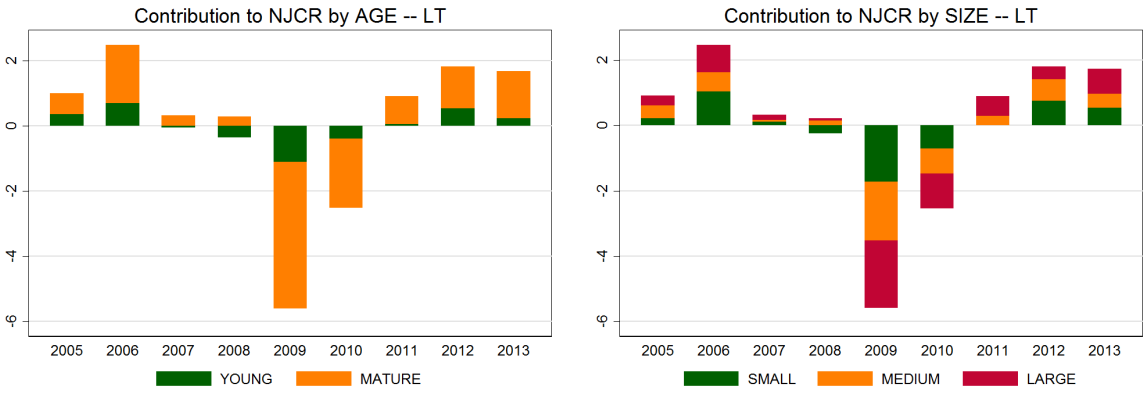
where $X = \{NJCR, JCR, JDR\}$ and $GROUPS = \{SIZE, AGE, AGE/SIZE\}$. When we move to the entry and exit we do not have to additionally weight the rates as they are already weighted. Therefore, those results are in line with the previous findings from the cyclical analysis.

The Role of Age and Size

We will start out by investigating the role of the different groups in terms of AGE and $SIZE$ separately and then discuss the combined $AGE/SIZE$ contributions. Because there are no visible differences across the job flow rates we decided to focus only on the $NJCR$ in this section and refer the interested reader to appendix B.6 for the contributions to JCR and JDR.
Figure 3.9 plots the annual contributions to the net job creation rate of AGE (left) and $SIZE$ groups (right). The left plot reveals that the lion's share of contribution stems from

$MATURE$ and not from $YOUNG$ firms. This indicates that the employment weights matter a lot. The results from the cyclical analysis showed that the $NJCR_t^{YOUNG}$ is more responsive than the $NJCR_t^{MATURE}$. Thus by equation (3.17) we know that the difference in the contributions stems from the employment weights. $YOUNG$ firms account to roughly 11 percent of the employment stock, while $MATURE$ firms employ the remaining workers. This means that even though $YOUNG$ firms show a stronger reaction during the Great Recession, this behavior is buffered, because of their small employment share. In absolute terms their contribution is found to be much less important.[33]

Figure 3.9: Contribution to $NJCR$ by AGE and $SIZE$ – Great Recession – LT



The graph plots the weighted contributions of individual job flow rates to overall $NJCR$. The left plot shows the contributions broken down by AGE, the right plot is broken down by $SIZE$. The procedure follows equation (3.17).

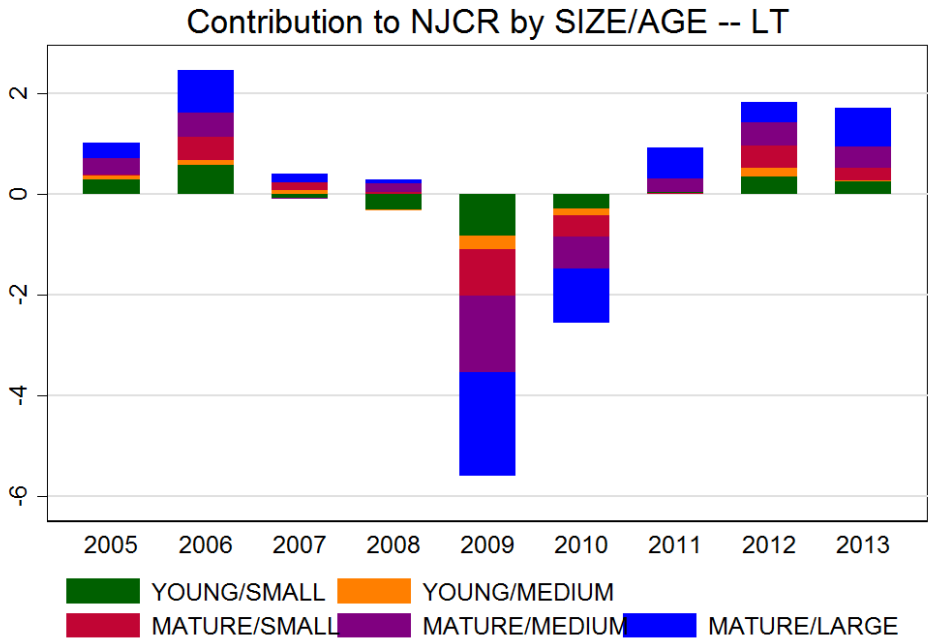
The right plot of figure 3.9 in contrast does not show strong heterogeneity for the different $SIZE$ groups. The bar chart shows that $LARGE$ contributed slightly more to aggregate job flows compared to $SMALL$.[34] The employment shares of the $SIZE$ groups are quite close with $SMALL$, $MEDIUM$ and $LARGE$ at 29 percent, 27 percent, and 44 percent respectively. Together with the previous findings that there was no strong difference in terms of the cyclical behavior this explains the results.
The last decomposition is along the $AGE/SIZE$ dimension at once. Figure 3.10 shows

[33]It is important to keep in mind that the contribution we measure here is only related to the direct and immediate effect. There are additional effects that we do not take into account. For example, less entry and less growth of $YOUNG$ firms has additional effects when they are supposed to grow older. Pugsley and Şahin (2015) show a direct relation between the decline in the startup rate and the gradual shift of employment towards more mature firms. Also Sedlacek and Sterk (2014) focus on the impact of recessions for life cycle patterns of firms and aggregate implications.

[34]The results of appendix B.9.2, which are based on the cut-offs of Fort et al. (2013) shows a larger contribution of $LARGE$ compared to $SMALL$, which is mainly a consequence of the smaller employment share for $SMALL$ due to the different size cut-offs.

that among the $MATURE$ mainly the $LARGE$ and $MEDIUM$ size firms contribute to overall job flows. Among the $YOUNG$ it is mainly the $SMALL$ that contribute.

Figure 3.10: Contribution to $NJCR$ by $AGE/SIZE$ – Great Recession – LT



The graph plots the weighted contributions of individual job flow rates to overall $NJCR$. The procedure follows equation (3.17).

This means that relative and absolute contributions are different for the job flows according to AGE and $SIZE$. Taking into account the employment weights overturns the cyclical results.

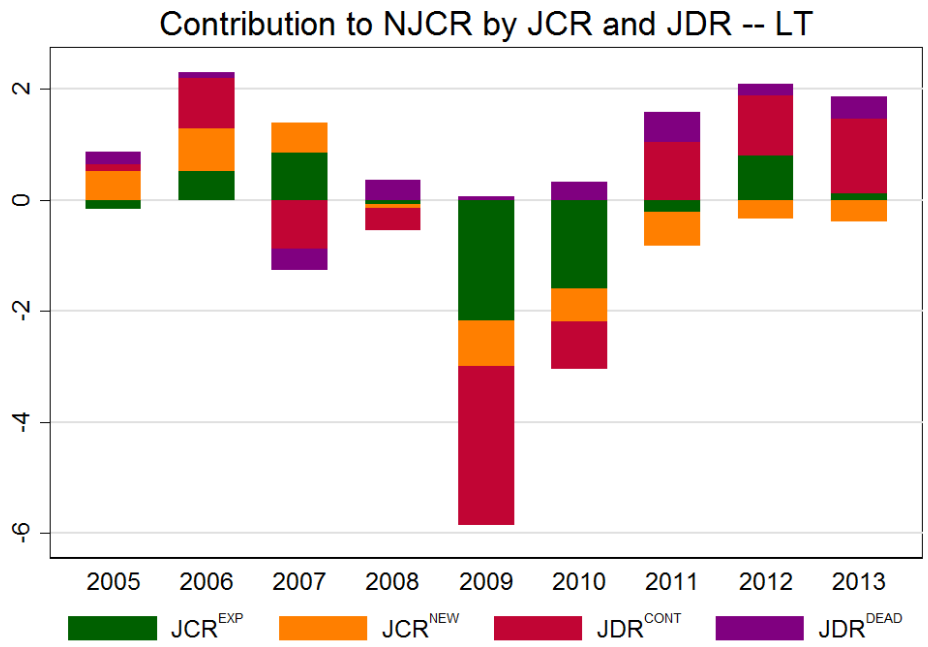
Entry and Exit

The contributions by entry and exit confirm the cyclical results. Since there is no additional weighting applied, this section adds mainly to the understanding of the different contributions over time.

Again, we start by studying also those establishments that expand and contract. As shown by figure 3.11, the lion's share of aggregate fluctuations comes from JCR^{EXP} and JDR^{CONT}. When it comes to entry and exit, it is mainly the entering establishments that contribute to the net job creation rate. In particular during the Great Recession the job creation of NEW contributed a bigger share, but still not much compared to the contribution of continuing firms. Interestingly, the contribution of JDR^{DEAD} is quite negligible during 2009, meaning that very few jobs were destroyed because of establishments that actually had to leave the market. This could be an effect of supportive policies that were

targeting the survival of firms during the Great Recession.

Figure 3.11: Contribution to NJCR by Entry and Exit – Great Recession – LT



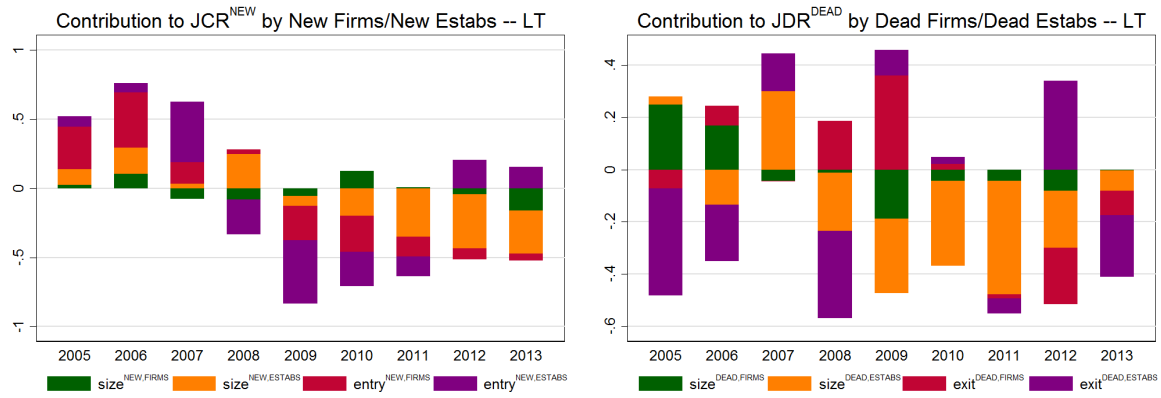
The graph plots the contribution of JCR^{NEW}, JCR^{EXP}, JDR^{DEAD}, and JDR^{CONT} to $NJCR$. The procedure follows equation (3.17). Rates are linearly de-trended.

Next we look at the actual entry and exit of firms and decompose the JCR^{NEW} and JDR^{DEAD} further into contributions of *size* and *entry/exit* rates. We thereby distinguish between the contributions that stem from entering and exiting firms, i.e. $NEW, FIRMS$ and $DEAD, FIRMS$, and continuing firms that set up or close establishments, i.e. $NEW, ESTABS$ and $DEAD, ESTABS$. It can be seen that the role of *size* of the latter group contributes substantially.

The decline of the JCR^{NEW} is partially due to the lower entry rate of new establishments, particularly in 2009. But we observe an additional phenomenon starting from 2009. The average size of $size^{NEW,ESTABS}$ is declining over the subsequent years, indicating that firms open up smaller plants than before. At the same time this could be an indication that certain frictions make it harder for those firms that want to open up relatively large establishments.

One of the reason why the overall JDR^{DEAD} did not contribute much to the $NJCR$ in 2009 is due to a compositional effect. Although the exit rates of $DEAD, FIRMS$ and $DEAD, ESTABS$ went up, the overall impact was buffered because the average size of exiting plants was smaller than usual.

Figure 3.12: Contribution to JCR^{NEW} and JDR^{DEAD} Flows – Great Recession – LT



The graphs decompose the entry, JCR^{NEW}, and exit margin, JDR^{DEAD}, into contributions of *size* and *entry/exit*. The procedure follows equation (3.17). Rates are linearly de-trended.

3.3.3 Cyclicality over the Business Cycle

While the previous part focused only on the period of the Great Recession, we now move towards the full sample period between 1982 and 2013. The longer sample period allows us to take into account also the 1981/82, 1990/91, and 2001 recession periods and verify our previous findings in a more general context. We focus on heterogeneous cyclical reactions of different groups of firms, similar to Moscarini and Postel-Vinay (2012) and Fort et al. (2013). First, we analyze the $SIZE$ and AGE groups and then investigate the entry and exit of establishments.

The longer time series allows us to compute meaningful correlations of differentials with the aggregate measures. We will focus on both, deviations from a linear trend as well as deviations from an HP-trend. By doing this, we can directly relate our findings to the research of Moscarini and Postel-Vinay (2012) who applied the HP-filter and Fort et al. (2013) who did not de-trend their data.[35] So we measure for instance the correlation between the de-trended growth rate of GDP and the differential of the net job creation rate over time:

$$Corr(\widetilde{\log(GDP_t)}, \widetilde{NJCR_t^{SMALL} - NJCR_t^{LARGE}}) \tag{3.18}$$

Similarly, we will look at differences between various groups on the entry and exit margin.

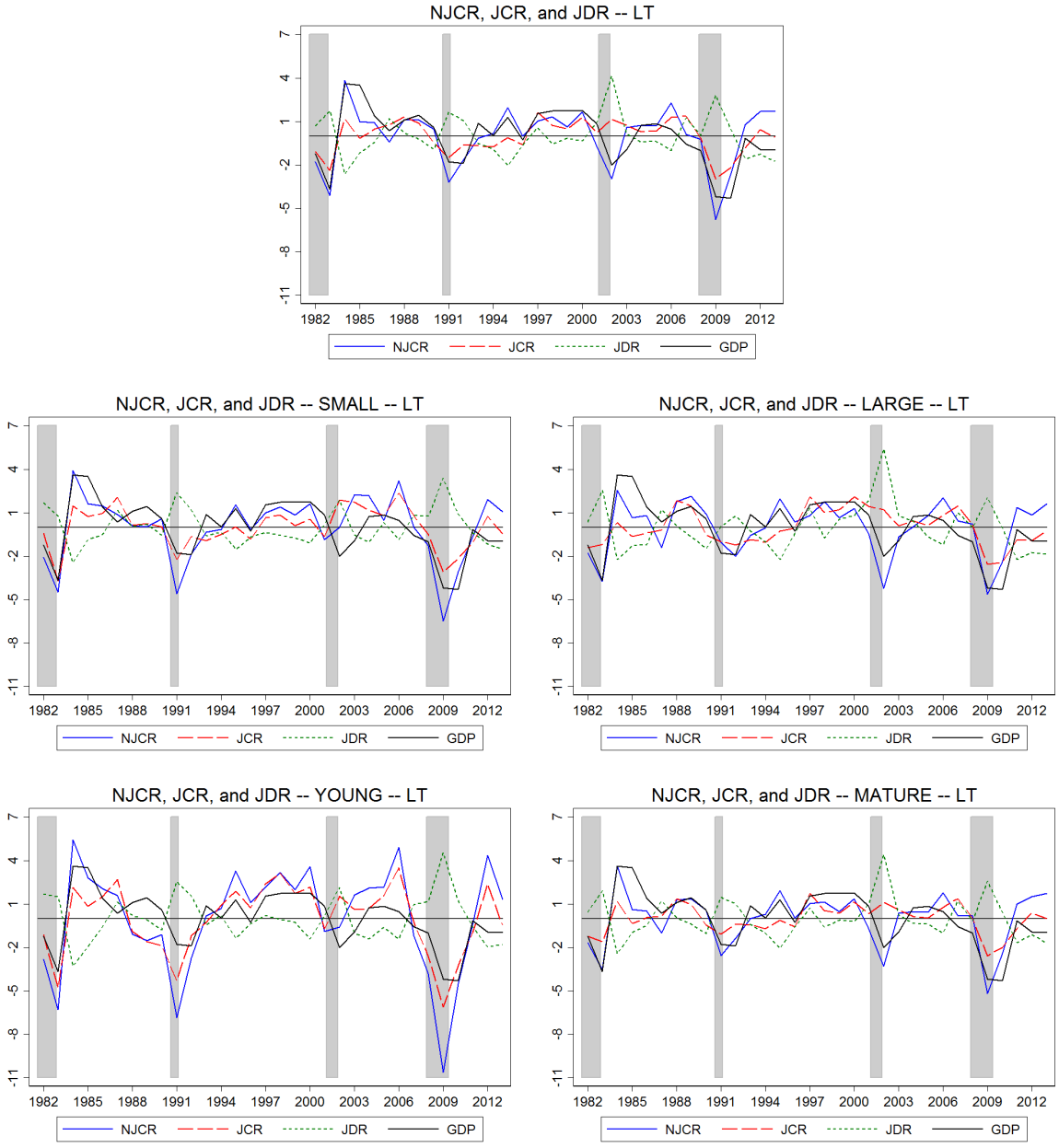
The Role of Age and Size

This section contributes to the discussion on AGE versus $SIZE$ for heterogeneous responses over the cycle. While Moscarini and Postel-Vinay (2012) highlight the hetero-

[35] The main reason of why we de-trend linearly and do not focus simply on the untreated rates is that in some of the more disaggregated series we observe trends over time.

geneous response between $SMALL$ and $LARGE$ firms and conclude a higher sensitivity of $LARGE$ firms during periods of high and low unemployment, Fort et al. (2013) put forward the importance of AGE and particularly $YOUNG/SMALL$ firms.

Figure 3.13: Job Flows over the Business Cycle

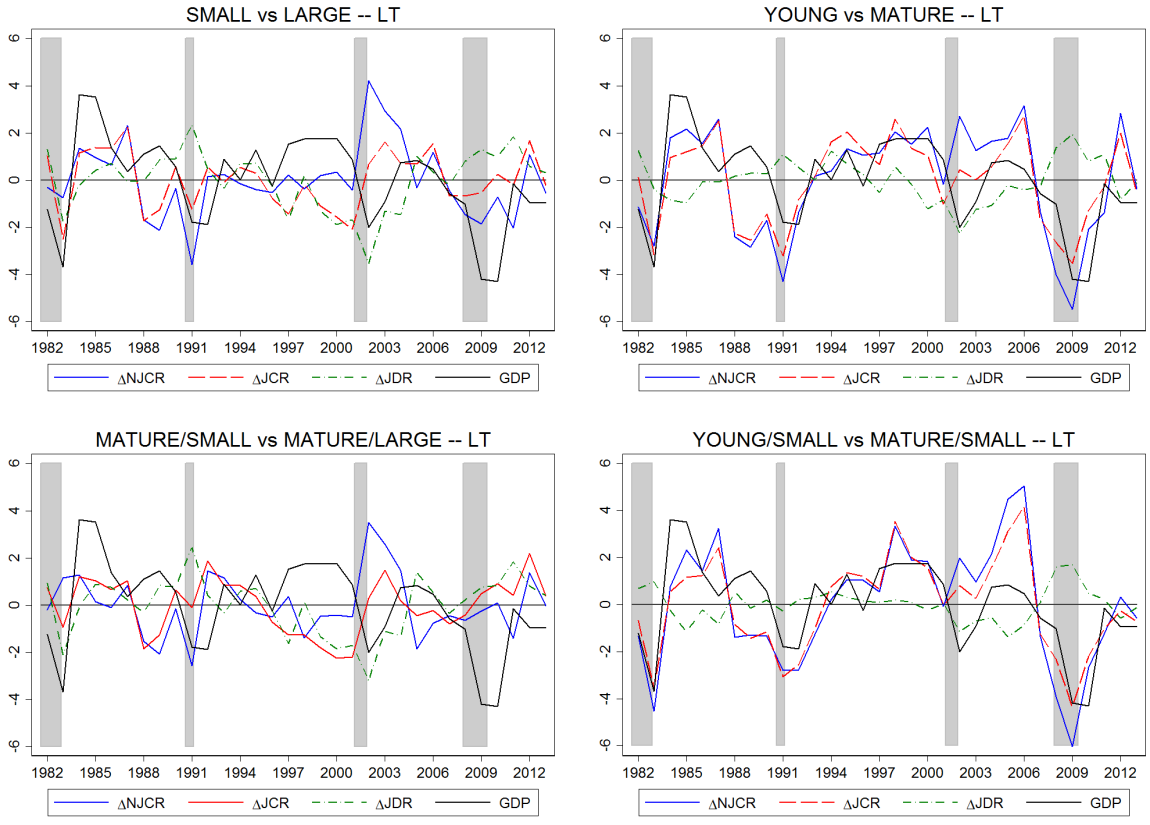


The graph plots the Job Creation Rate of different groups of firms. From the first top left to bottom right panel we look at $SIZE$, AGE, $SIZE$ conditional on $AGE = MATURE$, AGE conditional on $SIZE = SMALL$, and $MATURE/LARGE - YOUNG/SMALL$. All series are linearly de-trended.

Based on the BDS data we plot the linearly de-trended job flows in figure 3.13. NBER recessions are plotted in shaded gray areas. Starting from the first plot in which we include the overall $NJCR$, JCR, and JDR, we focus on $SMALL$ and $LARGE$ firms in

the middle and $YOUNG$ and $MATURE$ at the bottom. All plots show a pro-cyclical behavior of the $NJCR$ and the JCR, while JDR behaves counter-cyclical.
The graphs allow to compare the behavior across different recessions, the behavior of different job flows, and the behavior of different types of firms. While the previously mentioned pro- and counter-cyclicality of the job flows is a general feature that consistently shows up across all recessions, the magnitudes of cyclical deviations vary across time. A feature of the Great Recession is that it is the recession with the biggest negative drop in the $NJCR$ over the entire sample period. This is not generally true for the individual JCR and JDR. Other recessions episodes played a crucial role as well. The 2001 recession is the one with the highest peak of the overall JDR and was particularly harsh for $LARGE$ and $MATURE$ firms. $YOUNG$ and $SMALL$ were actually hit harder on the destruction side during the Great Recession. The drop in the JCR is of similar magnitude as in the 1981/82 recession, especially for the $SMALL$ and $YOUNG$ firms.

Figure 3.14: Differential Job Flows over the Business Cycle



The graph plots the Differential Job Flows of different groups of firms. From the first top left to bottom right panel we look at $SIZE$, AGE, $SIZE$ conditional on $AGE = MATURE$, AGE conditional on $SIZE = SMALL$, and $MATURE/LARGE - YOUNG/SMALL$. Differentials are computed by subtracting the respective series. The differentials for JCR, and $NJCR$ can be read in the same way, the one for JDR is consistent when going in the opposite direction. All series are linearly de-trended.

To understand the actual differences between $SMALL$ and $LARGE$, and $YOUNG$ and $MATURE$ we plot the differentials in figure 3.14. Besides plotting the two unconditional differentials in the upper graphs, we include the $SIZE$ differential conditional on $MATURE$ and the AGE differential conditional on $SMALL$ at the bottom.
For each of these differentials we correlate the differential with the business cycle measure. So generally speaking, each graph corresponds to a correlation coefficient for each job flow differential. In addition to the pure correlation coefficient, the graphs might be interesting to analyze specific periods of booms and recessions. But in the end the correlation coefficient is our statistic of interest to measure the cyclicality. Therefore, we abstain from plotting all individual graphs for correlations with the unemployment rate or GDP and set up a table with correlation coefficients instead. In addition to the correlation coefficients, we compute the p-values for the coefficients, which are displayed in parentheses in table 3.5.

Table 3.5: Contemporaneous Correlations of Differentials with GDP and Unemployment Rate

		$SMALL - LARGE$		$YOUNG - MATURE$		$MATURE\ SMALL - LARGE$		$SMALL\ YOUNG - MATURE$	
	Filter	LT	HP	LT	HP	LT	HP	LT	HP
JCR	GDP	0.13	0.06	0.54	0.13	-0.24	-0.22	0.69	0.24
		(0.49)	(0.76)	(0.00)	(0.48)	(0.19)	(0.23)	(0.00)	(0.18)
	U	-0.15	0.09	-0.48	0.12	0.17	0.27	-0.58	0.00
		(0.42)	(0.64)	(0.01)	(0.53)	(0.35)	(0.14)	(0.00)	(1.00)
JDR	GDP	-0.11	0.38	-0.34	0.23	-0.03	0.33	-0.42	0.02
		(0.54)	(0.03)	(0.06)	(0.20)	(0.87)	(0.07)	(0.02)	(0.90)
	U	-0.08	-0.27	0.19	-0.27	-0.16	-0.20	0.38	-0.18
		(0.66)	(0.14)	(0.30)	(0.13)	(0.39)	(0.28)	(0.03)	(0.33)
$NJCR$	GDP	0.19	-0.21	0.56	0.03	-0.19	-0.42	0.64	0.19
		(0.30)	(0.25)	(0.00)	(0.86)	(0.31)	(0.02)	(0.00)	(0.30)
	U	-0.05	0.27	-0.45	0.20	0.30	0.36	-0.55	0.05
		(0.79)	(0.14)	(0.01)	(0.28)	(0.09)	(0.05)	(0.00)	(0.78)

The table reports correlation coefficients and p-values of differential job flow rates with the cyclical aggregate measure (Unemployment Rate or GDP). The differential is computed by simply subtracting the two respective job flow rates. Data series are either linearly de-trended or HP-filtered with parameter 6.25.

Table 3.5 reports quite heterogeneous correlation patterns depending on the de-trending method. As shown by the first two columns, we do not find any statistical support for the result of Moscarini and Postel-Vinay (2012), i.e. $LARGE$ being more sensitive than $SMALL$ related to cyclical unemployment.[36] However, when conditioning on $MATURE$ firms, we find their $SIZE$ result, even independent of the filtering. As seen in columns 5 and 6, the correlation between the differential $NJCR$ and cyclical unemployment is about 0.30 (p-value 0.09) to 0.36 (p-value 0.05).[37]
The largest discrepancy of the filtering appears, however, when we distinguish between AGE groups. The linearly de-trended results in columns 3 and 7 are fully in line with the previous findings for the period of the Great Recession. $YOUNG$ firms are cyclically more sensitive than $MATURE$, indicated for example by the positive correlation of the $NJCR$ differential with GDP (0.56). The HP-filtered results, in contrast, are all not significant, sometimes even predicting the opposite behavior, but with insufficient statistical power.

Entry and Exit

This section aims to better understand how sensitive job creation and destruction due to entry and exit is over the cycle. Arguments for policies that try to avoid large fluctuations on the entry and exit margin are often mixing up the disproportionate role that entry and exit play in general and the cyclical role of it.
We start again with a wider view and take into account expanding and contracting establishments as well. Table 3.6 reports the differential for $EXP-NEW$ and $CONT-DEAD$ establishments. When focusing on deviations from a linear trend, we find a stronger sensitivity of the establishments that expand and contract. The HP-filtered results do not indicate a direction. Only the correlation of $CONT - DEAD$ with GDP is negative and significant. Because the JDR is counter-cyclical this indicates that during a boom the JDR drops stronger in $CONT$ than $DEAD$ establishments.

[36]The results of Moscarini and Postel-Vinay (2012) were found for the period 1979-2009 on a slightly older version of the BDS. Our codes give a correlation coefficient for the $NJCR$ differential and cyclical unemployment of 0.38 (p-value 0.03) for the same period, using the HP filter with parameter 390.625, which is in line with their findings.

[37]When we investigated the correlations of the linearly de-trended job flow rates with HP-filtered aggregates only the higher cyclical sensitivity of $MATURE/LARGE$ compared to $MATURE/SMALL$ for the JCR and $NJCR$ is found as well.

Table 3.6: Contemporaneous Correlations of Entry/Exit Differentials with the Business Cycle

	JCR				JDR			
	$EXP - NEW$		$NEW\ FIRMS - ESTABS$		$CONT - DEAD$		$DEAD\ FIRMS - ESTABS$	
Filter	LT	HP	LT	HP	LT	HP	LT	HP
GDP	0.58	-0.02	0.15	-0.26	-0.81	-0.32	-0.09	0.01
	(0.00)	(0.90)	(0.41)	(0.15)	(0.00)	(0.08)	(0.61)	(0.96)
U	-0.51	0.16	-0.11	0.38	0.77	0.05	0.03	0.03
	(0.00)	(0.37)	(0.56)	(0.03)	(0.00)	(0.78)	(0.88)	(0.85)

The table reports correlation coefficients and p-values of differential job flow rates with the cyclical aggregate measure (Unemployment Rate or GDP). The differential is computed by simply subtracting the two respective job flow rates. Data series are either linearly de-trended or HP-filtered with parameter 6.25.

Next we investigate differences between those new establishments that belong to brand new firms and those that are part of continuing firms. The third and fourth column of table 3.6 indicate that statistical differences depend on the de-trending. The linear de-trending does not indicate any heterogeneous behavior, while the HP-filtered series points towards a stronger reaction of $NEW, ESTABS$. The correlation with the unemployment rate is 0.38, meaning that in times of low unemployment $NEW, ESTABS$ perform better than $NEW, FIRMS$, and in times of high unemployment they perform worse. This suggests that continuing firms are more flexible in their timing of when to open new establishments.

Table 3.7 goes a step further and decomposes the job creation and job destruction rates of NEW and $DEAD$ establishments into the *size* and *entry/exit* rates. Again, the de-trending matters for the results. The linearly de-trended results indicate that $NEW, ESTABS$ react stronger in terms of establishment size, while $NEW, FIRMS$ show a stronger reaction in the entry rate. On the destruction side we again find a stronger reaction of $DEAD, ESTABS$ in terms of size, but no evidence related to the exit rate. The HP-filtered results are all insignificant.

Table 3.7: Contemporaneous Correlations of Entry/Exit Differentials with the Business Cycle

	NEW $FIRMS-ESTABS$				$DEAD$ $FIRMS-ESTABS$			
	size		*entry*		*size*		*exit*	
Filter	LT	HP	LT	HP	LT	HP	LT	HP
GDP	-0.32	-0.03	0.51	-0.09	-0.31	0.16	0.03	-0.13
	(0.07)	(0.88)	(0.00)	(0.62)	(0.08)	(0.40)	(0.88)	(0.49)
U	0.18	0.13	-0.41	0.18	0.24	-0.04	-0.06	0.05
	(0.33)	(0.46)	(0.02)	(0.33)	(0.19)	(0.83)	(0.76)	(0.80)

The table reports correlation coefficients and p-values of differential job flow rates with the cyclical aggregate measure (Unemployment Rate or GDP). The differential is computed by simply subtracting the two respective job flow rates. Data series are either linearly de-trended or HP-filtered with parameter 6.25.

3.3.4 Contribution to Aggregate Fluctuations over the Business Cycle

The cyclical sensitivity of different groups of firms that we have documented helps to understand the relative impact that these groups have. The total impact, however, is strongly related to the employment share of the individual groups of firms as we have seen for the Great Recession. Therefore, we decompose the variance of aggregate fluctuations into contributions of groups of firms and relate the results with the findings in the Great Recession.[38]

Pugsley and Şahin (2015) show that the life-cycle dynamics did not change over the period we are investigating. Therefore, changes in the overall employment dynamics are mainly driven by compositional effect that we take into account by de-trending the variables.

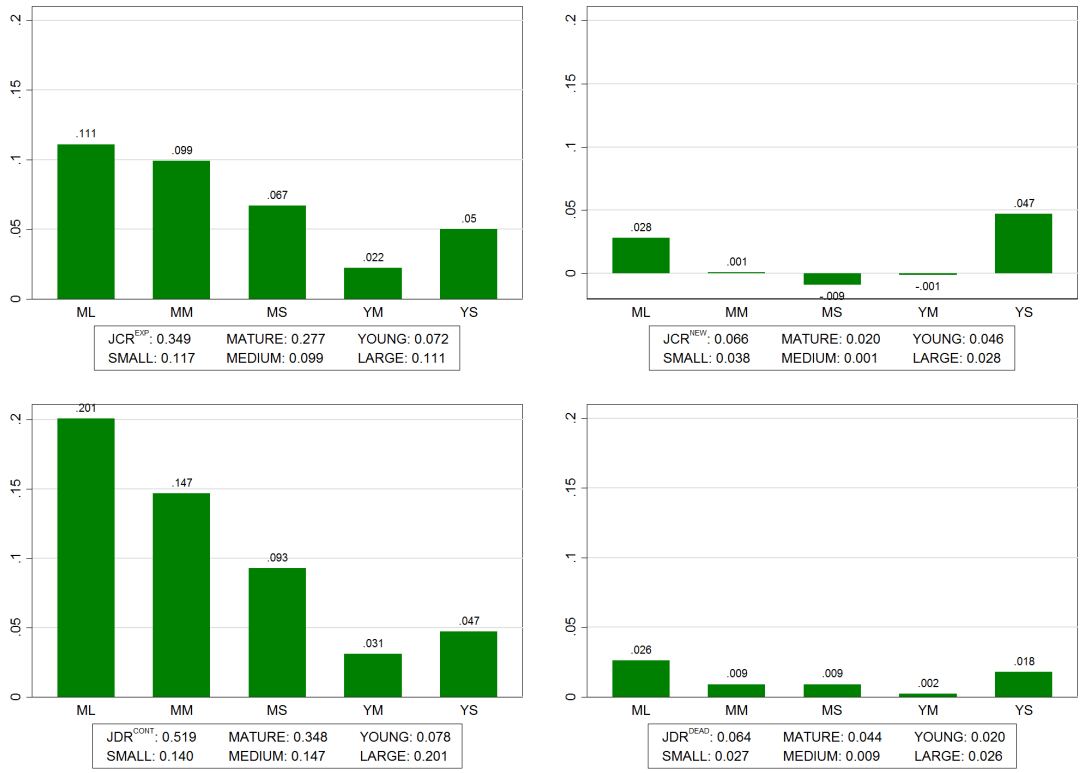
We describe the role of AGE and $SIZE$ first and then discuss the contributions that stem from the entry and exit of establishments. The results for the Great Recession period are generally confirmed.

[38]In principle, cyclical variations can stem from changes of the job flow rates of a group or by compositional changes due to changes in the employment weights. We neglect the latter contributions of the weights, because weights contribute only a tiny share to aggregate fluctuations as shown in appendix B.8. General trends in the employment weights, however, are taken into account as described by our methodology in section 3.2.5.

The Role of Age and Size

Figure 3.15 visualizes the contributions of job flow rates of $AGE/SIZE$ groups to overall $NJCR$. As described in section 3.2.5 we decompose the $NJCR$ into the $AGE/SIZE$ contributions according to JCR^{NEW}, JCR^{EXP}, JDR^{DEAD}, and JDR^{CONT}. Therefore, the 20 contributions from figure 3.15 add up to unity with some approximation error.[39] The approximation error stems from the fact that we implement a Taylor expansion around the trend. In addition, we neglect the contributions of cyclical employment weights in this analysis. Those contributions are reported in appendix B.8, but are negligible.

Figure 3.15: Variance Decomposition according to $AGE/SIZE$ – Weighted Results – LT



The bar charts report the weighted results of the variance decomposition, which is described in section 3.2.5. The weight consists of the trend of the employment share of the respective group. The period is 1982-2013 and the underlying dataset is from the BDS. The job flow rates are linearly de-trended.

Figure 3.15 shows that the two left plots, i.e. the expansion (34.9 %) and contraction (51.9 %) of existing establishments, contribute the lion's share to aggregate job fluctuations. The destruction side is dominating this decomposition with an overall share of 58.3 %. The plot reveals already the dominance of $MATURE/LARGE$ firms. Their impact on overall net job flows is enormous.

This sets the ground for a more rigorous comparison between AGE and $SIZE$. The nice

[39] Remember that we dropped the $YOUNG/LARGE$ firms from our analysis.

feature of these very disaggregated contributions in figure 3.15 is that we can use these numbers to compute any other contribution that might be of interest. Table 3.8 reports these results for both, linearly de-trended as well as HP-filtered rates. Before interpreting the results, we briefly explain again how to compute these contributions. Take for instance the contribution of $SMALL$ to $NJCR$, i.e. 0.323. This is simply the sum of all contributions of $YOUNG/SMALL$ and $MATURE/SMALL$ from figure 3.15 across all four plots. Instead, the contributions of $SMALL$ to JCR is computed by summing the contributions of $YOUNG/SMALL$ and $MATURE/SMALL$ in the upper two plots and dividing them by the overall contribution of JCR.[40]
In general, the results of table 3.8 are quite similar, independent on the de-trending. There are only some discrepancies related to job destruction. The HP-filtered rates reveal slightly larger contributions of $MATURE/LARGE$ firms compared to the linearly de-trended rates.

Table 3.8: Variance Decomposition of Job Flows

Decomposed	$SIZE$			AGE		$AGE/SIZE$				
Rate	S	M	L	Y	M	YS	YM	MS	MM	ML
Linearly De-trended Job Flows										
$NJCR$	0.323	0.311	0.367	0.216	0.784	0.162	0.054	0.160	0.257	0.367
JCR	0.373	0.292	0.335	0.284	0.716	0.234	0.051	0.140	0.241	0.335
JDR	0.286	0.324	0.389	0.168	0.832	0.111	0.057	0.175	0.268	0.389
HP-filtered Job Flows (parameter 6.25)										
$NJCR$	0.294	0.328	0.377	0.193	0.807	0.136	0.057	0.158	0.271	0.377
JCR	0.373	0.319	0.308	0.266	0.734	0.216	0.050	0.157	0.269	0.308
JDR	0.251	0.333	0.416	0.153	0.847	0.092	0.061	0.159	0.273	0.416

The table reports the contributions of the individual set of firms in each $SIZE$, AGE, or $AGE/SIZE$ group to the overall variance of the decomposed rate. For each of the groups, the rows sum to one with some approximation error. The methodology is described in section 3.2.5.

When we look at the contributions of different $SIZE$ groups, we observe that $LARGE$ matter a bit more for the $NJCR$ due to a stronger importance on the job destruction margin. On the job creation margin, however, $SMALL$ are more important. This relates a bit to the often used argument in the public debate that small firms are the engine of employment growth and need to be supported when cyclical shocks hit. This argument, however, leaves out the AGE of firms.
Comparing $YOUNG$ and $MATURE$ firms reveals a very clear picture that $MATURE$

[40]The sum of the contributions in the upper two plots is given by 0.155, while the total contribution of job creation is given by 0.415. Therefore, $SMALL$ contribute 37.3 % to overall JCR.

contribute around three quarters to the overall cyclical job flows. This is not surprising as $MATURE$ firms employ about 85 percent of the overall workforce. Thus, it is quite natural that they play a crucial role for the overall job flows. Again, we observe differences on the job creation and destruction margin. While $MATURE$ contribute 83.2% to the JDR, they contribute substantially less to JCR with 71.6%.
The last five columns of the table show the contributions of all $AGE/SIZE$ categories. Among $YOUNG$ mainly $YOUNG/SMALL$ contribute to cyclical fluctuations. They contribute a very disproportional share to the cyclicality of overall job flows. In terms of individual groups that contribute most to aggregate fluctuations, we can see that $MATURE/LARGE$ and $MATURE/MEDIUM$ play a crucial role and in sum matter for more than half of the overall cyclical job flows.
An important point, however, that the decomposition illustrates is that policies that might help $SMALL$ and in particular $YOUNG/SMALL$ can obviously have a disproportionate effect on the overall cyclicality of job flows, but are limited at the same time. Overall, any policy tool that supports for instance $YOUNG/SMALL$ is limited to affect a small fraction of overall net job creation, while a policy that targets large mature firms can act on a much larger share of the cyclical $NJCR$. Thus, this exercise helps to better understand the angle that policies are working on and their limitations when it comes to the stabilization of overall employment fluctuations.
In a last step, we compute "unweighted" contributions. This will highlight the relative contribution as it takes into account the employment weights. We divide the "weighted" contributions by average employment shares over the period, reported in table 3.9.[41]

Table 3.9: Average Employment Weights

	$YOUNG$		$MATURE$		
	$SMALL$	$MEDIUM$	$SMALL$	$MEDIUM$	$LARGE$
Employment Share	10.4%	3.7%	20.5%	23.1%	42.3%

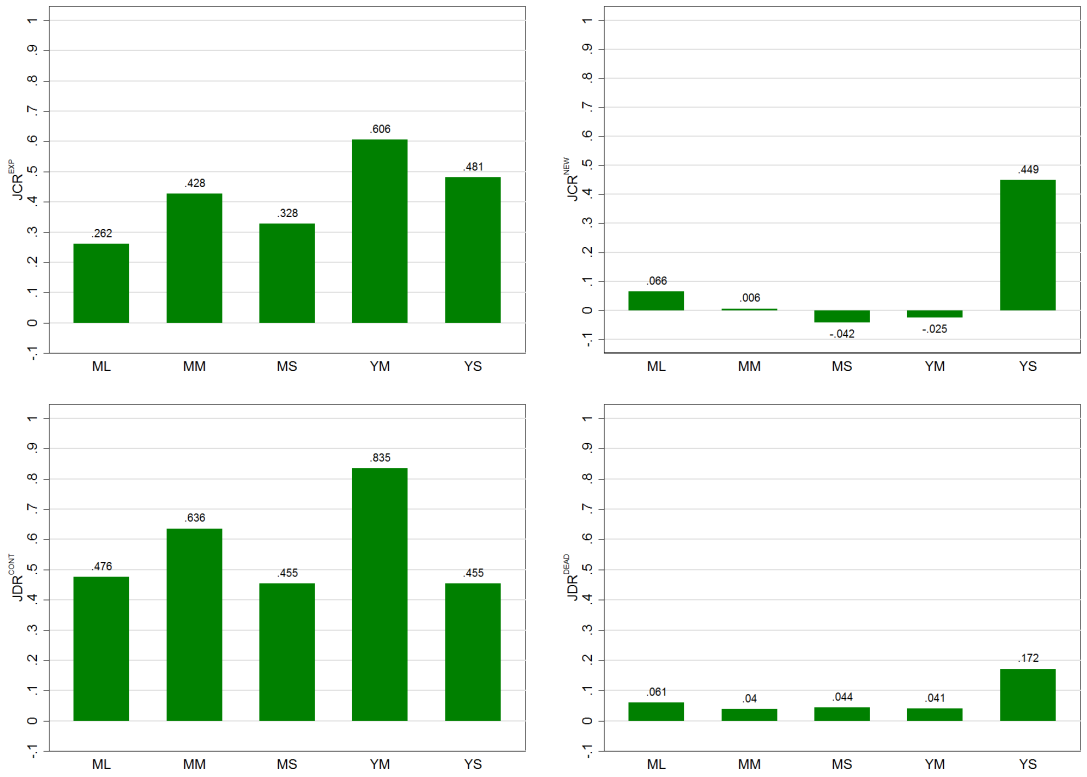
The table reports the average employment shares of the firm groups in the economy over the period 1982-2013. Young Large firms were completely dropped from the analysis and therefore do not contribute to overall employment.

Figure 3.16 plots the unweighted contributions of the different $AGE/SIZE$ groups. The plots show the crucial role of $YOUNG/SMALL$ businesses at the entry and exit margin and $YOUNG$ firms in general. The actual numbers do not have a precise meaning,

[41] A problem that we face in this respect is that we can only divide by the average employment share and therefore might face a bias. Since the cyclical behavior did not change significantly over time as found by Pugsley and Şahin (2015), we do not face a general problem with the variance decomposition. However, when dividing by the employment share of $LARGE$ firms, for instance, we will over-state the importance at the beginning and under-state the importance towards the end of the period. Similarly for groups that faced a decrease in the employment share over time we will face the opposite pattern.

but can be interpreted as relative contributions compared to other categories. The results also relate to the standard deviations for the de-trended rates. Those categories with a higher relative contribution to aggregate volatility feature higher standard deviations for their de-trended rates as well.

Figure 3.16: Variance Decomposition according to $AGE/SIZE$ – Unweighted Results – LT



The bar charts report the results of the variance decomposition, which is described in section 3.2.5. The period is 1982-2013 and the underlying dataset is from the BDS. The job flow rates are linearly de-trended. Actual contributions are unweighted as the weighted contributions are divided by the average employment share over the observation period, shown in table 3.9.

Entry and Exit

The job creation and job destruction of NEW and $DEAD$ as well as EXP and $CONT$ establishments are reported in table 3.10. We have seen already from figure 3.15 that the margin of expansion and contraction plays a more important role than the actual entry and exit.

In general $MATURE$ firms are dominating the decomposition with a contribution that is around four times higher than the one of $YOUNG$ firms. The only exception where the pattern is reversed is the JCR^{NEW}.

When it comes to $SIZE$ the expansion and contraction of existing establishments is

quite evenly caused by all three size categories. In contrast, the opening and closing of new establishments is dominated by one group. While $SMALL$ are responsible for about three quarters of overall cyclical JCR^{NEW}, about half of the JDR^{DEAD} is due to $LARGE$.

Table 3.10: Variance Decomposition of Job Flows at Entry/Exit Margin

Decomposed	$SIZE$			AGE		$AGE/SIZE$				
Rate	S	M	L	Y	M	YS	YM	MS	MM	ML
Linearly De-trended Job Flows										
JCR^{EXP}	0.335	0.347	0.318	0.206	0.794	0.143	0.063	0.192	0.284	0.318
JCR^{NEW}	0.576	0.000	0.424	0.697	0.303	0.712	-0.015	-0.136	0.015	0.424
JDR^{CONT}	0.270	0.343	0.387	0.150	0.850	0.091	0.060	0.179	0.283	0.387
JDR^{DEATH}	0.422	0.172	0.406	0.313	0.688	0.281	0.031	0.141	0.141	0.406
HP-filtered Job Flows (parameter 6.25)										
JCR^{EXP}	0.327	0.355	0.318	0.202	0.798	0.137	0.065	0.190	0.290	0.318
JCR^{NEW}	0.778	0.000	0.222	0.833	0.167	0.917	-0.083	-0.139	0.083	0.222
JDR^{CONT}	0.247	0.360	0.393	0.148	0.852	0.081	0.067	0.166	0.292	0.393
JDR^{DEAD}	0.265	0.235	0.500	0.169	0.831	0.132	0.037	0.132	0.199	0.500

The table reports the contributions of the individual set of firms in each $SIZE$, AGE, or $AGE/SIZE$ group to the overall variance of the decomposed rate. For each of the groups, the rows sum to one with some approximation error. The methodology is described in section 3.2.5.

Next we decompose the JCR^{NEW} and the JDR^{DEAD} further into contributions of *size* and *entry/exit* rates. The results of the linearly de-trended rates confirm what we observed for the period of the Great Recession. Continuing firms are more flexible when it comes to adjusting the size of new establishments and closing establishments. The size of $JCR^{NEW,ESTABS}$ and $JDR^{DEAD,ESTABS}$ contributed significantly to overall fluctuations. In addition, most of the contribution to the overall rates is caused by NEW and $DEAD$ establishments of continuing firms. The actual entry and exit of firms contributes mainly through the entry and exit rate as argued by Pugsley and Şahin (2015).

Table 3.11: Variance Decomposition of JCR^{NEW} and JDR^{DEAD}

Decomposed Rate	Linear Trend		HP-Filter (6.25)	
	size	*entry / exit*	*size*	*entry / exit*
$JCR^{NEW,ESTABS}$	0.198	0.506	0.020	0.704
$JCR^{NEW,FIRMS}$	0.098	0.208	0.073	0.178
$JDR^{DEATH,ESTABS}$	0.355	0.468	0.218	0.617
$JDR^{DEATH,FIRMS}$	0.076	0.068	0.070	0.054

The table reports the contributions of the the Size and the Entry/Exit Rates to JCR^{NEW} and JDR^{DEAD}. The four components for each, JCR^{NEW} and JDR^{DEAD}, sum to one with some approximation error. The methodology is described in section 3.2.5.

3.4 Discussion of Policies

Discussing policies on small and large firms is a highly controversial field in the political domain. The accusations and arguments start already with defining the "right" measurement of the economic importance of small businesses and the frictions that affect them. Some policy research even demands the end of all subsidies to small businesses (Rugy, 2005). At the same time, ongoing discussions about the impact of political lobbying or the recent focus on tax evasion of multi-national enterprises are related to large corporations. It is argued that policy-makers care too much about big businesses and do not acknowledge the importance of small businesses.

We want to contribute to this discussion by giving a brief overview of current policies in place and relating them to our empirical findings. By doing so we cannot challenge any results related to the innovative capacities of certain groups of firms or their overall contribution to economic growth. Instead we add to the discussion by providing information on the role of different groups of firms for the cyclical behavior of job flows.

An important information to start with is that it is very different what we describe as small and what the political process defines as small. For many industries the threshold of small businesses is set to 500 workers by the Small Business Administration (SBA) and therefore much higher than our size cut-off.

The general belief of advocates of small firms is that these small firms are the engines of (job) growth and the place in which most of innovation takes place.[42] Often mentioned examples are IT companies starting in garages, such as Google or Apple, and then heavily innovate and create jobs and value over time. But due to frictions not enough resources

[42]That this view on small businesses might have to be revised can be seen from research by Hurst and Pugsley (2011). Based on surveys they find that most small business owners do not have the intention to grow big, but rather serve an existing market with an existing product or service. This questions also the idea of small businesses being the cradle of innovation.

are allocated to these small firms. Potential frictions are the access to credit, externalities of technological spill-overs that are not internalized, and fixed costs due to regulations. That not all small firms are necessarily Google or Apple and could be also the entry of a real estate agent, the coffee shop around the corner, or the opening of a new barber shop is often downplayed.

There are several policies in place to support small businesses in the United States.[43] Many of those are taken care of by the SBA. In general they could be classified into direct and indirect subsidies.

The direct subsidies relate mainly to SBA programs related to the supply of credits. To facilitate the access to credits and help the liquidity constrained firms, the SBA allows credits to small businesses. Other forms of supporting small businesses are preferential treatments. Smaller firms are exempted from taxation or face tax breaks. Many of the regulatory burden is given to bigger firms, trying to lower the fixed costs of very small businesses by exempting them from certain requirements. A non negligible amount of direct spending of public procurement on small firms is also required by law. During the Great Recession various direct policies were implemented to support small businesses. By giving tax cuts to small businesses and increasing their access to finance, these policies should help to dampen the negative shock to small businesses during the Great Recession.[44] The aim of these policies is to fuel the credit supply to small businesses by giving government-backing for a fraction of the loans that partner banks give to these businesses.

The indirect subsidies are mainly non-pecuniary benefits. And they are generally not taxed. For example, small business owners can benefit from being their own boss and have more flexible working hours. There is also evidence that small business owners under-report their income to tax authorities (Hurst, Li, & Pugsley, 2010).

All these aforementioned subsidies are often linked to firm size, based on head-count measures of workers. This could actually inhibit growth by causing new distortions. Firms face additional costs when crossing these size thresholds. Therefore, they might prefer to stay slightly below the threshold and still be eligible to receive certain subsidies instead of growing to their optimal size.

But there is also a more fundamental problem with these policies. It seems that many policies are actually set up in the mindset of supporting firms that face frictions when

[43] A brief overview of different policies with exact criteria can be found in the discussion of Adam Looney in Hurst and Pugsley (2011).

[44] Policies were for example the "*Small Business Jobs Act*" in 2010, the "*Hiring Incentives to Restore Employment (HIRE) Act*" in 2010, the "*Middle Class Tax Relief and Job Creation Act*" in 2012. The "*Red Tape Reduction and Small Business Job Creation Act*" of 2012 is a law that puts a stronger emphasis on the regulatory costs for small businesses. The act tries to reduce regulations for small businesses to make it easier for them to hire new workers.

growing or are negatively impacted by aggregate shocks. Whether policies should therefore relate to size or age is not clear. There is little empirical evaluation available to study the effectiveness of current policies. By imprecise targeting, new distortions could arise. Our analysis revealed that the usual size distinction is not the relevant margin for business cycle fluctuations of job flows. Instead, the age of firms is found to be a more relevant margin, independent of size. Young firms are more cyclically sensitive to aggregate fluctuations. Thus, it seems to be a more relevant margin to include the firm age as well.

For policies that target the stabilization of aggregate employment over the business cycle our results from the variance decomposition analysis are relevant.[45] While young firms are more sensitive to the cycle, they contribute only very little to overall fluctuations. During the Great Recession they caused roughly around 20 percent of overall fluctuations. Thus, policies supporting the jobs in mature firms can have more leverage as more than 80 percent of employment is in mature firms.[46]

3.5 Conclusion

This paper investigates the cyclical behavior of heterogeneous firms in their job flows and their contribution to employment fluctuations. Of particular interest are firms of different size and age as well as the entry and exit margin. The first part of the analysis focuses on the period of the Great Recession, while the second investigates the behavior over multiple business cycles between 1982-2013.

For the period of the Great Recession we document important heterogeneity along the dimension of firm age. We find that firms younger than 5 years are hit harder than mature firms. When investigating the role of firm size, we do not find evidence of a heterogeneous behavior of small and large firms in contrast. However, when measuring the actual contribution to overall employment fluctuations the findings revert. Because of their small employment share, young firms contribute relatively little to overall employment fluctuations. Instead, mature firms contribute the lion's share.

For the period from 1982-2013 results are more dependent on the data treatment. Linearly de-trended job flows confirm our findings for the Great Recession and show that young firms are more sensitive than mature firms. The HP-filtered flows, in contrast, reveal mixed evidence.

In general, we find the job creation and destruction due to actual entry and exit of establishments relatively less important compared to the expansion and contraction of existing

[45] Note that in principle job losses due to aggregate fluctuations could be an efficient outcome as well if they are cleansing.

[46] The results of our variance decomposition are only based on direct effects, while there might well be additional dynamic effect that accumulate over time as shown by Sedlacek and Sterk (2014).

establishments.

Our findings underline the importance of firm age for policies and general discussions on cyclical effects on heterogeneous firms. As shown, most policies are centered around the size dimension of firms. The conventional view of economists and policymakers sees small businesses as the engine of growth with an important role for job creation and innovation. The cyclical sensitivity, however, is stronger related to firm age than to firm size. Therefore, it could be instructive to shift the focus more towards the role of small and young firms instead of only small.

This study also questions the argument of granularity, i.e. large firms driving the cycle, on the basis of cyclical job flows. Taking the granular argument literally, we would not only see that large firms are stronger correlated with the business cycle, but also that – as long as there is no further amplification – large firms contribute disproportionately to the aggregate fluctuations (as they are partially caused by them). While we confirm the findings of Moscarini and Postel-Vinay (2012) that large firms are more sensitive to the cycle, we can definitely rule out that large firms contribute disproportionally to aggregate fluctuations. Our variance decomposition shows that large and mature firms contribute the lion's share to aggregate fluctuations, but this is mainly due to their large share in overall employment. Nevertheless, they contribute relatively less compared to small and young firms.

B. Appendix

B.1 Distribution of Job Creation and Destruction across Firm Groups

To better understand how job creation and destruction is divided across firms, we include the following table. It reports the average shares of job creation and destruction shares due to various size and age categories. The last row reports the shares of small young firms without the new entrant firms.

Table B.1: Average Job Creation and Job Destruction Shares of Different Groups

	JOB CREATION			JOB DESTRUCTION		
	NEW	EXP	TOTAL	DEAD	CONT	TOTAL
$YOUNG$	.53	.22	.34	.31	.16	.21
$MATURE$	.46	.78	.66	.69	.84	.79
$YOUNG/SMALL$	.50	.17	.29	.23	.11	.15
$YOUNG/MEDIUM$	.03	.05	.04	.08	.05	.06
$MATURE/SMALL$	.05	.23	.16	.22	.21	.21
$MATURE/MEDIUM$	.12	.21	.17	.18	.23	.21
$MATURE/LARGE$	.30	.34	.33	.29	.40	.36
$YOUNG/SMALL$ without Firm Entry	.03	.17	.12	.23	.11	.15

The table reports the average shares for job creation and destruction as share of the respective column. The underlying data stems from the BDS and the period covers 1982-2013. The last row re-computes the average shares for $YOUNG/SMALL$ firms, deducting the job creation caused by firm entry.

As can be seen from the second line of the table B.1, $MATURE$ create (66 percent) and destroy (79 percent) the bulk of all jobs. Most of this creation (74 percent) and destruction (70 percent) of $MATURE$ stems from the intensive margin, i.e. expansion and contraction of already existing establishments, as seen in table B.2. In contrast, the creation and destruction shares for $YOUNG$ are almost balanced between the intensive margin – expanding/contracting existing establishments (42 percent / 50 percent) – and the extensive margin – opening/closing establishments (58 percent / 50 percent).
Next, we can look at the shares of different $AGE/SIZE$ groups. For the job creation, mainly $MATURE/LARGE$ (33 percent) and $YOUNG/SMALL$ (29 percent) are important, while for the job destruction $MATURE/LARGE$ (36 percent), $MATURE/MEDIUM$ (21 percent), and $MATURE/SMALL$ (21 percent). The margins of adjustment of ta-

ble B.2 are different across $SIZE$ groups. For job creation, with around 34 percent $LARGE$ firms adjust more on the extensive margin compared to medium (around 25 percent) and small firms (around 10 percent). In contrast, the extensive margin plays a more important role for job destruction at particular $YOUNG/SMALL$ (52 percent) and $YOUNG/MEDIUM$ (44 percent).

Table B.2: Distribution of Job Creation and Job Destruction across Extensive and Intensive Margins

	JOB CREATION		JOB DESTRUCTION	
	NEW	EXP	DEAD	CONT
TOTAL				
$YOUNG$	.58	.42	.50	.50
$MATURE$	.26	.74	.30	.70
$YOUNG/SMALL$	.63	.37	.52	.48
$YOUNG/MEDIUM$	.26	.74	.44	.56
$MATURE/SMALL$	.12	.88	.36	.64
$MATURE/MEDIUM$	.25	.75	.29	.71
$MATURE/LARGE$	.34	.66	.28	.72
$YOUNG/SMALL$ without Firm Entry	.09	.91	.52	.48

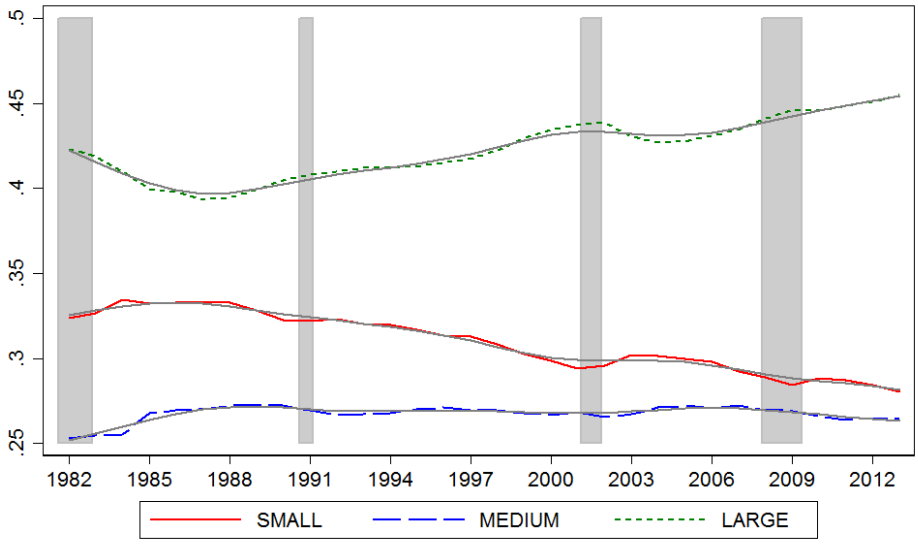
The table reports the distribution of job creation and job destruction across new/expanding and dying/contracting firms respectively. The underlying data stems from the BDS and the period covers 1982-2013.

In addition to the figures that are visible in the table, we looked into the entry and exit of firms as well. The job creation of new born firms represents 18 percent of total job creation and 47 percent of all jobs created by newly created establishments. Similarly, 48 percent of all jobs destroyed through establishments closing are due to firm closure. 17 percent of all destroyed jobs are caused by exiting firms. In terms of firm age, $YOUNG$ and $MATURE$ exiting firms contribute equally to job destruction. $LARGE$ do not matter much as exit of $LARGE$ is a very rare event. Jobs are mainly destroyed by $SMALL$. The individual contributions to overall job destruction are given by $YOUNG/SMALL$ (6 percent), $MATURE/SMALL$ (6 percent), $YOUNG/MEDIUM$ (2 percent), and $MATURE/MEDIUM$ (3 percent).

B.2 BDS Employment Shares over Time

A glance at the time series shows that the employment share of large firms is constantly increasing over time, while the share of small firms is decreasing. Pugsley and Şahin (2015) show that the increase in employment of $LARGE$ – and particularly $MATURE/LARGE$ – firms is likely a consequence of a decline in the startup rate.
Besides these obvious trends in the data, there is a visible cyclicality in the employment shares. When focusing only on the NBER recession periods, shaded in gray, the importance of large firms for the aggregate employment seems to increase, while the one for small firms decreases.

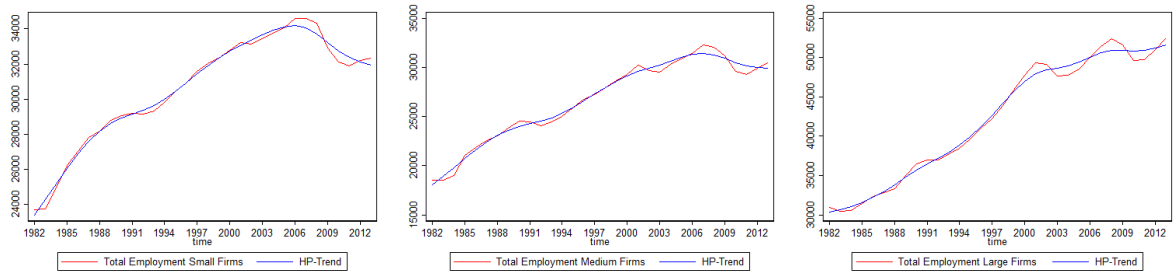
Figure B.1: Employment Share by $SIZE$



The gray lines represent the HP-trends of the data series. The shaded gray areas represent NBER recession periods. Data stems from the BDS.

Even though, employment shares shifted towards more mature and large firms, one can observe from the following graphs that employment of all firm sizes increased during the observed period. So the decline of small firms is only a relative trend.

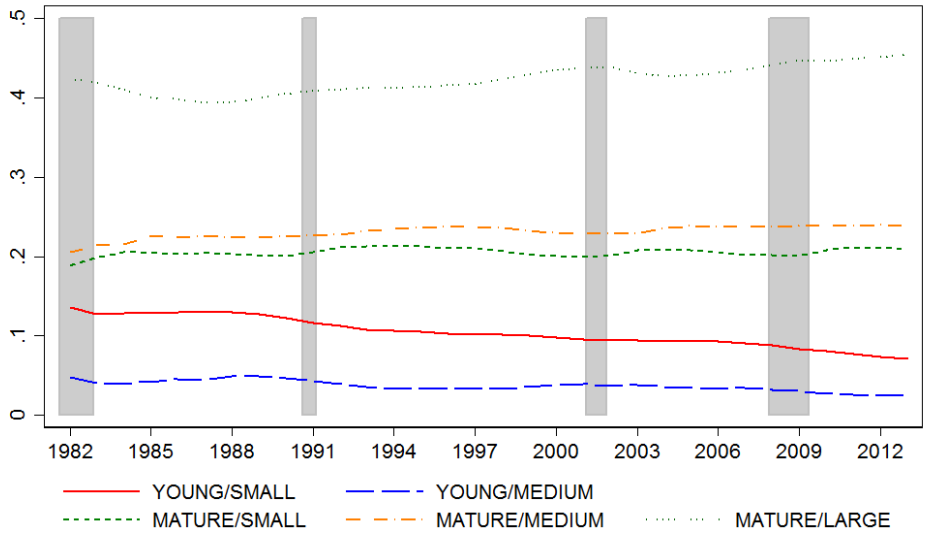
Figure B.2: Employment Levels by $SIZE$



Employment is measured in thousands of workers. Data stems from the BDS.

The employment shares of different $AGE/SIZE$ groups seems more stable over time, but reveals opposing trends for young and mature firms. Between 1982 and 2013 the employment share of young firms decreased from overall 19.1 percent to 10.2 percent. Most of this change is due to a decline of employment in $YOUNG/SMALL$, which decreased from 13.6 percent to 7.3 percent, which is related to a decline in entry as well as average entry size over time. All these findings are in line with Pugsley and Şahin (2015), even though they use a different size and age cut-off.

Figure B.3: Employment Share by $AGE/SIZE$

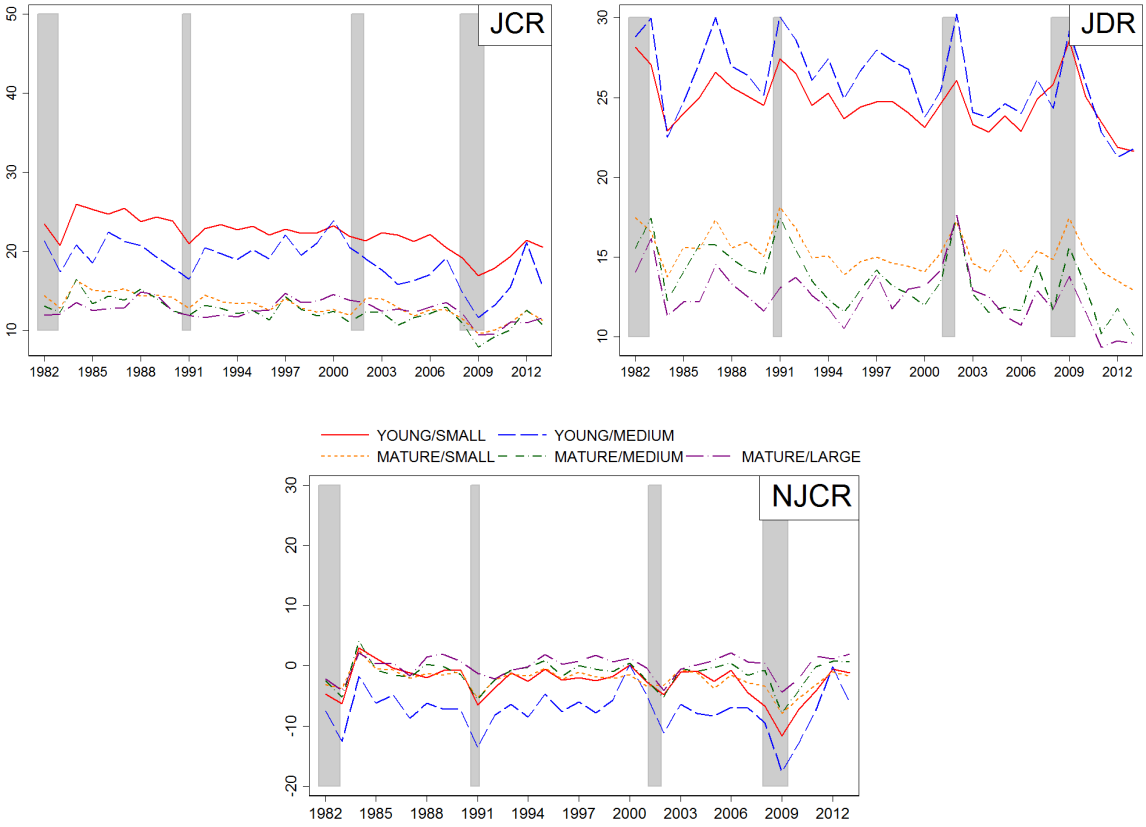


The gray lines represent the HP-trends of the data series. The shaded gray areas represent NBER recession periods. Data stems from the BDS.

B.3 Job Flows without Firm Entry

This section is plotting the three different job flow rates over time, neglecting the existence of firm entry, i.e. 0 age firms from the BDS dataset. Obviously, the JDR is identical with the one shown in figure 3.1 in the main text. The JCR of $YOUNG/SMALL$, however, is dropping strongly. This unterlines the importance of the entry margin for the job creation. However, these plots only describe the behavior of job flow rates over time and do not indicate the cyclicality, which is our research focus.

Figure B.4: Job Flow Rates by AGE/SIZE over Time without Firm Entry



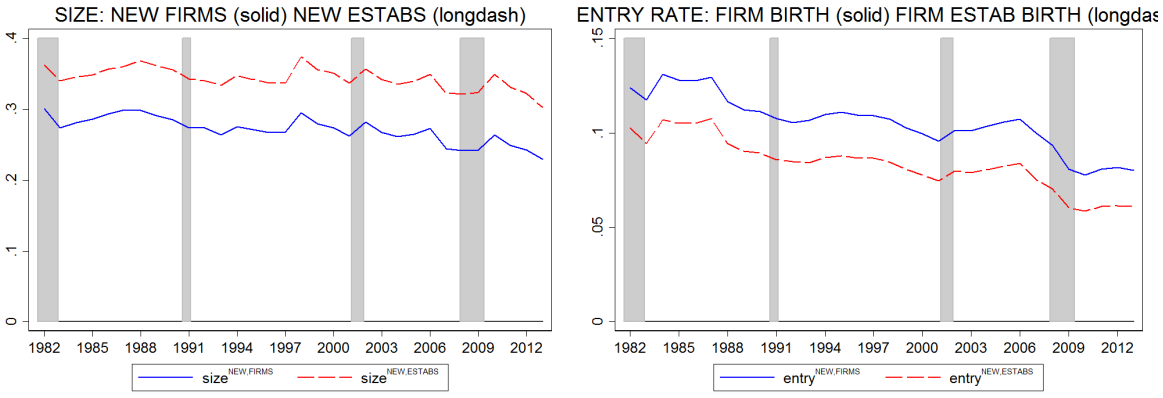
The graph plots the BDS job flow rates by AGE/SIZE. NBER recessions are plotted in shaded gray areas. The group of $YOUNG/LARGE$ firms is dropped from the analysis.

B.4 Entry/Exit at the Firm Level

In this section we plot the decomposition of the the job creation and destruction rate of new firms on the firm level, similar to Pugsley and Şahin (2015). The plots show that the pattern of entry and exit rates as well as size is the same for the firm and establishment level. Only the size differs slightly, because the number of establishments of new firms is larger than the number of new firms itself and the same for exiting firms.
The job creation rate of new firms is decomposed into the firm entry rate and the relative firm size:

$$JCR_t^{NEW,FIRMS} = \underbrace{\frac{\#FIRMS_t^{NF}}{\#FIRMS_t}}_{\text{Firm Entry Rate NF}} \times \underbrace{\frac{\frac{JC_t^{NF}}{\#FIRMS_t^{NF}}}{\frac{EMP_t}{\#FIRMS_t}}}_{\text{Relative Firm Size NF}} \tag{B.1}$$

Figure B.5: Decomposing $JCR^{NEW,FIRMS}$ on the Firm and Establishment Level

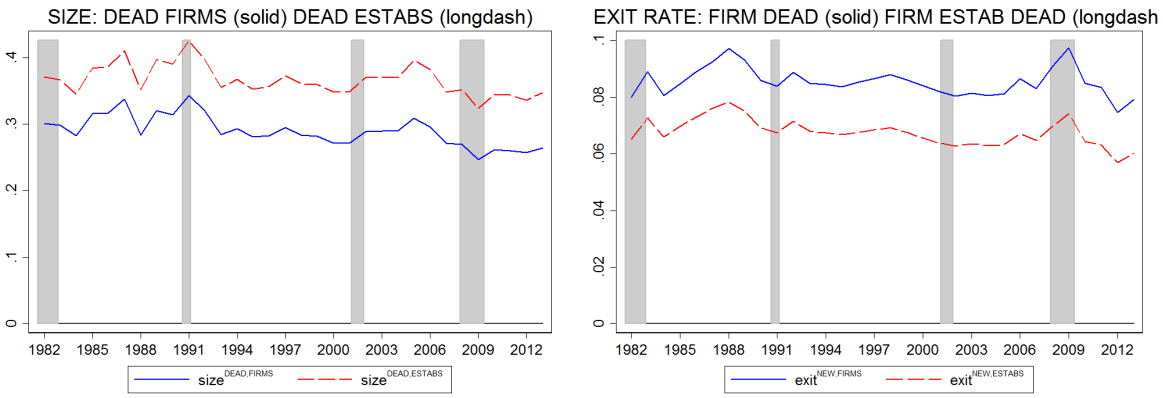


The graph shows the relative firm and establishment size as well as the firm and establishment entry rates. The vertical line in 2009 represents the trough of the Great Recession.

Similarly, the job destruction rate of dying firms is decomposed into the firm exit rate and the relative firm size:

$$JDR_t^{DEAD,FIRMS} = \underbrace{\frac{\#FIRMS_t^{DF}}{\#FIRMS_t}}_{\text{Exit Rate DF}} \times \underbrace{\frac{\frac{JD_t^{DF}}{\#FIRMS_t^{DF}}}{\frac{EMP_t}{\#FIRMS_t}}}_{\text{Relative Firm Size DF}} \tag{B.2}$$

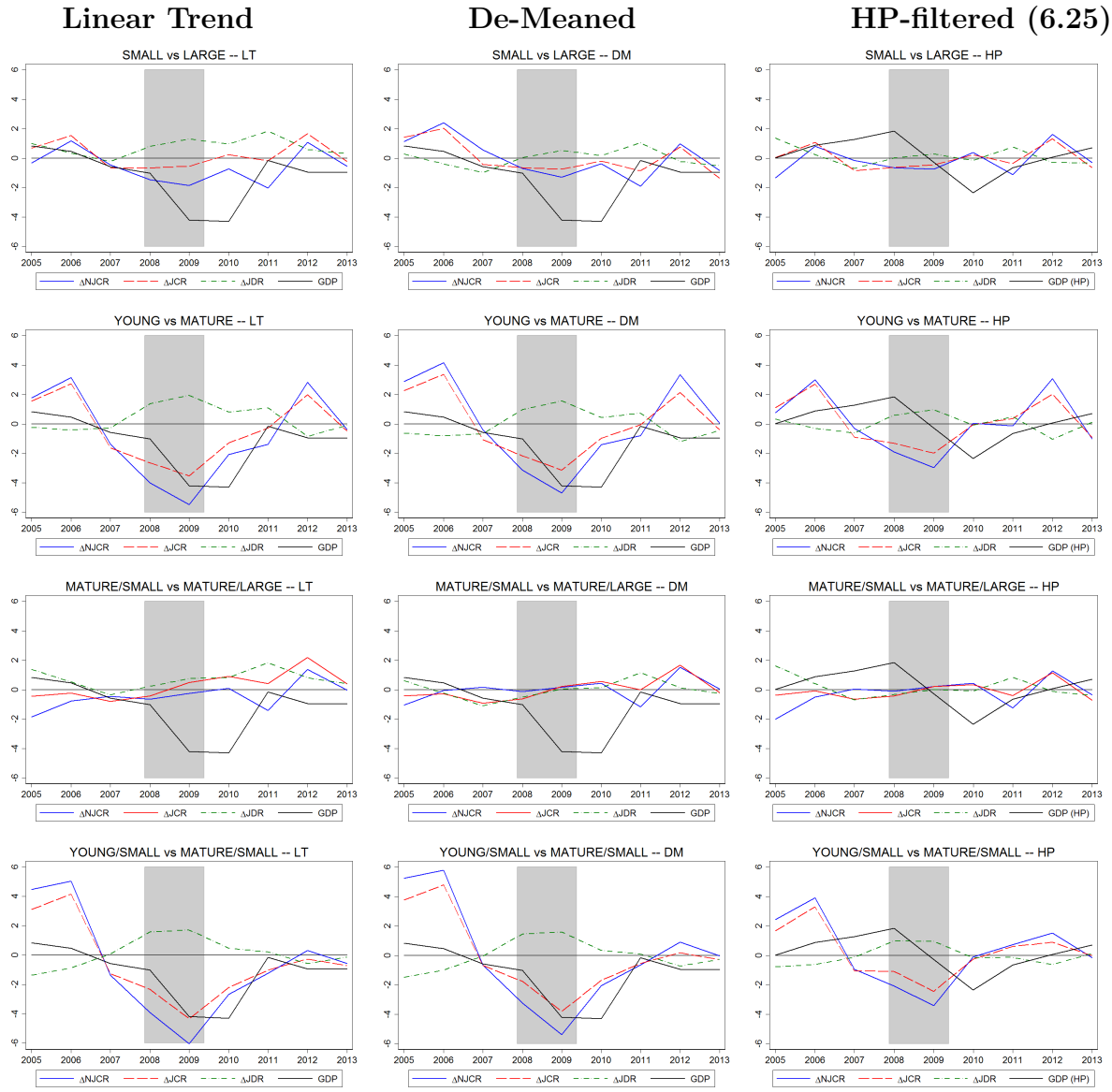
Figure B.6: Decomposing $JDR^{DEAD,FIRMS}$ on the Firm and Establishment Level



The graph shows the relative firm and establishment size as well as the firm and establishment entry rates. The vertical line in 2009 represents the trough of the Great Recession.

B.5 Differential Job Flows during the Great Recession – Alternative Filters

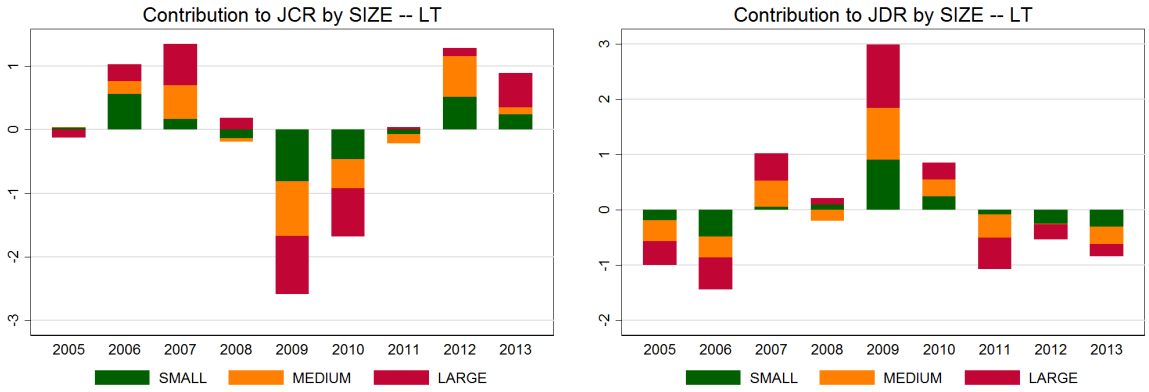
Figure B.7: Differential Job Flows during the Great Recession – Alternative Filters



The graph plots the Differential Job Flows of different groups of firms. From the first top left to bottom right panel we look at $SIZE$, AGE, $SIZE$ conditional on $AGE = MATURE$, AGE conditional on $SIZE = SMALL$, and $MATURE/LARGE - YOUNG/SMALL$. Differentials are computed by subtracting the respective series. The differentials for JCR, and $NJCR$ can be read in the same way, the one for JDR is consistent when going in the opposite direction. All series HP-filtered with parameter 6.25.

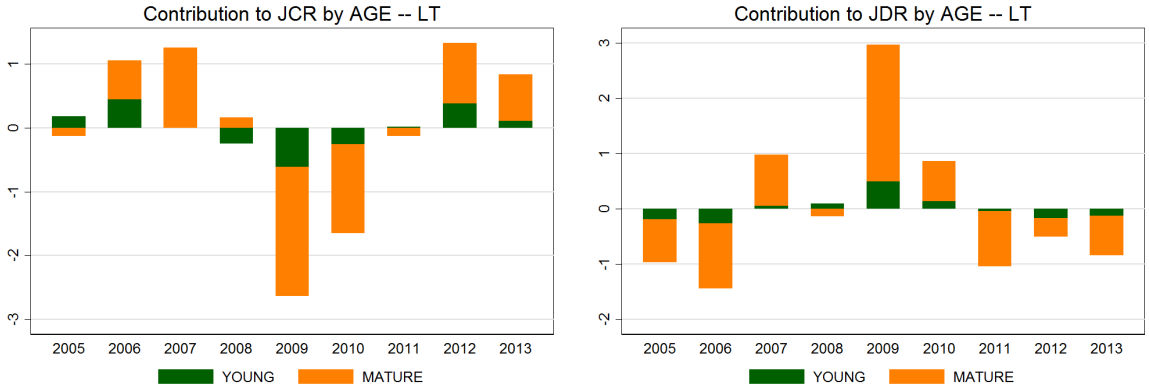
B.6 Contributions to JCR and JDR during the Great Recession

Figure B.8: Contribution to JCR and JDR by $SIZE$ – Great Recession – LT



The graph plots the weighted contributions of individual job flow rates to overall JCR and JDR. The procedure follows equation (3.17).

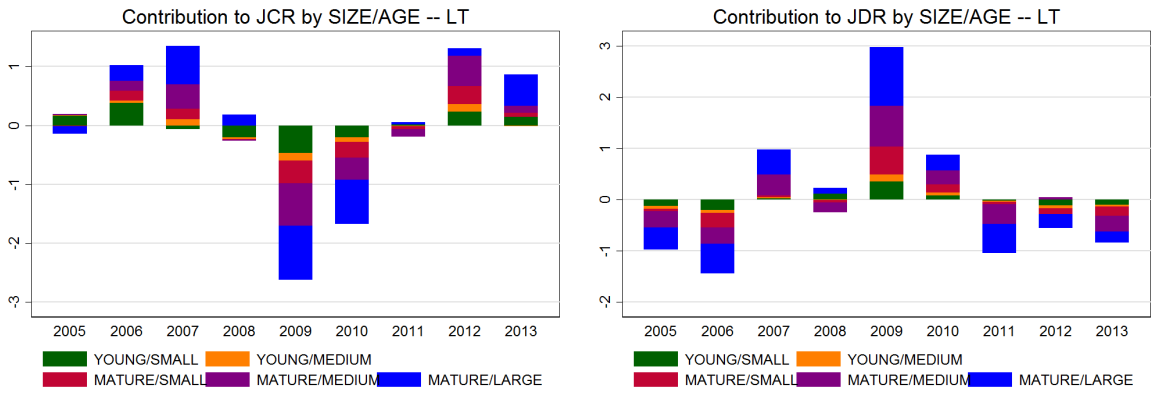
Figure B.9: Contribution to JCR and JDR by AGE – Great Recession – LT



The graph plots the weighted contributions of individual job flow rates to overall JCR and JDR. The procedure follows equation (3.17).

In addition, we decompose the variance as outlined in section 3.2.5 even though we base the analysis on only nine data points.

Figure B.10: Contribution to JCR and JDR by $AGE/SIZE$ – Great Recession – LT



The graph plots the weighted contributions of individual job flow rates to overall JCR and JDR. The procedure follows equation (3.17).

Table B.3: Variance Decomposition – Great Recession – LT

Decomposed	$SIZE$			AGE		$AGE/SIZE$				
Rate	S	M	L	Y	M	YS	YM	MS	MM	ML
$NJCR$	0.322	0.307	0.371	0.203	0.797	0.155	0.048	0.167	0.259	0.371
JCR	0.342	0.304	0.354	0.239	0.761	0.190	0.049	0.152	0.255	0.354
JDR	0.302	0.310	0.387	0.168	0.832	0.121	0.047	0.182	0.263	0.387
JCR^{EXP}	0.267	0.350	0.383	0.152	0.848	0.096	0.055	0.171	0.295	0.383
JCR^{NEW}	0.550	0.176	0.275	0.481	0.519	0.450	0.031	0.099	0.145	0.275
JDR^{CONT}	0.269	0.350	0.381	0.132	0.868	0.081	0.051	0.187	0.299	0.381
JDR^{DEATH}	1.400	-1.000	0.600	1.333	-0.333	1.400	-0.067	0.000	-0.933	0.600

The table reports the contributions of the individual set of firms in each $SIZE$, AGE, or $AGE/SIZE$ group to the overall variance of the decomposed rate. For each of the groups, the rows sum to one with some approximation error. The methodology is described in section 3.2.5.

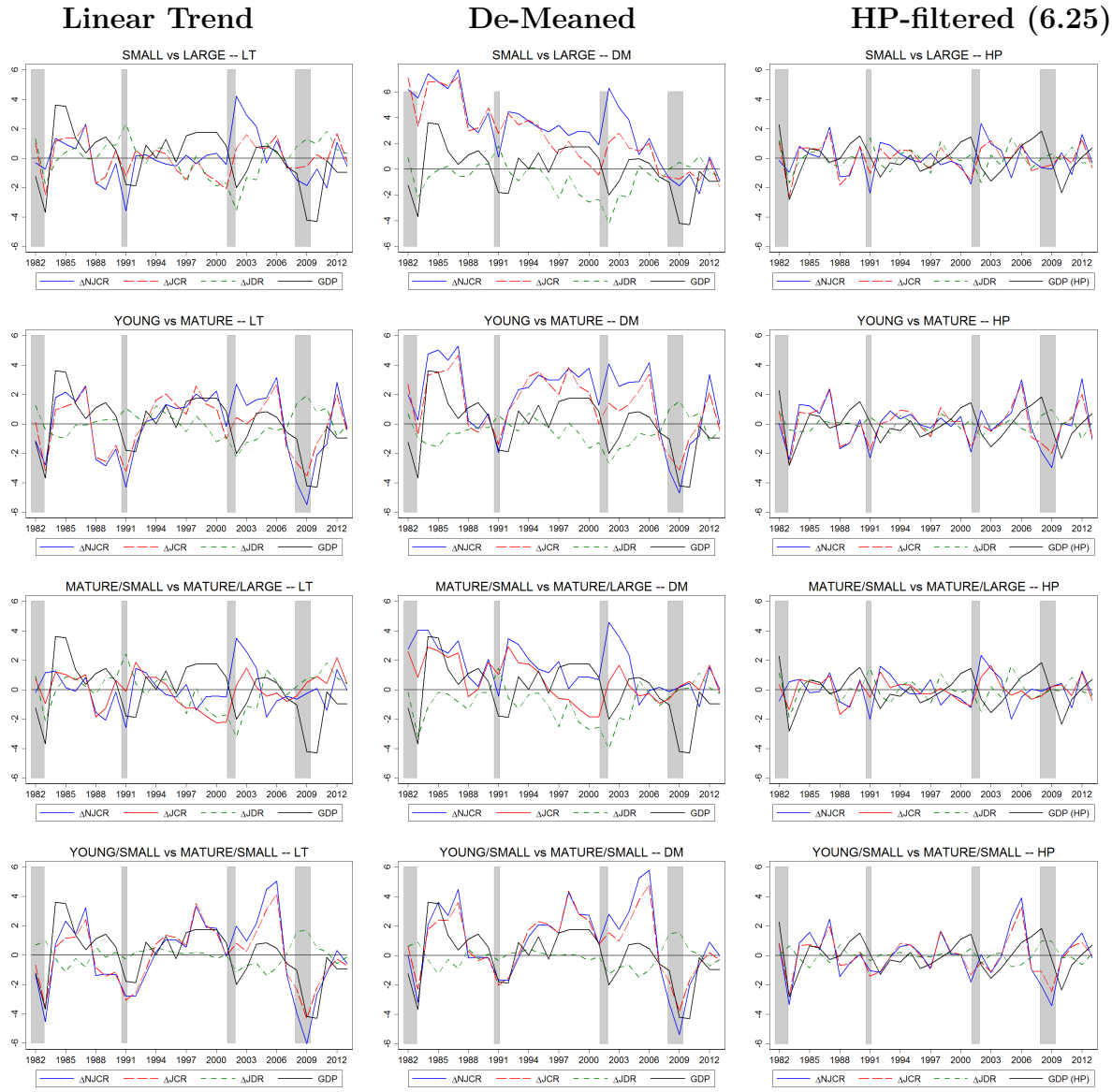
Table B.4: Variance Decomposition of JCR^{NEW} and JDR^{DEAD} – Great Recession – LT

	$size$	$entry\ /\ exit$
$JCR^{NEW,ESTABS}$	0.005	0.632
$JCR^{NEW,FIRMS}$	-0.037	0.386
$JDR^{DEATH,ESTABS}$	0.542	0.649
$JDR^{DEATH,FIRMS}$	-0.232	-0.008

The table reports the contributions of the the Size and the Entry/Exit Rates to JCR^{NEW} and JDR^{DEAD}. The four components for each, JCR^{NEW} and JDR^{DEAD}, sum to one with some approximation error. The methodology is described in section 3.2.5.

B.7 Differential Job Flows over the Business Cycle – Alternative Filters

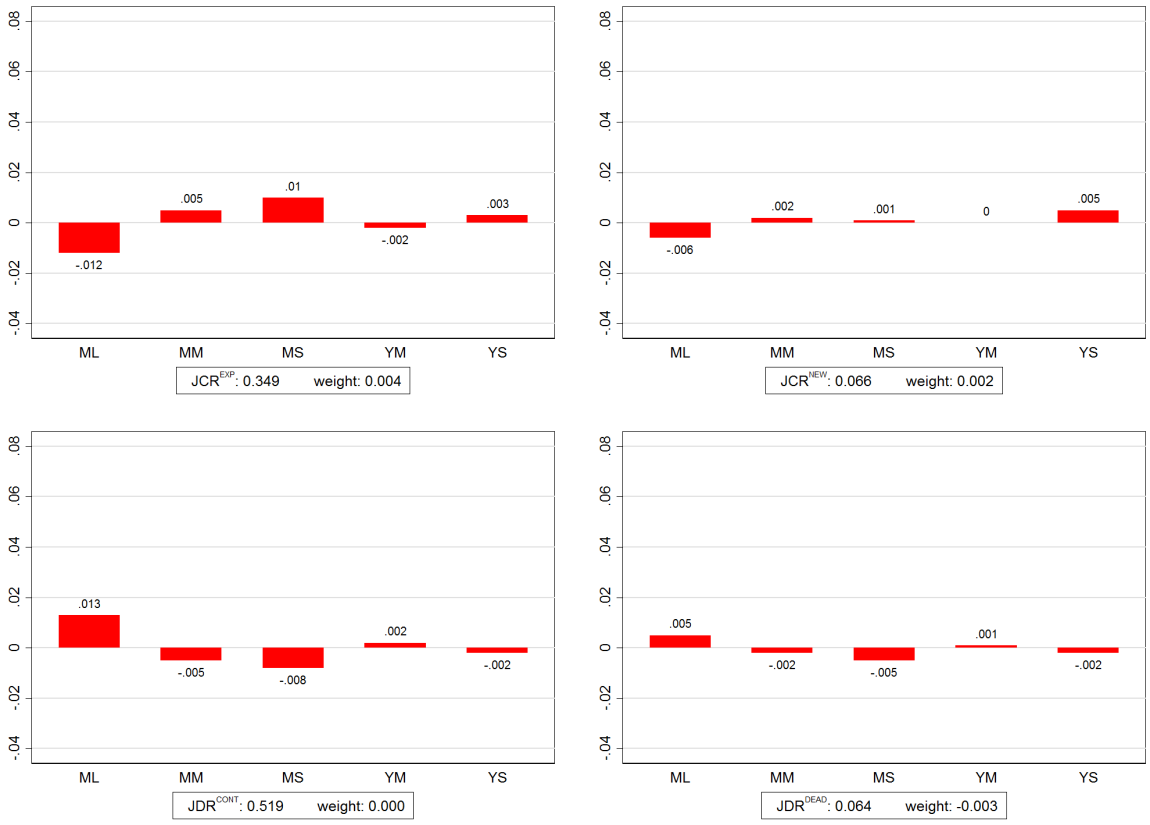
Figure B.11: Differential Job Flows over the Business Cycle – Alternative Filters



The graph plots the Differential Job Flows of different groups of firms. From the first top left to bottom right panel we look at $SIZE$, AGE, $SIZE$ conditional on $AGE = MATURE$, AGE conditional on $SIZE = SMALL$, and $MATURE/LARGE - YOUNG/SMALL$. Differentials are computed by subtracting the respective series. The differentials for JCR, and $NJCR$ can be read in the same way, the one for JDR is consistent when going in the opposite direction. All series HP-filtered with parameter 6.25.

B.8 Contribution of Employment Weights to Variance Decomposition

Figure B.12: Variance Decomposition according to $AGE/SIZE$ – Weighted Results for Weights – LT



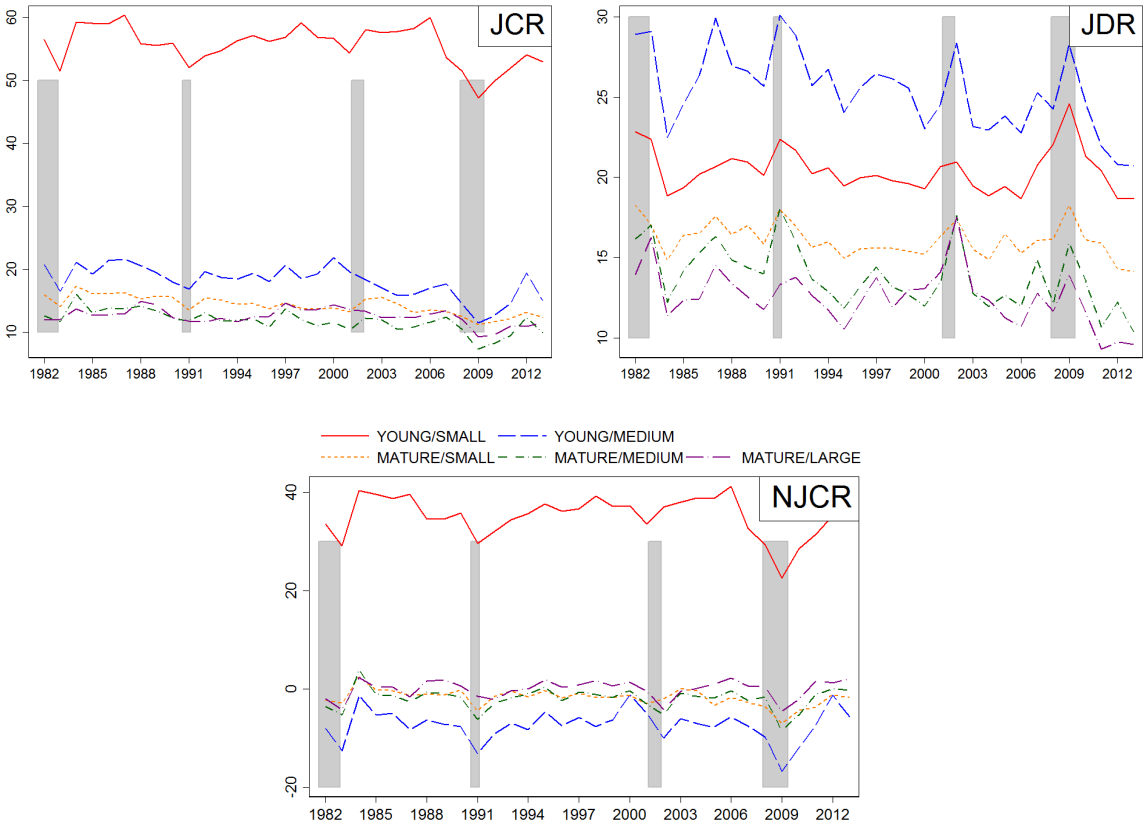
The bar charts report the weighted results of the variance decomposition, which is described in section 3.2.5. The weight consists of the trend of the $NJCR$ of the respective group. The period is 1982-2013 and the underlying dataset is from the BDS. The job flow rates are linearly de-trended.

B.9 Robustness – Alternative Size Cut-off

While we follow Moscarini and Postel-Vinay (2012) in defining small, medium, and large firms, Fort et al. (2013) as well as Pugsley and Şahin (2015) use different size cut-offs. Compared to our definition (small: less than 50; medium: 50-1000; large: more than 1000), we apply the alternative size cut-off in this section (small: less than 20; medium: 20-500; large: more than 500).

Note that the aggregate job flow rates are the same as in the baseline case, i.e. all values from firms with more than 1000 employees and less than 5 years of age are dropped from the sample. Thus, the category of young large firms is only composed of young firms with 500-1000 employees.

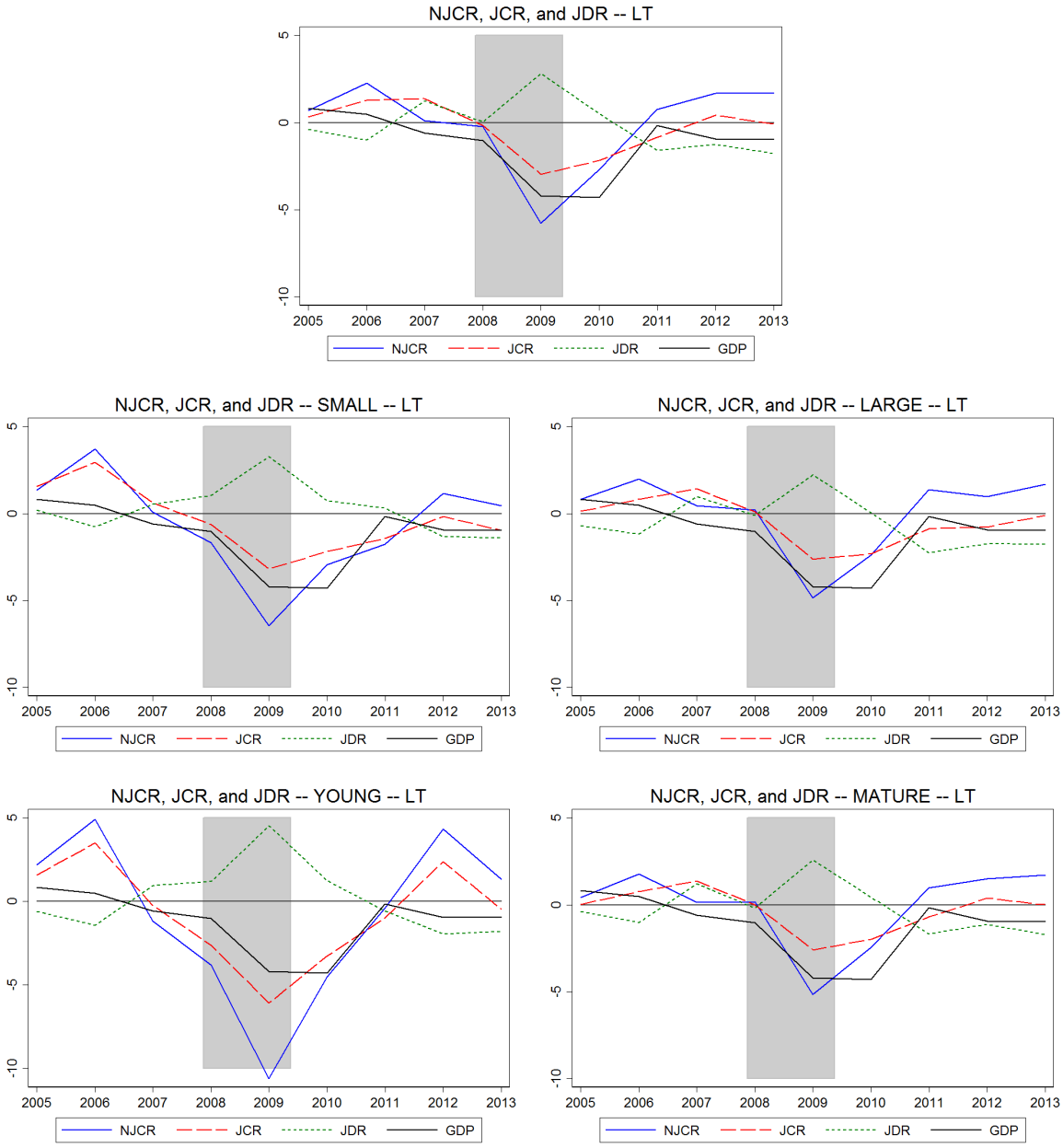
Figure B.13: Job Flow Rates by AGE/SIZE over Time – Alternative Size Cut-off



The graph plots the BDS job flow rates by AGE/SIZE. NBER recessions are plotted in shaded gray areas. The group of $YOUNG/LARGE$ firms is dropped from the analysis.

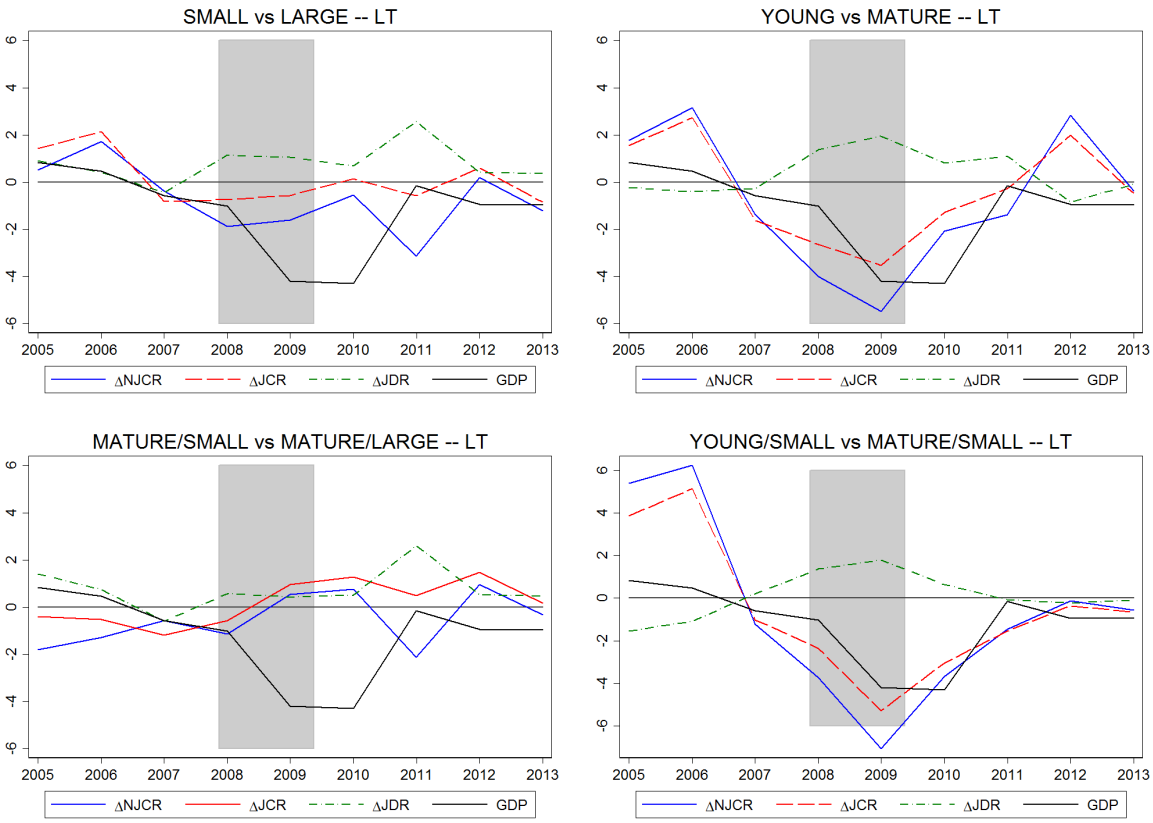
B.9.1 Cyclicality in the Great Recession

Figure B.14: Job Creation Rate during the Great Recession



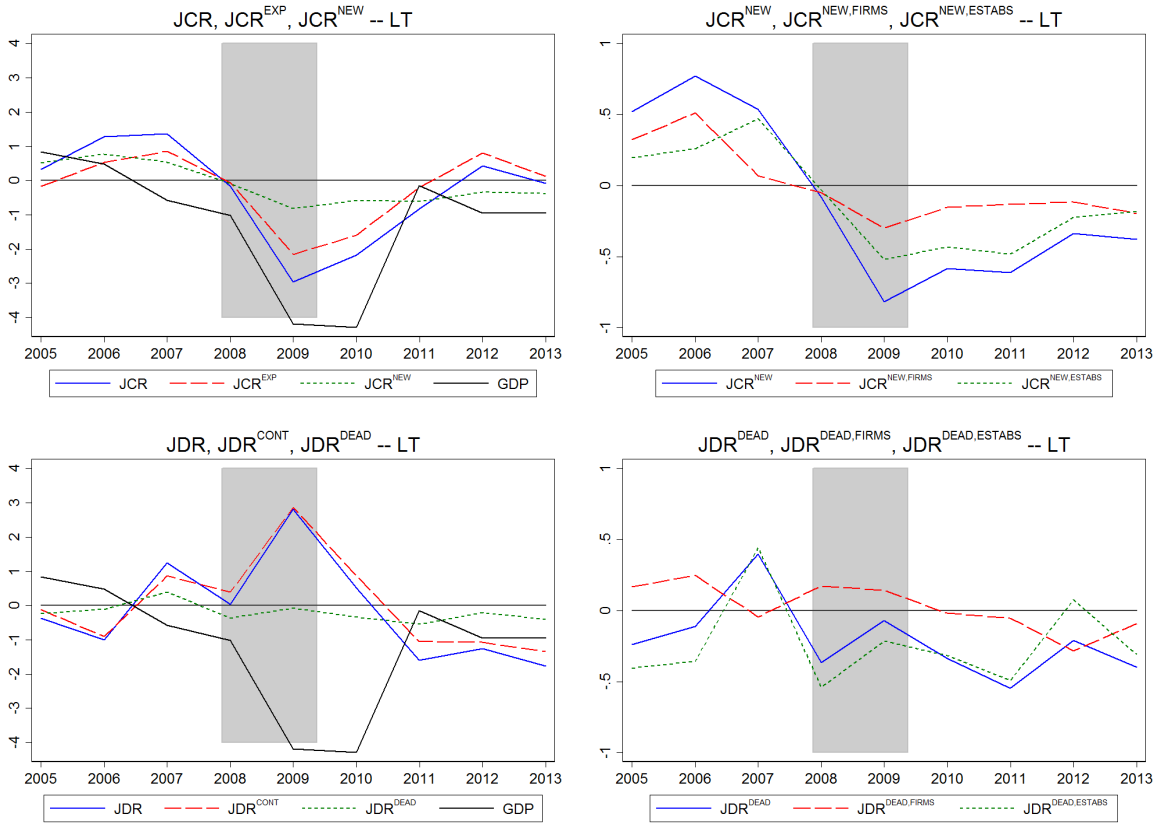
The graph plots the Job Creation Rate of different groups of firms. From the first top left to bottom right panel we look at $SIZE$, AGE, $SIZE$ conditional on $AGE = MATURE$, AGE conditional on $SIZE = SMALL$, and $MATURE/LARGE - YOUNG/SMALL$. All series are linearly de-trended.

Figure B.15: Differential Job Flows during the Great Recession



The graph plots the Differential Job Flows of different groups of firms. From the first top left to bottom right panel we look at $SIZE$, AGE, $SIZE$ conditional on $AGE = MATURE$, AGE conditional on $SIZE = SMALL$, and $MATURE/LARGE - YOUNG/SMALL$. Differentials are computed by subtracting the respective series. The differentials for JCR, and $NJCR$ can be read in the same way, the one for JDR is consistent when going in the opposite direction. All series are linearly de-trended.

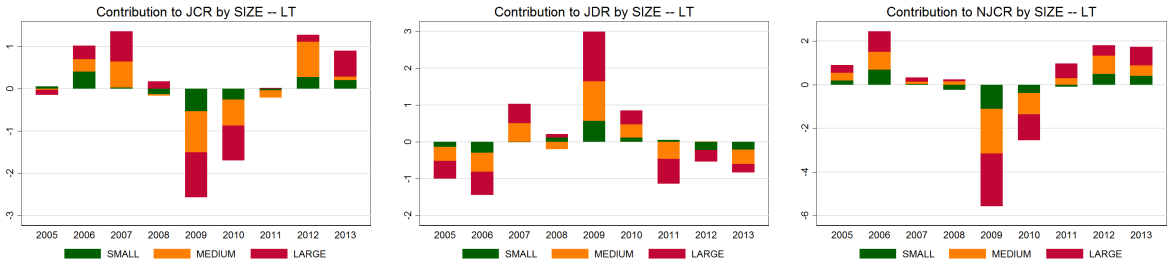
Figure B.16: Job Creation and Job Destruction during the Great Recession by Entry and Exit



The plots show the job creation and destruction rates by expanding/contracting establishments of existing firms, new or dying establishments of continuing firms, and new or dying establishments of those firms that enter or exit the market. All rates are linearly de-trended.

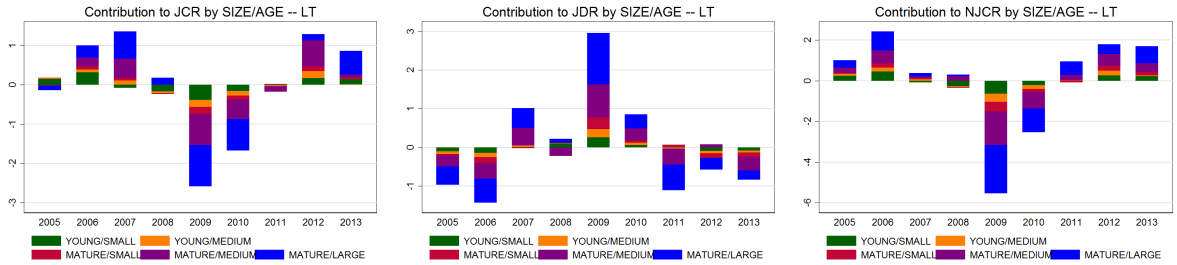
B.9.2 Contribution to Aggregate Fluctuations in the Great Recession

Figure B.17: Contribution to Job Flows by $SIZE$ – Great Recession – LT



The graph plots the weighted contributions of individual job flow rates to overall JCR, JDR, and $NJCR$ respectively. The procedure follows equation (3.17).

Figure B.18: Contribution to Job Flows by $AGE/SIZE$ – Great Recession – LT



The graph plots the weighted contributions of individual job flow rates to overall JCR, JDR, and $NJCR$ respectively. The procedure follows equation (3.17).

B.9.3 Cyclicality over the Business Cycle

Table B.5: Contemporaneous Correlations of Differentials with GDP and Unemployment Rate – Alternative Size

		$SMALL - LARGE$		$YOUNG - MATURE$		$MATURE\ SMALL - LARGE$		$SMALL\ YOUNG - MATURE$	
	Filter	LT	HP	LT	HP	LT	HP	LT	HP
JCR	GDP	0.18	0.09	0.54	0.13	-0.31	-0.24	0.65	0.26
		(0.32)	(0.62)	(0.00)	(0.48)	(0.09)	(0.18)	(0.00)	(0.16)
	U	-0.14	0.05	-0.48	0.12	0.30	0.30	-0.58	-0.05
		(0.44)	(0.77)	(0.01)	(0.53)	(0.10)	(0.10)	(0.00)	(0.79)
JDR	GDP	-0.00	0.42	-0.34	0.23	0.11	0.41	-0.54	-0.15
		(1.00)	(0.02)	(0.06)	(0.20)	(0.54)	(0.02)	(0.00)	(0.40)
	U	-0.17	-0.25	0.19	-0.27	-0.28	-0.21	0.49	-0.08
		(0.35)	(0.16)	(0.30)	(0.13)	(0.13)	(0.25)	(0.00)	(0.67)
$NJCR$	GDP	0.13	-0.21	0.56	0.03	-0.34	-0.48	0.64	0.24
		(0.46)	(0.25)	(0.00)	(0.86)	(0.06)	(0.01)	(0.00)	(0.19)
	U	0.02	0.23	-0.45	0.20	0.47	0.37	-0.57	-0.02
		(0.93)	(0.21)	(0.01)	(0.28)	(0.01)	(0.04)	(0.00)	(0.92)

The table reports correlation coefficients and p-values of differential job flow rates with the cyclical aggregate measure (Unemployment Rate or GDP). The differential is computed by simply subtracting the two respective job flow rates. Data series are either linearly de-trended or HP-filtered with parameter 6.25.

Table B.6: Contemporaneous Correlations of Entry/Exit Differentials with the Business Cycle – Alternative Size

	JCR				JDR			
	$EXP - NEW$		$NEW\ FIRMS - ESTABS$		$CONT - DEAD$		$DEAD\ FIRMS - ESTABS$	
Filter	LT	HP	LT	HP	LT	HP	LT	HP
GDP	0.58	-0.02	0.15	-0.26	-0.81	-0.32	-0.09	0.01
	(0.00)	(0.90)	(0.41)	(0.15)	(0.00)	(0.08)	(0.61)	(0.96)
U	-0.51	0.16	-0.11	0.38	0.77	0.05	0.03	0.03
	(0.00)	(0.37)	(0.56)	(0.03)	(0.00)	(0.78)	(0.88)	(0.85)

The table reports correlation coefficients and p-values of differential job flow rates with the cyclical aggregate measure (Unemployment Rate or GDP). The differential is computed by simply subtracting the two respective job flow rates. Data series are either linearly de-trended or HP-filtered with parameter 6.25.

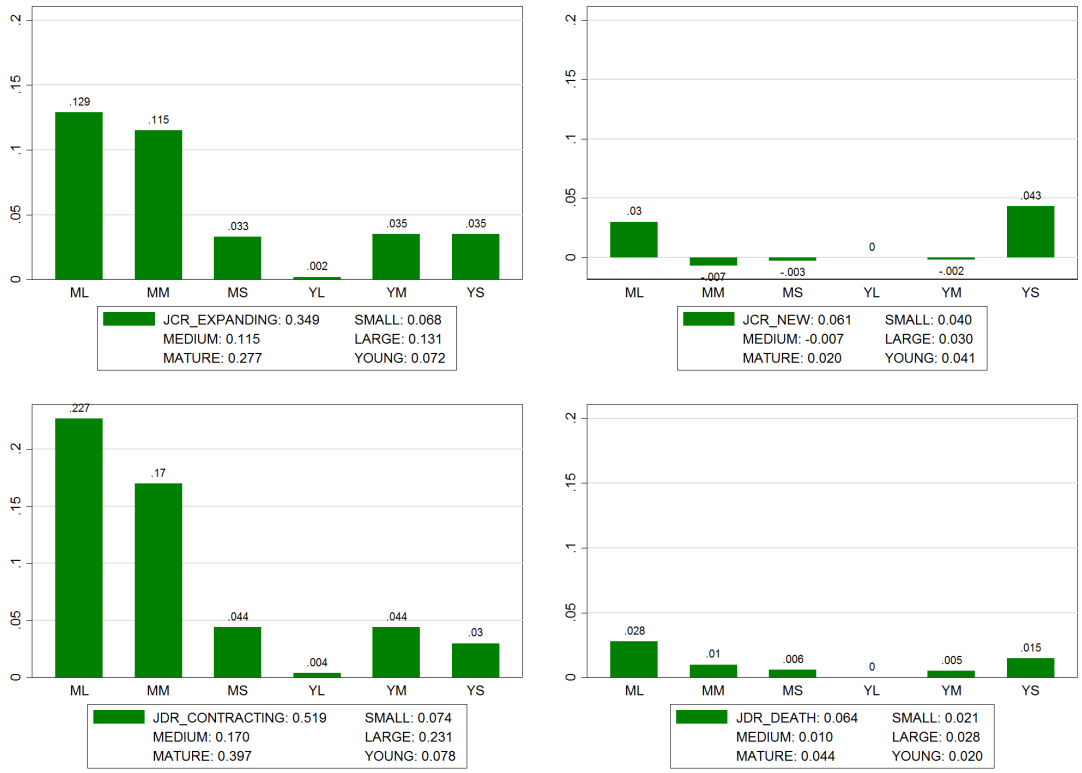
Table B.7: Contemporaneous Correlations of Entry/Exit Differentials with the Business Cycle – LT

	$NEW\ FIRMS - ESTABS$				$DEAD\ FIRMS - ESTABS$			
	size		*entry*		*size*		*exit*	
Filter	LT	HP	LT	HP	LT	HP	LT	HP
GDP	-0.32	-0.03	0.51	-0.09	-0.31	0.16	0.03	-0.13
	(0.07)	(0.88)	(0.00)	(0.62)	(0.08)	(0.40)	(0.88)	(0.49)
U	0.18	0.13	-0.41	0.18	0.24	-0.04	-0.06	0.05
	(0.33)	(0.46)	(0.02)	(0.33)	(0.19)	(0.83)	(0.76)	(0.80)

The table reports correlation coefficients and p-values of differential job flow rates with the cyclical aggregate measure (Unemployment Rate or GDP). The differential is computed by simply subtracting the two respective job flow rates. Data series are either linearly de-trended or HP-filtered with parameter 6.25.

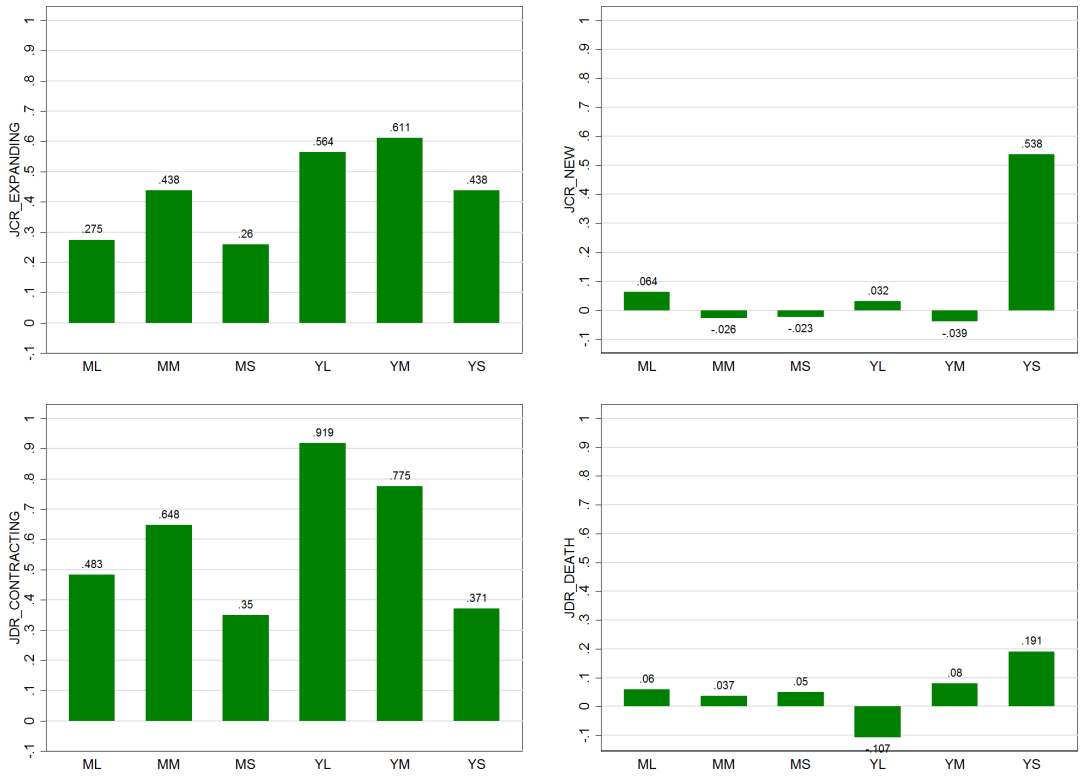
B.9.4 Contribution to Aggregate Fluctuations over the Business Cycle

Figure B.19: Variance Decomposition according to $AGE/SIZE$ – Weighted Results – LT



The bar charts report the weighted results of the variance decomposition, which is described in section 3.2.5. The weight consists of the trend of the employment share of the respective group. The period is 1982-2013 and the underlying dataset is from the BDS. The job flow rates are Linearly De-Trended.

Figure B.20: Variance Decomposition according to $AGE/SIZE$ – Unweighted Results – LT



The bar charts report the results of the variance decomposition, which is described in section 3.2.5. The period is 1982-2013 and the underlying dataset is from the BDS. The job flow rates are Linearly De-Trended. Actual contributions are unweighted as the weighted contributions are divided by the average employment share over the observation period, shown in table 3.9.

Table B.8: Variance Decomposition – Alternative Size Cut-Off

Decomposed	*SIZE*			*AGE*		*AGE/SIZE*					
Rate	S	M	L	Y	M	YS	YM	YL	MS	MM	ML
Linearly De-trended Job Flows											
$NJCR$	0.204	0.373	0.423	0.212	0.788	0.124	0.083	0.006	0.081	0.290	0.417
JCR	0.263	0.344	0.393	0.276	0.724	0.190	0.080	0.005	0.073	0.263	0.388
JDR	0.163	0.393	0.444	0.168	0.832	0.077	0.084	0.007	0.086	0.309	0.437
HP-filterd Job Flows (parameter 6.25)											
$NJCR$	0.176	0.387	0.436	0.190	0.810	0.099	0.085	0.006	0.078	0.302	0.430
JCR	0.256	0.375	0.369	0.259	0.741	0.170	0.082	0.006	0.085	0.293	0.364
JDR	0.133	0.394	0.473	0.152	0.848	0.059	0.086	0.006	0.073	0.308	0.467

The table reports the contributions of the individual set of firms in each $SIZE$, AGE, or $AGE/SIZE$ group to the overall variance of the decomposed rate. For each of the groups, the rows sum to one with some approximation error. The methodology is described in section 3.2.5.

Table B.9: Variance Decomposition – Alternative Size Cut-Off

Decomposed	*SIZE*			*AGE*		*AGE/SIZE*					
Rate	S	M	L	Y	M	YS	YM	YL	MS	MM	ML
Linearly De-trended Job Flows											
JCR^{EXP}	0.195	0.430	0.375	0.206	0.794	0.100	0.100	0.006	0.095	0.330	0.370
JCR^{NEW}	0.656	-0.148	0.492	0.672	0.328	0.705	-0.033	0.000	-0.049	-0.115	0.492
JDR^{CONT}	0.143	0.412	0.445	0.150	0.850	0.058	0.085	0.008	0.085	0.328	0.437
JDR^{DEATH}	0.328	0.234	0.438	0.313	0.688	0.234	0.078	0.000	0.094	0.156	0.438
HP-filterd Job Flows (parameter 6.25)											
JCR^{EXP}	0.193	0.424	0.383	0.202	0.798	0.097	0.097	0.009	0.097	0.327	0.374
JCR^{NEW}	0.903	-0.129	0.226	0.839	0.161	0.935	-0.065	-0.032	-0.032	-0.065	0.258
JDR^{CONT}	0.121	0.425	0.454	0.147	0.853	0.048	0.091	0.008	0.073	0.333	0.446
JDR^{DEAD}	0.176	0.279	0.544	0.169	0.831	0.103	0.066	0.000	0.074	0.213	0.544

The table reports the contributions of the individual set of firms in each $SIZE$, AGE, or $AGE/SIZE$ group to the overall variance of the decomposed rate. For each of the groups, the rows sum to one with some approximation error. The methodology is described in section 3.2.5.

4. Betting against Jews? The Market Reaction to Jewish Firms in Nazi Germany

Abstract

Jewish managers represented a substantial and well-integrated part of the German economic elite when the Nazis seized power in 1933. This chapter investigates the heterogeneous stock market performance of "Jewish" and "non-Jewish" corporations at the Berlin stock exchange. It exploits recently collected information on religious affiliations of individual members of the executive and supervisory board of listed corporations. Based on the 1932 composition of boards, "Jewish" firms underperformed the Berlin stock exchange by about 6 to 9 percent during the first months of 1933. This result is mainly driven by firms in which Jews represented a substantial part of the executive board.

Already during in 1933 – before many of the atrocious and inhumane policies against Jews were implemented– about one third of the Jewish elite members were removed to avoid conflicts with the new rulers of the country. Between 1932 and 1933 the average share of Jewish board members dropped from 16 to 11 percent (6 to 3 percent for executive board members and 19 to 14 percent for supervisory board members). Interestingly, those "Jewish" firms that strongly underperformed the market removed their Jewish board members almost entirely. This might be a reaction to the public pressure associated with the stigma of being "Jewish" under the new rule.

4.1 Introduction

The rise of the Nazi regime marked the end of a short, but quite liberal period for the Jewish population in Germany that started with the foundation of the German Reich in 1871. Already within a few months after coming into office, Hitler extended his power base by dissolving the parliament and all opposition groups. At the same time anti-Jewish policies started to be implemented, aggravating Jewish life in Germany and culminating in terrible atrocities related to the attempted extermination of the European Jews. With the foundation of the German Reich in 1871 Jews were awarded full citizenship, which they were detracted by the Nazis again. While many scientists research the historical and social consequences of the antisemitic regime in Germany, the current study contributes by highlighting economic consequences. For many decades Jews marked a substantial part among the economic elite in Germany. While the overall Jewish population in Germany was less than 1%, the Jewish economic elite represented a highly dis-proportional share of executive (6%) and supervisory board members (19%).

This research project studies the reaction of stock market investors at the Berlin stock exchange to an expected worsening of the situation of the Jewish population and in particular of the Jewish members of the economic elite. We are interested in a potentially systematic response of investors to Jewish dominated corporations in contrast to other firms, some of which had strong ties to the Nazi regime.[1] Did the stock market performance of corporations with strong Jewish influence differ from non-Jewish firms when Hitler and the Nazi movement seized power? At what time were "Jewish" firms discounted due to their Jewish control, either because investors saw trouble for Jewish managers coming up or because they devalued the economic benefits that these firms had due to their executives being part of the Jewish economic elite with connections to the old, democratic system. And last, how do stock prices react to a removal of Jews from leading positions in the corporations?

The reason for an expected immediate negative valuation of companies with prominent Jews on the board lies mainly in increasing isolation and political pressure combined with an expected loss of political connections of the corporations. When the Nazi movement seized power in January 1933, many political connections were harshly cut off and business partners of Jews feared the public thread of being stigmatized as a firm that still deals with Jews, the declared public enemies. Many boycotts were organized against Jewish shops and products, which had a direct impact on their sales. Moreover, historical evidence shows that public authorities were reluctant to involve Jewish firms in public procurement unless Jews were removed from leading positions.

As a consequence, many Jewish board members were soon removed, mainly after April

[1] The value of political connections between corporations and the Nazi regime is researched by Ferguson and Voth (2008).

1933 when the first nation-wide boycott against Jewish businesses was organized. Particularly international active firms were afraid of publicly removing their Jewish board members and risk to be criticized as anti-Jewish. Therefore, most decisions on changes of board members took place silently and were cushioned and masked by replacing Jews and non-Jews at the same time, arguing that these changes were due to reasons of age or a new focus of the firm. In addition, firms in which the government was a major shareholder or which were highly dependent on public contracts removed their Jewish board members almost immediately. In principle, the stock market reaction to this removal of Jews from leading executive and supervisory positions is ambiguous. On the one hand, this removal is associated with a huge loss of human capital and business experience for a company that might lead to a negative valuation of investors. At the same time, the actual removal of Jews from leading positions could be seen positive by investors, because corporations are adjusting to the new order of the Nazi movement.

The analysis is motivated by the research of Ferguson and Voth (2008) but deviates in several dimensions. We exploit more refined measures to define the importance of Jews for a firm and emphasize the role of Jewish elite members. While Ferguson and Voth (2008) rely on previous work of Mosse (1987) and others, this study exploits the seminal dissertation of Münzel (2006) in which information on religious affiliation and potential removals of individual members of the German economic elite are collected and analyzed. Unfortunately, information is only available for a fraction of the listed firms in Berlin. Apart from the measure and some differences in the sample construction another deviation from Ferguson and Voth (2008) lies in the actual set up of the estimation procedure which we base on abnormal returns and not only on log-returns.

The study is organized as follows. The next section is providing a historical background of the corporate elite and its Jewish members as well as a general picture of the historical events and anti-Jewish measures implemented by the Nazi rulers. The third section discusses the dataset with descriptive statistics and sets up a measure to identify Jewish firms. The fourth section shows the estimation specification and the results. Section five verifies robustness and the last section concludes.

4.2 Background

4.2.1 The Corporate Elite and its Jewish Members

At the beginning of the 20th century, the German economic system was characterized by a dense network of top managers, politicians, and unionists, often called the *Deutschland-AG* ("Germany Inc."). [2] Due to many links between corporations and major participations

[2] The assassinated Foreign Minister Walther Rathenau was refering to a dense oligarchic network of leaders in the business world in his famous quote: "Three hundred men, all of whom know one another,

of financial institutes in corporations, many so-called big linkers were on – mainly supervisory – boards of multiple companies.[3] In this way, major businessmen met each other in ever-changing combinations and there are many indications of top managers setting up deals among their companies in these meetings.[4]

In the 1930's the number of memberships in supervisory boards of the so-called *big linkers* magnified to an unprecedented degree.[5] For example, Jakob Goldschmidt held supervisory positions in more than 100 companies in 1930. Due to a scandal related to false accounting at Nordwolle his own bank – the Darmstädter und Nationalbank (Danat-Bank) – tumbled and went bankruptcy. In the aftermath, the so-called "Lex Goldschmidt" was passed on September 19th 1931.[6] It regulated the number of positions that individual members were allowed to hold to a maximum of 20 per person. The same law limited the overall number of members in the supervisory boards to 30.[7] In principle, this act gave corporations the opportunity to reduce the share of Jewish board members already ahead of the Nazi period without facing accusations of obvious discrimination against Jews. But Münzel (2006) shows that this was not a common behavior across firms. There is no clear evidence of a major reduction in the share of Jewish board members before Hitler came into office in January 1933 as will be discussed later on in section 4.3.1.

The German-Jewish economic elite members represented a crucial part of the economic leaders in the country. And it was mainly due to anti-Jewish hatred that Jews were not represented in more exposed political or financial positions. For example, neither in 1923

direct the economic destiny of continents and choose their successors from among themselves." The Nazi movement often mis-interpreting this quote as Jews secretely ruling the world.

[3]According to the German corporation law, "Aktiengesetz", public companies are required to consist of two-tier board system: The management board ("Vorstand") and the supervisory board ("Aufsichtsrat"). While the management board is in charge of the day-to-day business of the company, the supervisory board must approve major business decisions and oversees and appoints the members of the management board. The supervisory board is supposed to represent the interests of the owners of the company and consists often of current or former managers of other large companies.

[4]Just to give an example, Münzel (2006) counts that in 1929 the board members of the AEG held 1023 seats in 670 corporations and were therefore well connected among the business elite.

[5]In general, supervisory boards consisted of at least three members and on average corporations had 7.2 members in 1927, which increased in the following years and finally dropped to 6.8 in 1932 (based on corporations with a capitalization of over 500,000 RM).

[6]Due to his Jewish religion, this scandal was often used by right wing media to attack not only Goldschmidt, but Jewish bankers and businessmen in general with antisemitic propaganda.

[7]The act was called "Verordnung des Reichspräsidenten über Aktienrecht, Bankenaufsicht und über eine Steueramnestie". Some companies got excempted from the regulations and were allowed to have a larger supervisory board. And many companies bypassed the regulations by setting up committees with former supervisory members. These committees acted as advisers to the actual supervisory board, but did not have the same rights and duties as normal board members. On October 1st 1937 the number of supervisory mandates was limited further through the "Gesetz über Aktiengesellschaften und Kommanditgesellschaft auf Aktien (Aktiengesetz)". Subsequently, supervisory board were limited to 3 to 20 members and each member was allowed to have a maximum of 10 mandates.

as predecessor of Rudolf Havenstein, nor in 1930 when Hjalmar Schacht stepped down from his position, a Jewish economist was appointed governor of the Reichsbank in spite of qualified candidates. Both sides, the political decision makers as well as Jewish economic elite members themselves were afraid that a Jewish central bank governor would stimulate more hatred against the Jewish community. In the corporate world, about 16 percent (in the core even about 25 percent) of the members of the corporate network were of Jewish background while Jews accounted only for about 1 percent of the German population (Windolf, 2011, 2009).[8] Among the prestigious positions of chairman or vice-chairman of the supervisory boards, the Jewish share was even higher with about 27 percent (Münzel, 2006). Windolf's research focuses on the determinants of the disproportionate Jewish share, but cannot find empirical support for any of the common claims. Neither a stronger role due to a long lasting history of money lending with many Jewish private bankers, nor a higher educational attainment that gained importance in a more advanced industrial economy, nor closer links among Jewish elite members that provided a comparative advantage to non-Jewish elite members can be considered as main explanation for a prominent Jewish role in the German economic elite. Therefore, it is still an open question why we can observe such a crucial role of Jewish elite members.[9]
Among the economic elite, antisemitic behavior was not common, despite some well-known figures like Fritz Thyssen[10] or Kurt Schmitt from the Allianz. Due to many meetings in several occasions and the persistence of elite members, trust among the economic elite was high, independent of religious background of the individual members. Although Mosse (1987) argues that trust among Jewish elite members was higher there are many examples of well established relations between Jewish and non-Jewish elite members. The historical and sociological literature questions a separate Jewish elite network in which ties among Jews were stronger compared to the overall elite network.

4.2.2 Discrimination of Jews and the Rise of the Nazis

In contrast to the economic elite, anti-Jewish hatred and prejudices among the general population were a wide spread and by no means new phenomenon in Germany at the

[8]Similar work confirms the prominent role of Jewish businessmen. For instance, Münzel (2006) shows that in larger corporations that he analyzed about 11 percent of the executive and 23 percent of the supervisory board members were of Jewish origin right before the banking crisis of 1931. Among the "big linkers" in his sample, 40 out of 100 were of Jewish origin.

[9]This study cannot contribute to answer this question, but will take the allocation of Jewish board members at the beginning of the Nazi reign as an efficient outcome, in which corporations chose freely those board members who fit their needs best. Thus, we assume that there was an economic motive in the first place for why firms chose certain board members, independent of their religion, but only based on their managerial abilities.

[10]Thyssen became also popular by being a financiar of the Nazi movement (Thyssen, 1941).

beginning of the 20th century.[11] After World War I, right wing groups like the Operation Consul became more aggressive, culminating in assassinations of important leaders such as the Foreign Minister Walther Rathenau, one of the most famous Jewish politicians and business men. His father Emil Rathenau founded the Allgemeine Elektricitäts-Gesellschaft AG (AEG), one of the main producers of electrical equipment. In this after-war-period of the 1920s in which the right wing grew stronger, Adolf Hitler took over the National Socialist German Workers Party (NSDAP) and formed it as a racist right-wing party with anti-Jewish hatred as crucial component. Jews fulfilled the role of a scapegoat for any social and economic problem.

After the unsuccessful 1923-putsch in Munich with the following imprisonment of Hitler and others, Hitler changed strategy and tried to seize power by abiding the electoral process. For many years this strategy did not seem to pay off, but the Great Depression with its disastrous effects on the German economy played in his hands. The NSDAP received 18.3 percent of votes in September 1930 and increased this share to 37,4 percent in July 1932. Although the Nazi party lost ground in the last free elections of the Weimar Republic (33.1 percent in November 1932) this did not stop the rise and Hitler was appointed Chancellor on January 30th 1933. In the following months he managed to seize complete power by dis-empowering the parliament after the Reichstag fire by means of the *Enabling Act* and later on dissolving all unions, clubs, and parties.

Table 4.1: Chronology of Key Events

1932	April 12	Berlin bourse re-opens after financial turbulences in 1931
1933	January 30	Hitler appointed Chancellor
	March 23	Enabling Act ("*Ermächtigungsgesetz*")
	April 1	Nationwide boycott of Jewish-owned stores
	April 7	Law for the Restoration of the Professional Civil Service *("Gesetz zur Wiederherstellung des Berufsbeamtentums*")
	June 15	Act on the Co-ordination of the Supervisory Boards of Public Corporations ("*Gesetz zur Gleichschaltung der Aufsichtsräte von Körperschaften des öffentlichen Rechts*")
1935	September 15	Reich Citizenship Law ("*Reichsbürgergesetz*")
1938	November 12	Regulation to exclude Jews from the German Economic Life ("*Verordnung zur Ausschaltung der Juden aus dem deutschen Wirtschaftsleben*")

[11] Voigtländer and Voth (2012), for example, show that anti-Jewish hatred was present in Germany for centuries and spatially very persistent.

The discrimination of Jews increased steadily during the Nazi reign and on April 1st a first trial of an open and country-wide anti-Jewish boycott was executed. In the public this boycott was propagated as response to a Jewish boycott towards German products. It marked the beginning of a campaign against the German Jewish population. On April 7th, the *Law for the Restoration of the Professional Civil Service* was passed, which restricted employment in the civil service to "Aryans" and gave grounds to systematically drive out Jews from the public sphere. In particular the *Aryan Paragraph* ("Arierparagraph") allowed to apply the law on public employees with a Jewish grandparent, later on even with a "non-Aryan" spouse. Although this law did not directly target economic elite members it was used to drive out Jews from corporations, which were mainly owned by public authorities. Besides the Reichsbank and the Reichsbahn many banks were owned by the state, because of rescue interventions during the financial crisis. In addition, stocks of gas, water, and electricity service providers and stocks of public transportation companies were often held by municipalities. As a consequence, the political leaders could directly enforce the "Aryanization" in these corporations.[12] The actual racial definition that allowed to distinguish between "Aryans" and "non-Aryans" was only passed in the *Nuremberg Laws* in September 1935 and acted as a crucial refinement of the discriminatory policies that started already in 1933. It ended the equal status of Jews as citizens that was effective since the founding of the German Reich in 1871. The last step to drive out Jews from business life in Germany was the *Regulation to exclude Jews from the German Business Life* ("Verordnung zur Ausschaltung der Juden aus dem deutschen Wirtschaftsleben") from 1938, which regulated that all remaining Jewish firms had to be closed by the police.[13]

These laws contributed to the process of the so-called "Aryanization" of Jewish properties, i.e. the compulsory purchase, that started shortly after the Nazis seized power in 1933. Recent estimates conclude that about 20-25% of Jewish firms were changing ownership until 1935 and about 60-70% until 1938.[14] During the "Aryanization" the pressure on small businesses was much higher compared to big corporations, which were

[12]The actual legal base was the *Act on the Co-ordination of the Supervisory Boards of Public Corporations* ("Gesetz zur Gleichschaltung der Aufsichtsräte von Körperschaften des öffentlichen Rechts") from June 1933. It empowered the political leaders to replace board members even without the necessary decisions within the corporation. Still without the legal permission, the jurisdiction often followed cooked-up arguments why Jewish board members were fired, such as causing riots among the workers or alleviating the incentives to work.

[13]The classification of firms to be Jewish was very narrowly defined. The "Dritte Verordnung zum Reichsbürgergesetz" defined that companies mainly owned by Jews were Jewish, but also all corporations with at least one Jew on the supervisory board.

[14]Münzel (2006) notes that older research literature in contrast put forward a story in which the "protecting hand" of Hjalmar Schacht slowed down the "Aryanization" until 1938. However, this story is dis-proven by historical facts.

more influential as important contributor of foreign currencies and employment. Some authors distinguish between two "Jewish economies", one composed of small and one of large firms.[15] The focus in this paper will be on large corporations and thus section 4.3.1 describes not only measures to characterize these "Jewish firms", but gives descriptive details on the removal of Jewish elite members in these firms as well.

4.3 Data, Measures, and Descriptive Statistics

4.3.1 Dataset and Sample Construction

Daily stock market information and information on dividends of firms listed at the Berlin stock exchange are printed in an old journal named *Monats-Kursblatt*, published on a monthly basis by the Berlin stock exchange.[16] A few copies of this journal survived the Second World War and are accessible in special libraries such as the Staatsbibliothek zu Berlin. During the financial turbulences of 1931/1932, the Berlin stock exchange was closed and only re-opened in April 1932. Therefore, we digitized the official daily stock prices of a total of 786 stocks starting from April 1932 up to December 1933. Over this time period, only one stock was newly listed[17], but 88 stocks were de-listed, causing some attrition to the sample.[18] Many stocks were not traded on a daily basis[19] and therefore

[15]The distinction goes back to Strauss (1980).

[16]An alternative source for daily stock prices is the *Berliner Börsen Courier*, a daily newspaper. This newspaper covers stock prices of other stock exchanges, but would be more cumbersome to collect from daily editions as it does not provide an overview of monthly developments.

[17]"Nordst. Allg." starting from July 1933.

[18]The de-listed stocks are (with end month): Chem. Wke. Brockhues, Frankf. Maschinen, Hann. Msch. Eg., Schles. Leinen, Schles. Textil (all April 32), Rh.-Westf. Sprengst. (May 32), Alexanderwerk (June 32), Barmer Bankv., Großenh. Webst, Ostpr. Dampfw., Pongs Spinner., Svenska B, Wihard, H.& F. (all July 32), Darmst. U. Nat., Elsbach, Mech. Linden, Tielsch Porz. (all August 32), Bankv. F. Schl-H, Carlshütte, Fahlberg, List (all September 32), Leipz. Piano, Masch. Starke (all October 32), Eisen Sprottau, Rh. Möbelstoff (all November 32), Annab. Steing., Egestorff Salz, Frister, R., Hammersen, Schwanebeck, Veritas Gummi, Wegelin & Hübner, Wicking Cem. (all December 32), Dte. Jute, Dürkoppwerke, Dürkoppwerke Vorz., Müser, Gebr., Westd. Handels, Neptun Dampf (all January 33), Bazar, Excelsior, Harkort Brück., Harkort Brück. St.-Pr., Minimax, Oeking Stahl, Runge-Wke., Stettin. Papier (all February 33), Bendix Holz, Körting Gebr., Lehmann, Leonische Wke., Lüneb. Wachs, Pinnau Mühlen, Wayß & Freytag (all March 33), Askaniawerke, Bösperde, Lüdensch. Met., Neue Amperkr., Niederbarnim, Oberb. Ueberl., Schles. Cellulose, Ver. Flanschen (all April 33), Bayer. Granit, Dolerit-Basalt, Terr. Bot. Gart., Ver. Schuh Bern, Ver. Thür. Metall, Volkstedt Porz. (all May 33), Eilenbg. Kattun, Glas Brockwitz, Lingel Schuh, Magirus, Magirus Vorz., Thür. Bleiweiß (all June 33), Baroper Walz, Girmes & Co. (all July 33), Flohr, Carl (August 33), Faradit, Hirsch Kupfer, Preßluftwerkz., Ruscheweyh, Stettin. Oderwerke (all September 33), Concord. Spinnerei, Union Bau, Zellstoff-Ver. (all October 33), Richter, David, O Oesterr. Cr., Rostocker Bk. (all December 33)

[19]Later on we construct a measure of liquidity based on trading days to control for the fact that few stocks of mainly small firms were traded reluctantly.

we follow Ferguson and Voth (2008) in defining monthly stock prices. We define these monthly stock prices as the price of a stock on the tenth of each month or the price within the closest five business days before or after.[20] Taking only stock data from Berlin ensures that institutional factors are the same across firms and the potential set of investors is the same. But it comes with a cost as well. Even though the Berlin stock exchange was the main bourse in Germany, it constrains the sample. Some large industrial companies such as the *Friedrich Krupp AG* from the Ruhr area are not traded in Berlin.

Another adjustment we have to implement is due to stock consolidations. During the period of 1932/1933 a total of 31 stocks were consolidated. To account for this, the stock prices were recomputed by taking into account the ratio between old and new price and thus, adjusting the time series.[21]

The information of the *Monats-Kursblatt* on dividend payments is used to compute the dividend yields as ratio of the dividend payment in 1931/1932 divided by the average stock price during December 1932. This limits the sample to a maximum of 614 stocks.[22]

The second major source of historical data is the *Handbuch der deutschen Aktiengesellschaften*. The Handbuch is usually published in four volumes per year and contains a large set of information on all corporations. For example, the information covers members of the executive and supervisory board, founding date, purpose of the corporation, nominal capital, number of shares, accounting year, balance sheets, industry, profit and loss statements and dividends. The 1932 and 1933 editions of the Handbuch were used to collect information on capitalization as well as the members of the executive and supervisory boards of all companies listed at the Berlin stock exchange.[23] We manually identified the listed firms based on their stock name.[24] Unfortunately, no information is reported on the 19 foreign companies (with 21 stocks) that are listed in Berlin and their

[20]Similar to Ferguson and Voth (2008), we take the subsequent price in case we have a price for one day before and one day after.

[21]The stock names of firms for which stocks were adjusted are: Allg. Bau Lenz, Allg. Dt. Credit, Bank f. Brau, Berl. Masch., Berthold Mess., Busch & Gebr. Jaeger, Comm.u.Privat, Dresdner Bank (2x), Dt. Bk. U. Disc., Dte. Kabel, Hambg. Pack., Holzmann, Junghans, Kokswerke, Kronprinz Met., Metallges., Meyer Kauffmann, Miag, Nordd. Lloyd, Reichelt Metall, Schneider, Schultheiß, Stollwerck, Sturm, Dachz., Wanderer, Wenderoth. For the following firms there is no previous stock price for many days before the consolidation and therefore they are dropped after the consolidation: Düss. Hoefel, Günther & Sohn, Sangerh. Msch., Wickrath Led.

[22]The dividend yield of firms that do not report a dividend payment is set to zero in order not to lose these observations.

[23]Dieter Ziegler gratefully provided a dataset with information on board members for all corporations with a nominal market capitalization above 500 000 RM, covering also all financial institutions independent of their market capitalization. This sample covers almost all listed firms at the Berlin stock exchange. Information on the remaining firms is collected from the Handbuch volumes of 1932 and 1933.

[24]For many firms the Handbuch is reporting information on stock prices at given dates or stock exchanges where the firms are listed. This helped to settle doubts for firms which were hard to identify. The Handbuch sometimes reports differing stock names for a company.

stocks are therefore not taken into account for the analysis.[25] By doing so, we overcome a potential bias as the discrimination of Jews in those firms might have been mitigated not to endanger foreign relations at this point in time. In addition, German authorities did not have any direct control over these foreign firms. In contrast, German firms owned by foreign companies, such as Opel (owned by General Motors), voluntarily removed Jews from their boards.

In the aftermath of the financial and economic crisis of the early 1930s, several companies tumbled and went into liquidation. Because the process of liquidation takes time, some stocks were still listed at the Berlin stock exchange. We decided to exclude all those firms based on two reasons. First, their stock prices are driven by the process of the liquidation itself, leading to some strong outlying performance. Second, their executive and supervisory boards were not freely chosen any more. According to the Handbuch, stocks of 18 firms (with 19 stocks) were in liquidation.[26]

The market capitalization is computed by taking the actual number of stocks and multiplying it by the average stock price in December 1932. The data on the actual number of outstanding stocks is collected from the Handbuch volumes of 1932. Additional information from the Handbuch volumes of 1933 are used in case no information on the exact break down of the nominal capital is available in 1932. In case of multiple stocks with different face value, simply the total number of stocks is taken into account.

What is a "Jewish" Firm?

We define Jewish firms based on the religious affiliation of their board members. Alternatively, one could also think of defining Jewish firms according to other dimensions such as ownership or Jewish founders as done by Mosse (1987). The reason to focus on board members is that those are the decision-makers in day-to-day business relations, representing their firms in public. They are involved in elite networks and have exchange with managers of other corporations and important political leaders. Thus, a worsening of their perception by the business community or the general public can lead to severe consequences for their firms. Other leaders might be more reluctant to work with them and the image of their firms can be worsened by their representation. There are many episodes in which right wing newspapers agitated against individual business leaders due to their Jewish heritage. We generally define a firm to be Jewish if the total share of Jew-

[25]The stock names of these firms are: AlgKunstzijde, Baltimore, Canada, Chemie, I.G. (2x), Comp. Hisp. (2x), Cont. Linol., Csakath.-Ag., Kopenh Dmpf, Luxemb. Henri, Luxembg. Inter., Montecat., Oest. Esb. Vk., Oest. Siem. Sch., Oesterr. Cr., Pennsylvania, Svenska B V, Ung. Cred., Westsicillian., Wiener Bkv.

[26]The stock names of these firms are: Allg. Boden, Bendix Holz, Bodg. Schönh, Chem. Schuster, Eisen Sprottau, Excelsior, Faradit, Frister, R., Grauert, Masch. Starke, Neu-Westend, Pongs Spinner., Schles. Leinen, Schles. Textil, Stadtberger, Staßfurt Chem. (2x), Terr. Südwesten, Transradio.

ish board members – executive and supervisory board – exceeded 30% of their members in 1932.[27]

Defining individual elite members as Jewish or non-Jewish is a difficult and highly controversial task. While the Halacha, the Jewish religious law, is clear-cut and defines Jews by those being born to Jewish mothers or converted adults, there are various approaches in the literature. Often researchers define Jews based on culture, or ethnic affiliation. In particular, the latter was used in previous work by Mosse (1987). For the purpose of this study, there is a quite clear definition that comes from the research question itself. As this study wants to estimate economic effects of how the stock market reacted to Jewish firms or Jewish board members, we have to follow the public (Nazi) perception of who is Jewish. The Nazis were the ones agitating against Jews and investors could foresee future discrimination under their rule. Therefore, the definition follows mainly the racial definition of the Nazis.[28] Note that by applying this rule, even important elite members such as the chairman of Deutsche Bank Georg Solmssen that converted to Christianity and were not self-declared Jews are classified Jewish.[29]

In total, our Berlin sample includes 1999 (1932) / 1700 (1933) distinct executive board members and 6068 (1932) / 4691 (1933) distinct supervisory board members. The religious affiliation of elite members is not public information in the volumes of the Handbook, but there is work from historians and sociologists about the Jewish economic elite that we can build on (Münzel, 2006; Windolf, 2011; Mosse, 1987, 1989). We mainly follow the seminal work of Münzel (2006) on the Jewish members of the German economic elite. In his work on about 300 corporations in 15 industries, he identified about 640 elite members as Jewish. Unfortunately, not all these firms are listed at the Berlin stock exchange. The number of elite members that are identified as Jewish are a lower bound of the actual number, because only those members are defined Jewish for whom sufficient information is available. Out of these overall 6337 distinct members of the economic elite for the two years, we could identify at least 260 members as being of Jewish origin.

As already discussed above in section 4.2.1, important legal changes on the supervisory board took place at the early 1930's, limiting the overall number of members. Therefore, one obvious objection to our study is that a decline in the number of Jewish board mem-

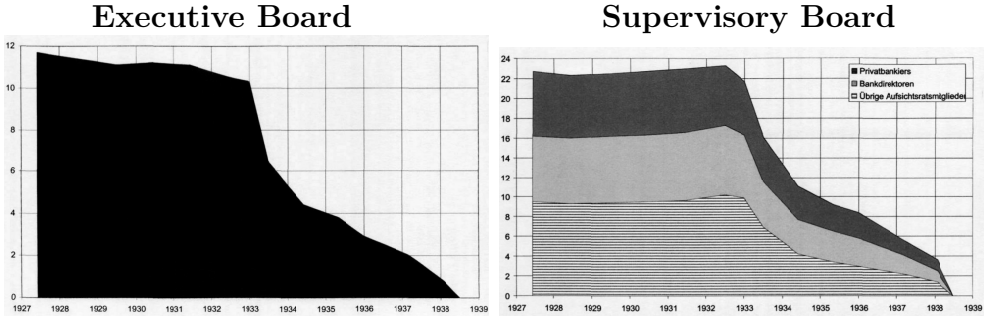
[27]Later on in January 1938, Hermann Göring issued a decree in which among other things he defined Jewish firms as those with more than 25 % Jewish supervisory board members. This suggests that initial cut-offs should be set higher.

[28]Note that the actual *Nuremberg Laws* were only passed in September 1935. However, the Nazi movement was agitating against "Jewish" political and business leaders already for many years. Thus, the exact definition was mainly used to motivate discrimination in the wider public domain. In addition, the *Law for the Restoration of the Professional Civil Service* from 1933 was already a first step to distinguish between Jews and non-Jews.

[29]Solmssen was born into a Jewish family of bankers, but converted in 1900 to Protestantism and subsequently changed his name from Salomonsohn to Solmssen.

bers is simply a longer lasting trend and not (only) related to the Nazis. In figure 4.1, Münzel (2006) provides evidence that the Jewish share among the board members was very stable before 1933. The share of Jewish executive board members fell slightly from 11.7 percent in 1927 to 10.4 percent at the end of 1932. The share of Jewish supervisory board members slightly increased from 22.8 to 23.3 percent over the same period. The latter fact is assuring that the legal changes did not affect Jewish board members disproportionately as the overall number of supervisory board seats decreased by about 17 percent over the period.[30]

Figure 4.1: Share of Jewish Board Members over Time (Sample of Münzel (2006))



The graph shows the share of Jewish executive board members (left) and supervisory board members (right) over time, based on a sample of 300 German corporations. Source: (Münzel, 2006, p. 180f)

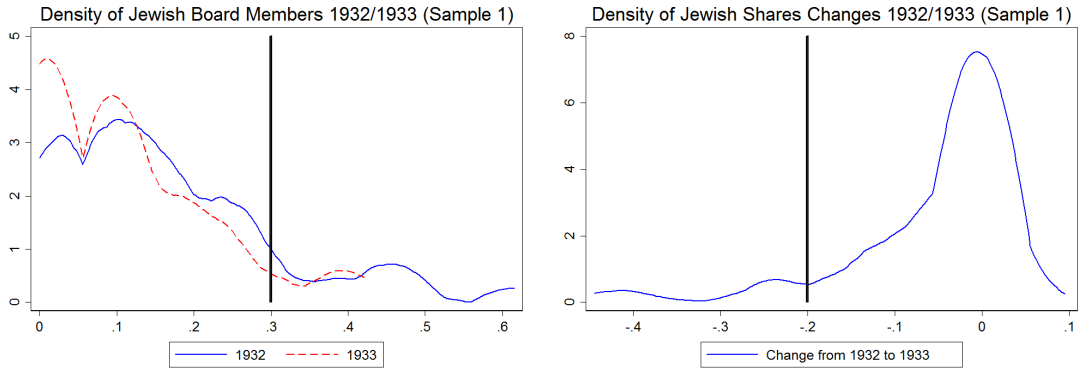
The drastic decline in Jewish board members started in 1933. In many instances the removal of Jewish board members was further fostered by court decisions, which followed economic arguments that Jewish board members harmed the revenues of the company. The main arguments were that their employment could cause consumer boycotts, dissolve the morale of the employees, or cause discrimination by public authorities (Münzel, 2006, p.129).
The presented statistics weaken another objection on the removal of Jews. Mosse (1987) pushes a tale of Hjalmar Schacht as being a protector of Jewish elite members.

> "*As to Jewish participation in the corporate sector, the evidence suggests that, thanks largely to the interested protection of Dr Hjalmar Schacht, this, in many cases, was not seriously impaired until 1935. There is also some evidence to suggest that, at least down to this date, many Gentile members of the German economic community showed no particular alacrity to rid themselves of their Jewish colleagues. It was only after 1935 that the expulsion of Jews from German economic life appears to have gathered momentum, culminating in their complete exclusion by 1938.*" (Mosse, 1987, p. 329)

[30]Obviously, individual board memberships are not fixed and there are constantly changes. Moreover, there are changes across industries over time. For an extensive discussion we relate to Münzel (2006).

This perception of the role of Schacht was already refuted by Barkai (1988). The removal of Jewish board members by many firms during 1933 is also shown in figure 4.2. The left panel plots the distribution of Jewish board members across firms in 1932 and 1933. The number of Jewish board members was decreased between those years and the number of firms with no Jewish board members increased from 28 to 49. A list of the Jewish firms is shown in appendix C.1.4. Appendix C.1.5 reports information on the names of firms that removed their Jewish board members.

Figure 4.2: Distribution of Jewish Board Members and Removal



The left panel plots the distribution of firms according to their share of Jewish executive and supervisory board members in 1932 and 1933. The right panel plots the distribution of firms according to their change in the share of Jewish executive and supervisory board members between 1932 and 1933. Both distributions are based on the sample of Münzel (2006). The plots display the chosen cut-off levels to define a Jewish firm (0.3) as well as a firm that removes its Jewish board members (-0.2).

Which are the "Jewish" Firms and who removed Jews?

After having defined "Jewish" firms, we want to discusses additional information on sectoral compositions of these firms as well as historical evidence on the removal of Jews. Most information is based on Münzel (2006). In appendix C.1.2 statistics are provided about the industrial structure of the Jewish and non-Jewish firms in our sample.
The *construction sector* offers insights into the pressure on corporations by the new rulers. The situation of the biggest construction business Philipp Holzmann is an example of how the Nazis pushed companies to force out their Jewish board members. In August 1933 an NSDAP official recommended the chief construction office not to give any forther public contracts for the construction of highways to Holzmann. It was argued that Holzmann is working with Jewish capital and therefore, the competitor Wayss & Freytag should be employed instead. Fritz Todt clarified later on that the company did not act according to the new spirit and should accordingly replace their Jewish board members if they want to be further considered for public contracts. As a consequence, Adolf Meyer, Paul Stern, Hermann Galewski, and Charles Rosenthal were removed from the supervisory board.

Only Max Warburg was kept on the board as he seemed to be too important for international business relations. Furthermore, the close connections between newly Aryanized companies of other sectors affected construction businesses as well. The Aryanization of the Schultheiss-Brauerei led to a replacement of Jewish board members such as Käthe Oppenheimer at Vereinigte Portland Zement- und Kalkwerke Schimischow and the Schlesische Portland-Cement-Industrie.

Another sector that was highly dependent on the government are the *gas, water, and electricity suppliers*. Many companies were under direct control of the Reich, Länder or municipal politicians. Thus, it was easier to force out Jews from the boards of the corporations, often by exploiting the *Law for the Restoration of the Professional Civil Service*. At RWE only Paul Silverberg was left, at Bekula, Fritz Elsas, Bruno Asch, Martin Katz and Paul Robinson had to leave. The Elektricitäts-Lieferungs-Gesellschaft (ELG) had to replace their complete executive board, because they forced out the three Jewish board members.

Similarly, the *transport sector* was under pressure by political authorities. Many municipalities owned larger shares of public transport companies and could easily remove those Jewish board members that were delegated to the supervisory board by them. Thus, Jewish board members of Berliner Verkehrs-AG (Bevag), Gesellschaft für elektrische Hoch- und Untergrundbahnen in Berlin or the Hamburger Hochbahn-AG were removed immediately. Furthermore, the political pressure on companies like Lufthansa was increased.

In the *banking sector* many board members were of Jewish origin although in our sample we only define 3 out of the 20 firms as being Jewish. Due to the strong impact of the government either by having rescued banks during the financial crisis or because of public mandates such as in the Reichsbank or the Dego many Jewish board members were forced out once the Nazis extended their power. One example is Bank elektrischer Werte (BEW) in which 7 of 11 supervisory board members were exchanged due to the strong role of the government, which owned Sächsische Werke, which in turn was a major stock holder of BEW.

Private (Jewish) bankers played an important role in the *insurance sector*. Due to their ownership, they were less changes of board members right away, but still over time due to the Aryanization of German businesses.

In the *mining industry* we observe examples of direct exclusions such as Paul Silverberg being forced out and resigned all his mandates in 1934.[31] At the same time, family Petschek kept control of their supervisory board memberships at the Ilse Bergbau AG. Actually Wilhelm and Ernst replaced their father Ignaz after his death in 1934.

In the *iron and steel industry* we observe few replacements due to antisemitic reasons. The removal of Oscar Altmann (Mannesmann) and Arved Michelson (Mansfeld AG) were

[31] Among others, Silverberg was represented in the GBAG, the RAG, and the Harpener Bergbau AG.

motivated by antisemitic accusations similar to Paul Silverbergs removal at Vereinigte Stahlwerke or changes at Krupp (Jakob Goldschmidt and Kurt Hirschland). But at the same time, there were take overs such as the take-over by Mitteldeutsche Stahlwerke by Flick that caused some compositional changes of board members.

Many Jewish board members had to leave firms producing *machinery*. Even though Opel was owned by General Motors, Manfred Wronker-Flatow was removed to avoid conflicts with the new regime. At the Daimler-Benz AG the Nazi Emil Georg von Stauß exploited his position to force out Wilhelm Kleemann, Herbert Gutmann, Arthur Rosin, and Hermann Aaron Marx.[32] At Orenstein & Koppel we find many removals such as Oscar Wassermann, Ludwig Berliner, and Oscar Oliven. Interestingly, Alfred Orenstein, the son of the founder Benno Orenstein, asked Gustav Wolfsohn to leave the supervisory board not to endanger public contracts (Münzel, 2006, p. 224). Similar to the role of von Stauß, the Nazi Erich Niemann from Dresdner Bank was delegated into 13 companies ("Berater für besondere wirtschaftliche Aufgaben") to force out Jews, among others also at Orenstein & Koppel in which he refused a pension agreement arranged with Gustav Wolfsohn (Münzel, 2006, p. 224).

In the *electronics industry*, with corporations such as Siemens, Jews did not play such a prominent role. Obviously, the AEG was a major exception. Only Paul Silverberg and Alfred Mertons left Siemens-Schuckertwerke in 1934, but the latter was replaced by another Jew, named Alfred Petersen. For Siemens & Halske, Alfred Berliner stayed on the board until 1938.

The *chemical* giant IG Farben – that later on became known as producer of cyclon B – had about one third Jewish board members in 1933 and kept many Jewish board members until 1938. Similarly, the removal of Jews at Degussa went slowly. Only at Continental-Gummi-Werke 4 out of 10 supervisory board members left soon.

The *textile industry* did not have many Jewish board members. An exception was the shoe producer Salamander that was mainly owned by the Christian family Sigle and the Jewish families Levi/Rothschild. In 1933 the Levi/Rothschild family sold their shares to family Sigle. Moreover, Weil and Hirsch had to leave the executive board and two nephews of Max Levis as well as Fritz Abraham had to leave the supervisory board. In contrast, Adler and Oppenheimer (A & O) could fight the Aryanization until 1938.

The *wood and paper industry* is a rare example in which Jewish board members stayed much longer.

Firms producing *food and beverages* had a large share of Jewish board members and were also an industry, which forced out many Jews very soon. For example, the biggest brewery Schultheiss fired Walter Sobernheim already in autumn 1933. In addition, 15 out of 19 supervisory board members had to give up their mandates until mid 1933. For another

[32] As for many individual companies, there are books available that describe the behavior of these firms during the Third Reich (Gregor, 1998).

Jewish brewery, Löwenbräu, the local popularity in Munich was not enough. The major shareholder family Schülein was exposed to an antisemitic campaign in 1933. As a consequence of severe economic problems and the threat of a boycott of public beer orders, five Jewish supervisory board members including Josef Schülein had to leave the company in May 1933. In other companies such as Südzucker, important Jewish figures such as Albert Flegenheimer were kept and only left after long lasting fights in later years.
Department stores and trading firms was dominated by Jewish businessmen. Already until mid 1933 half of the Jewish elite members were forced out. On April 1st 1933 all Jewish board members were fired at Karstadt AG. In the preceding months, the political pressure was increased and often shops were closed or boycotted. At Leonhard Tietz AG, about three quarters of leading positions higher than department managers were replaced between April 1933 and December 1935. Already one day after the boycott against Jews on April 1st 1933, eight Jewish supervisory board members were removed, leaving only three Jewish board members. At the same time, Alfred Tietz and five other executive board members gave up their mandates. In July 1933 the company was renamed into Westdeutsche Kaufhof AG and on September 25th 1934 all remaining Jewish board members left the firm.
When it comes to *publishers, press, and the film industry*, Münzel (2006) reports many changes of board members. Until 1934 all Jewish executive board members and three quarters of the Jewish supervisory board members were driven out of their firms. However, many publishers were not set up as corporations with the main exception of Ullstein AG. The Universum-Film AG (Ufa) was already taken over by Hugenberg in 1927, but in 1933 many contracts with Jewish actors and directors were voided. And by the end of 1933 all Jewish board members were removed.
From all these instances we can understand that the removal – and in particular the immediate removal – of Jewish board members was widely spread across sectors. In particular, the public authorities forced out Jewish board members whenever they could execute direct power.

4.4 Specifications and Estimation Method

Based on the information available, we construct two samples. The first sample is our preferred sample, because we have complete information on all board members in these firms. The second sample helps to investigate and validate robustness. The samples are defined as follows:

- Sample 1: covers all firms of Münzel (2006), which are listed at the Berlin stock exchange
- Sample 2: covers the full sample of all firms listed at the Berlin stock exchange

After discussing the specification and estimation procedure, we will show some descriptive statistics for the samples. It is no surprise that the first sample contains relatively larger firms compared to the overall sample. This is based on the selection of Münzel (2006) who researched the biggest corporations in Germany.

4.4.1 Computing Abnormal Returns

The rally at the Berlin stock exchange did not start when Hitler was appointed Chancellor end of January 1933, but already in summer 1932 as shown by figure 4.3. This highlights that other factors are at play as well and emphasizes the importance of constructing a counter-factual stock market performance of firms for our event study. We are interested in a heterogeneous effect across firms, taking care of expected returns that might be associated to the general boom of the market. Thus, we construct abnormal returns following the proposed methodology for event studies by Campbell, Lo, and MacKinlay (2012).

Figure 4.3: Berlin Stock Market Index

The figure shows the stock market index for the Berlin Stock Exchange ("*Aktienindes des Statistischen Reichsamtes*") for the period April 1932 to December 1933. The 30th of January, the day when Hitler became Chancellor, is market with a vertical line. Source: Statistical Office of the Reich ("*Statistisches Reichsamt*").

Due to the stock market closures we can use only 1932 as estimation window for the market model. In a first step, we regress the monthly log returns of stock i, R_{it}, on a stock specific constant α_i and the market returns, R_{mt} to identify β_i.

$$R_{it} = \alpha_i + \beta_i R_{mt} + \varepsilon_{it} \tag{4.1}$$

The frequency is limited to monthly observations due to the availability of the stock

market index of the Statistical Office of the Reich. In a second step, we subtract the predicted returns from the actual return in 1933 to identify the abnormal returns $\widehat{\varepsilon^*_{it}}$.

$$\widehat{\varepsilon^*_{it}} = R^*_i t - \widehat{\alpha_i} - \widehat{\beta_i} R^*_{mt} \tag{4.2}$$

In a further step we compute the cumulative abnormal returns, $\text{CAR}_{i,t}$ by simply summing the monthly abnormal returns over time for the period January to March, January to April, and January to May. The first period ends short before the *Enabling Act* was signed to dis-empower the parliament. At the same time it does not include the April boycott, while the second period does. The third period captures the performance over the four months. It will help to investigate if stock prices were only affected for a few days by the April boycott.

4.4.2 Regression Framework

The actual methodology consists of OLS regressions in which we use the cumulative abnormal returns, CAR_{it}, (or unadjusted log return, R_{it}) as dependent variable. The main independent variable of interest is a time invariant dummy to distinguish between Jewish and non-Jewish firms. It is based on the previously outlined 30 percent threshold of Jewish board members. The control vector X_i consists of the dividend yields, the market capitalization, and the liquidity of the stock.

$$\text{CAR}_{i,t} = \alpha Jew_i + \gamma X_i + \varepsilon_{i,t} \tag{4.3}$$

In a further specification we include a dummy variable to identify firms with a high Jewish share in 1932 that reduced the number of Jewish board members drastically. We set this threshold to a decrease of Jewish board members that corresponds to 20 percent of the overall board members.

$$\text{CAR}_{i,t} = \alpha Jew_i + \beta Jew\_change_i + \gamma X_i + \varepsilon_{i,t} \tag{4.4}$$

In general, the idea is to distinguish between firms with few Jewish board members and firms with many Jewish board members. By doing so we can analyze a potential heterogeneous performance. In the second specification we go a step further and try to investigate additional heterogeneity among the firms with a high share of Jewish board members. It helps to identify those firms, which were counted as Jewish in 1932, but replaced a large share of their board members to become "Aryan" soon after Hitler came to power.

4.4.3 Sample Descriptives

After having specified the estimation framework, we want to better understand potential biases due to the sample construction, i.e. comparing the sample based on Münzel (2006) and the full sample. And we want to understand in which dimensions Jewish firms have been different to non-Jewish firms in the first place.

The first bias that we observe originates from the market capitalization between the samples. As we already know, Martin Münzel did not investigate a random sample of firms, but chose the largest corporations for 15 industries in Germany. Therefore, the large discrepancy in terms of market capitalization is no surprise, but certainly a bias. In addition, we see differences in the dividend yield and the liquidity supporting the general view that larger firms pay higher dividends and have simply more stocks so that trading occurs more often. All these differences make it unlikely that any findings in the smaller sample are valid for the full sample as well, even though we control for observables. We will further investigate this in section 4.6.2.

Table 4.2: Sample Descriptives

	Sample 1		Sample 2	
	Jewish	Non-Jewish	Jewish	Non-Jewish
Market Capitalization	12.7	13.0	6.6	4.4
Dividend Yield	0.044	0.030	0.038	0.028
Liquidity	79%	72%	60%	43%
Log Returns				
January-March 33	0.003	0.042	0.030	0.019
January-April 33	0.025	0.102	0.099	0.094
January-May 33	0.067	0.124	0.121	0.119
Cumulative Abnormal Returns				
January-March 33	-0.147	-0.106	-0.108	-0.127
January-April 33	-0.187	-0.105	-0.100	-0.108
January-May 33	-0.164	-0.097	-0.097	-0.094
N	20	134	52	640

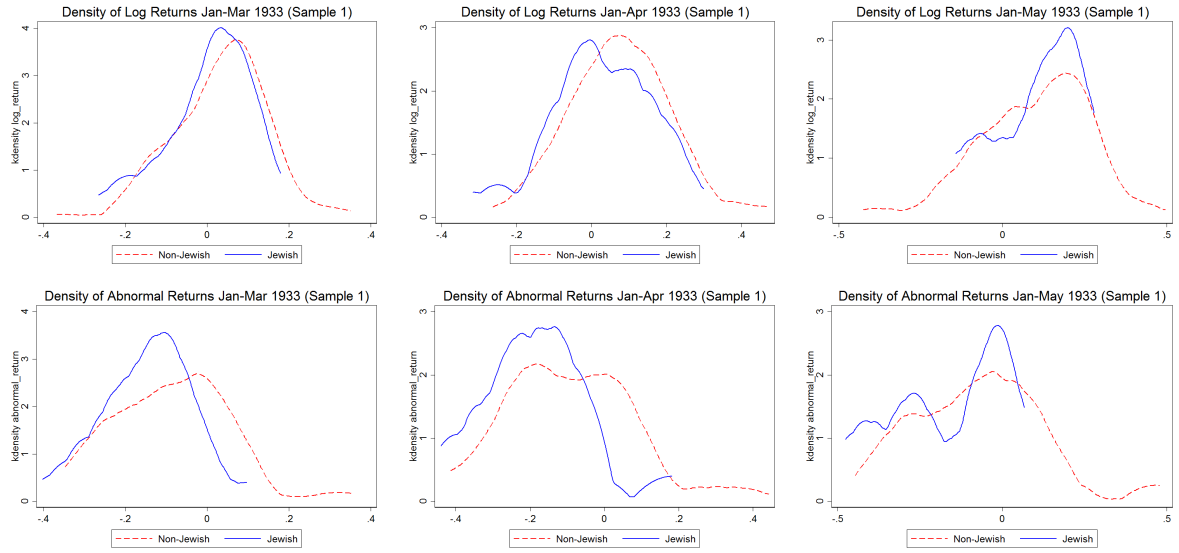
The Market Capitalization is measured as of December 1932 in mio RM. It is simply the product of average share price in December 1932 and the number of stocks. The Dividend Yield describes the paid dividend in 1931/32 relative to the average share price in December 1932. Liquidity is measured as share of trading days in which the stocks are traded. Sample 1 refer to those firms investigated by (Münzel, 2006), sample 2 contains all firms of ther Berlin stock exchange for which information is available.

Next, we will focus on the statistics of sample 1 of table 4.2 to check for heterogeneity

between Jewish and non-Jewish firms. There are slight differences in terms of market capitalization, dividend yield and liquidity between the Jewish and the non-Jewish firms. We will control for these differences by taking into account these variables as regressors in our analysis. Appendix C.1.7 gives further insights into the differences in the distribution of liquidity across stocks. It highlights that stocks of Jewish firms are more liquid compared to the rest of the sample.

Let us move to our dependent variable, i.e. the stock returns. We have seen in figure 4.3 that the Berlin stock exchange started booming from the summer of 1932 onwards. Thus, we took into account the individual performance of stocks in 1932 to compute abnormal returns for the first months of 1933. Figure 4.4 plots both, the distribution of log returns as well as the distribution of cumulative abnormal returns for three periods. In all plots we distinguish between Jewish and non-Jewish firms.

Figure 4.4: Log Returns and Cumulative Abnormal Returns Jan-May 1933



The figure shows the distribution of log returns in the upper panels and the cumulative monthly abnormal returns in the lower panels. All returns are divided into Jewish and non-Jewish firms. From left to right, the panels show the returns for the period January to March 1933, January to April 1933, and January to May 1933. Returns are truncated at -0.5 and 0.5 for better visualization, the regressions are executed on non-truncated returns.

The first period between January and March 1933 covers the first weeks of Hitler's chancellorship, but ends before the *Enabling Act* was established, which fully dis-empowered the parliament and massively widened the power base of Hitler. The second period period from January to April 1933 ends short after the country-wide boycotts against Jewish stores and the *Law for the Restoration of the Professional Civil Service*. The third period from January to May 1933 covers the period in which Hitler consolidated and widened his power, but also the first signs that the Nazi movement is very committed to its antisemitic

propaganda and ready to act against the Jewish population.
The distribution of the cumulative abnormal returns shows that stocks of Jewish firms underperformed in the first two periods. For the third period it suggests a bi-modal distribution in which some additional heterogeneity among Jewish firms becomes visible.
The plots, however, give only suggestive evidence and do not control for additional observables, such as the market capitalization or the dividend yield. Therefore, we will implement the econometric analysis to investigate the heterogeneous performance of firms.

4.5 Results

4.5.1 Performance of Jewish Firms

The distribution of returns in figure 4.4 gives already suggestive evidence that Jewish firms underperformed the market in the first months of 1933. In particular, when taking into account expected returns by looking at abnormal returns. Our baseline regressions confirm this hypothesis. First, we run a set of regressions for the log returns, i.e. a very similar dependent variable as was used by Ferguson and Voth (2008). Next, we will regress the cumulative abnormal returns on all independent variables.

Table 4.3: Regression Output – Baseline – Sample 1

	Log Returns			Abnormal Returns		
	(1)	(2)	(3)	(4)	(5)	(6)
	Jan_Mar	Jan_Apr	Jan_May	Jan_Mar	Jan_Apr	Jan_May
Jew	-0.059**	-0.081**	-0.067	-0.070**	-0.098**	-0.086*
	(0.03)	(0.03)	(0.17)	(0.01)	(0.01)	(0.07)
DivY	0.178	-0.399	-0.712	0.819***	0.551	0.313
	(0.50)	(0.31)	(0.18)	(0.01)	(0.11)	(0.47)
log(MarketCap)	0.018	-0.007	0.007	0.027*	0.004	0.012
	(0.20)	(0.61)	(0.68)	(0.09)	(0.81)	(0.48)
Liquidity	0.028	0.063	0.068	-0.089	-0.123	-0.162
	(0.64)	(0.48)	(0.49)	(0.32)	(0.35)	(0.31)
Constant	-0.260	0.182	-0.010	-0.461**	-0.060	-0.136
	(0.18)	(0.33)	(0.96)	(0.03)	(0.74)	(0.52)
Observations	124	123	122	120	118	118
R-squared	0.070	0.047	0.040	0.116	0.045	0.032

All regressions are estimated with robust standard errors. Robust pval are reported in parentheses with significance levels according to: *** p<0.01, ** p<0.05, * p<0.1

The first set of regressions on the log returns (column (1) to (3)) show that returns for Jewish firms were on average lower by about 5 to 8 percent in the first months of 1933. However, only the under-performing returns for the first two periods are statistically significant. The returns for the subsequent period are not found to be statistically different from 0. Based on log returns of the full sample of firms, Ferguson and Voth (2008) found Nazi-connected firms to outperform the market by about 5 to 8 percent. At the same time they did not find statistical significant evidence on an under-performance of Jewish firms.

More reliable are the results for the cumulative abnormal returns as they take into account a counter-factual performance of firms. The cumulative abnormal returns (column (4) to (6)) indicate that the 20 Jewish firms – with more than 30 percent Jewish board members in 1932 – had about 7 to 10 percent lower returns. Already before the country-wide boycotts against Jewish stores on the 1st of April and the removal of Jews from the civil service on April 7th, Jewish firms did not keep up with the market expectations, which were set in 1932. This low performance of Jewish firms suggests that investors took the antisemitic agitation of the Nazi movement serious and saw troubling times coming up for Jewish businesses. The manifestation through the boycott is associated with an even more negative abnormal return of almost 10 percent.

Most of the controls for the abnormal returns are found to be insignificant, indicating that many information on these observables are incorporated already in the prediction of stock returns based on the 1932 performance. Only dividend yields seem to be a strong driver of positive abnormal returns, in particular during the first period between January and March 1933.

4.5.2 Executive Board vs. Supervisory Board

Next we turn to potential differences between the executive and the supervisory board members. The executive board decides on the day-to-day business of the corporations and might therefore be more important for the actual performance of the firm. However, the role of the supervisory board can hardly be over-estimated as many big deals between corporations are decided among influential supervisory board members. The supervisory board members must approve major business decisions as well and represent the interests of the owners of the company. Among others, they oversee and appoint the management board.

Table 4.4 shows the results for regressions of the cumulative abnormal returns firms with more than 30 percent Jewish executive board members (column (1) to (3)) and more than 30 percent Jewish supervisory board members (column (4) to (6)).

Table 4.4: Abnormal Returns for the Executive and Supervisory Board – Sample 1

	Executive Board			Supervisory Board		
	(1)	(2)	(3)	(4)	(5)	(6)
	Jan_Mar	Jan_Apr	Jan_May	Jan_Mar	Jan_Apr	Jan_May
Jew_EB	-0.083**	-0.136**	-0.106			
	(0.04)	(0.01)	(0.12)			
Jew_SB				-0.040	-0.063*	-0.054
				(0.10)	(0.07)	(0.18)
DivY	0.755***	0.461	0.230	0.798***	0.533	0.296
	(0.01)	(0.19)	(0.60)	(0.01)	(0.12)	(0.50)
log(MarketCap)	0.028*	0.004	0.013	0.027*	0.004	0.013
	(0.08)	(0.77)	(0.46)	(0.08)	(0.79)	(0.46)
Liquidity	-0.079	-0.101	-0.146	-0.092	-0.126	-0.165
	(0.38)	(0.45)	(0.37)	(0.30)	(0.34)	(0.30)
Constant	-0.477**	-0.091	-0.160	-0.463**	-0.063	-0.139
	(0.03)	(0.61)	(0.45)	(0.03)	(0.73)	(0.51)
Observations	120	118	118	120	118	118
R-squared	0.113	0.051	0.031	0.106	0.034	0.025

All regressions are estimated with robust standard errors. Robust pval are reported in parentheses with significance levels according to: *** p<0.01, ** p<0.05, * p<0.1

The results for the executive board members affirms the results of our baseline scenario. It even shows stronger results in the first two periods for those firms with a large share of Jewish managers, indicating the high importance of the executive board. Between January and March 1933, the 11 firms that are defined Jewish exhibited 8 percent lower abnormal returns compared to the rest of the sample. For the period January to April 1933, the difference rose to 13.6 percent. This supports the narrative evidence from section 4.3.1 about Jewish firms being under pressure after the Nazis came to power.
When looking at the supervisory board, coefficients are lower, but not statistically significant with the exception for the period until mid April. An explanation for the non-significant coefficients for the supervisory board is that the thresholds for executive and supervisory boards are actually different. The definition of Jewish firms in the baseline scenario can be seen as weighted average between the share of executive board members and supervisory board members with the supervisory board having a larger weight. It might well be that the cut-off for the executive board is lower compared to the supervisory board. Therefore, we further investigate the cut-offs in appendix C.2. While a cut-off of 30 percent board members defines 11 firms as Jewish based on the executive board, it

identifies 35 firms as Jewish based on the supervisory board. If we instead increase the threshold to 40 percent for the supervisory board, only 17 firms are defined as Jewish and the results resemble those of the baseline scenario. Nevertheless, coefficients are larger for those firms with a large share of executive board members.

4.5.3 Removal of Jewish Board Members

Many of the Jewish board members were forced out already during 1933, either because the political authorities had direct control or exerted pressure. In some cases, even newly Aryanized businesses imposed pressure on firms that they dealt with or in which they held shares.

By comparing the board members at the end of 1932 and 1933 we can identify those firms that removed a large fraction of their Jewish board members. Unfortunately, the data does not allow to identify the exact timing for many changes of board members. The stock market performance is measured at the first months of 1933 while the removals are measured on an annual basis, i.e. by the end of 1933. It is very likely that the coefficient for the change in Jewish board members identifies firms that faced a strong market pressure to remove their Jewish board members. But at the same time, the results could be a reaction to the removal of Jewish board members as well.

The dummy for firms that replaced more than 20 percent of their board members with non-Jewish members is highly correlated with our definition of Jewish firms. To avoid collinearity – the correlation between the measures is around 80 percent – we include only the dummy for firms that removed many Jews from their board. Table 4.5 shows a negative relation between firms that removed many Jews from their board and their stock market performance. We cannot infer causality from this analysis. Nevertheless, the timing provides some suggestive evidence. Because we measure the stock market performance in the first months of 1933, while the removal took place over the year, it might well be the case that the removal occurred at a later date of the year. The results support a channel in which Jewish firms that were hit hard during the first months of 1933 removed a large share of their Jewish board members to be considered “Aryan”.

Table 4.5: Removal of Jewish Board Members – Sample 1

	Log Returns			Abnormal Returns		
	(1)	(2)	(3)	(4)	(5)	(6)
	Jan_Mar	Jan_Apr	Jan_May	Jan_Mar	Jan_Apr	Jan_May
Jew_change	-0.073**	-0.095**	-0.079	-0.089***	-0.118***	-0.103*
	(0.03)	(0.04)	(0.23)	(0.01)	(0.01)	(0.08)
DivY	0.129	-0.468	-0.769	0.755***	0.457	0.230
	(0.63)	(0.25)	(0.16)	(0.01)	(0.19)	(0.60)
log(MarketCap)	0.018	-0.008	0.006	0.026	0.002	0.011
	(0.22)	(0.56)	(0.72)	(0.10)	(0.89)	(0.53)
Liquidity	0.028	0.063	0.068	-0.086	-0.117	-0.157
	(0.64)	(0.48)	(0.48)	(0.34)	(0.38)	(0.33)
Constant	-0.248	0.200	0.005	-0.448**	-0.040	-0.119
	(0.21)	(0.29)	(0.98)	(0.04)	(0.83)	(0.57)
Observations	124	123	122	120	118	118
R-squared	0.073	0.048	0.040	0.120	0.048	0.033

Jew_change is a dummy that takes the value 1 if a firm removed more than 20 percent of its Jewish board members. All regressions are estimated with robust standard errors. Robust pval are reported in parentheses with significance levels according to: *** p<0.01, ** p<0.05, * p<0.1

4.5.4 Results over Time

So far we analyzed the cumulative abnormal returns, which are by construction a summation of monthly abnormal returns. In this section we further investigate the monthly abnormal returns over time. To do this, we regress the abnormal returns for individual months on the set of regressors. We have already discussed major events such as the boycott against Jewish stores on April 1st 1933 that had repercussions on stocks of Jewish businesses. The monthly regressions indicate that Jewish firms under-performed the market, in particular between February and March 1933. But they are not significantly different from zero. Therefore, we cannot draw any further conclusions from these results. It seems that the April boycott did not have strong repercussions.

Table 4.6: Abnormal Returns over Time – Sample 1

	(1) Jan_Feb	(2) Feb_Mar	(3) Mar_Apr	(4) Apr_May	(5) May_Jun
Jew	-0.035	-0.065	-0.022	0.002	0.000
	(0.20)	(0.13)	(0.28)	(0.94)	(0.98)
DivY	0.621	0.345	-0.342*	-0.147	0.146
	(0.14)	(0.31)	(0.09)	(0.50)	(0.54)
log(MarketCap)	-0.004	0.030	-0.011	0.007	-0.008
	(0.79)	(0.10)	(0.28)	(0.35)	(0.48)
Liquidity	0.233	-0.304	-0.048	-0.042	-0.078
	(0.52)	(0.41)	(0.46)	(0.42)	(0.30)
Constant	-0.210	-0.242	0.221*	-0.055	0.179
	(0.26)	(0.30)	(0.09)	(0.62)	(0.36)
Observations	122	121	122	122	121
R-squared	0.029	0.049	0.075	0.011	0.028

All regressions are estimated with robust standard errors. Robust pval are reported in parentheses with significance levels according to: *** p<0.01, ** p<0.05, * p<0.1

4.6 Robustness

4.6.1 Alternative Cutoffs for Jewish Firms

Drawing a line and defining Jewish and non-Jewish firms is a very stylized and simplified view. We know from historical sources that Jews were a crucial part of the economic elite. They were not only concentrated in few firms, but rather spread out and Jewish board members could be found in the vast majority of firms. It is hard to believe that only one number, one specific share of Jewish board members, is responsible for why firms performed better or worse. The measure is certainly not perfect, but it captures the intention to distinguish between firms with a prominent role of Jews and those without it quite well.

To better understand the effect and defend a threshold of 30 percent, we will show results for a range of potential definitions. We start out with any firm that had Jews on the board to a maximum of firms with more than 40 percent Jewish board members. We expect to find a threshold above which we find significant negative effects for Jewish firms. Defining firms as Jewish already when they have a single Jewish board member is a very strong definition and let us count 126 of the 154 firms as Jewish. It is similar to how Ferguson and Voth (2008) define Nazi-connected firms as being those with a prominent

supporter of the Nazi movement on the board. However, the role of Jewish elite members for listed firms cannot be compared in any way with those board members. Jewish elite members consisted an integral part of the business elite and almost all companies relied on their knowledge. Not, because they were Jewish, but because they were often brilliant businessmen. The religion did not matter for most of the time. For the other extreme of 40 percent Jewish board members, we are left with only 14 firms that are considered Jewish. As shown by appendix C.1.4, this definition is so restrictive that it does not even include firms like the AEG that were certainly considered Jewish by the general public.[33]

Two additional statistics might be of interest when looking at the results in table 4.7. The unconditional sample average lies at 15.9 percent, the conditional sample average of firms with at least one Jewish board member is given by 23.6 percent. Thus, the thresholds of 15 and 25 percent are interesting to look at if one would like to define Jewish firms based on the unconditional or conditional mean.

The results indicate that the chosen threshold of 30 percent is not too specific or restrictive. Those firms with a share of Jewish board members of 30 percent and above indicate significant negative cumulative abnormal returns for the first two periods that we investigate. The period from January to May 1933 lacks significance, but still resembles the magnitude of the previous periods. For thresholds below 30 percent we do not find evidence, although the results for the period from January to April 1933 point towards a negative effect for cut-offs of 15 and 20 percent. Defining Jewish firms only based on the sample mean is not sufficient to capture a significant negative effect.

The main takeaway from the table is that the results from the baseline scenario are robust when considering definitions with a higher threshold. For smaller cut-off values, coefficients are estimated to be smaller and they have less precision.

[33]Appendix C.1.4 lists those firms that had more than 30 percent Jewish board members.

Table 4.7: Alternative Cut-Offs to Define Jewish Firms – Sample 1

	Log Returns			Abnormal Returns		
Cut-Off	(1)	(2)	(3)	(4)	(5)	(6)
	Jan_Mar	Jan_Apr	Jan_May	Jan_Mar	Jan_Apr	Jan_May
0%	-0.004	0.032	0.072	-0.033	-0.015	0.028
(J=126)	(0.91)	(0.53)	(0.20)	(0.56)	(0.83)	(0.71)
5%	0.008	0.038	0.048	-0.022	-0.008	0.000
(J=120)	(0.80)	(0.38)	(0.29)	(0.65)	(0.89)	(1.00)
10%	0.018	0.012	0.017	0.005	-0.009	-0.007
(J=95)	(0.52)	(0.73)	(0.67)	(0.88)	(0.83)	(0.88)
15%	-0.016	-0.024	-0.007	-0.030	-0.046	-0.039
(J=66)	(0.54)	(0.48)	(0.86)	(0.35)	(0.23)	(0.39)
20%	-0.039*	-0.066**	-0.069*	-0.037	-0.065*	-0.078*
(J=48)	(0.05)	(0.03)	(0.08)	(0.18)	(0.08)	(0.09)
25%	-0.033*	-0.056*	-0.045	-0.025	-0.046	-0.040
(J=32)	(0.10)	(0.06)	(0.24)	(0.35)	(0.21)	(0.33)
30%	**-0.059****	**-0.081****	**-0.067**	**-0.070****	**-0.098****	**-0.086***
(J=20)	**(0.03)**	**(0.03)**	**(0.17)**	**(0.01)**	**(0.01)**	**(0.07)**
35%	-0.075***	-0.108***	-0.073	-0.088***	-0.127***	-0.093*
(J=17)	(0.01)	(0.00)	(0.17)	(0.00)	(0.00)	(0.07)
40%	-0.056*	-0.086*	-0.082	-0.073***	-0.110***	-0.100*
(J=14)	(0.06)	(0.05)	(0.20)	(0.00)	(0.01)	(0.08)

The table reports the coefficients of the Jewish dummy, based on the specified threshold. Each row stems from a different set of regressions, always including the full set of controls. The chosen cut-off for the baseline is 30% and marked in bold. For each regression the number of firms counted as Jewish is reported as "J"). All regressions are estimated with robust standard errors. Robust pval in parentheses
*** p<0.01, ** p<0.05, * p<0.1

4.6.2 Representativeness for Full Sample

As a final robustness check we investigate the representativeness of our baseline results for the full sample. The sample descriptives of table 4.2 showed a bias towards large firms and caused already doubts on the external validity of any estimation on the sample that is based on Münzel (2006).

A further problem of our measure of Jewish firms is that we do not have information

on many board members of firms in the full sample.[34] Therefore, we have very likely biased results, because the Jewish dummy can only capture the firms for which we have enough information on the religious affiliation of board members. And those firms are on average larger. It is very likely that we miss out many smaller firms. The Jewish dummy is therefore biased towards larger firms for which we have better information.

Table 4.8: Regression Results for the Full Sample – Full Sample

	Log Returns			Abnormal Returns		
	(1)	(2)	(3)	(4)	(5)	(6)
	Jan_Mar	Jan_Apr	Jan_May	Jan_Mar	Jan_Apr	Jan_May
Jew	-0.014	0.008	-0.004	-0.011	0.009	-0.005
	(0.47)	(0.85)	(0.92)	(0.62)	(0.85)	(0.92)
DivY	0.392***	-0.245	-0.432	0.937***	0.464	0.200
	(0.01)	(0.27)	(0.11)	(0.00)	(0.14)	(0.62)
log(MarketCap)	0.015**	-0.011*	-0.004	0.025***	0.001	0.005
	(0.02)	(0.09)	(0.61)	(0.00)	(0.92)	(0.69)
Liquidity	0.039	0.052	0.091*	-0.055	-0.124**	-0.118
	(0.25)	(0.22)	(0.06)	(0.22)	(0.05)	(0.12)
Constant	-0.231***	0.225***	0.131	-0.462***	-0.043	-0.077
	(0.00)	(0.01)	(0.18)	(0.00)	(0.75)	(0.63)
Observations	396	393	390	383	368	357
R-squared	0.076	0.017	0.020	0.100	0.021	0.009

All regressions are estimated with robust standard errors. Robust pval are reported in parentheses with significance levels according to: *** p<0.01, ** p<0.05, * p<0.1

In total, we identify 52 out of the 692 firms as Jewish. The results for both, the log returns as well as the abnormal returns, show that there is no statistical difference between the Jewish firms and the remaining firms in the full sample. Neither the shorter nor the longer time horizon changes results.

The dividend yield is again found to be a valid control for the period of January to March 1933 and is positively associated to the stock market performance of firms. Now that many small firms are included in the sample, the market capitalization of firms is getting more important as well. Between January and March 1933 larger firms had higher abnormal returns.

[34]Because we have information of the board members of the sample of Münzel (2006) we can exploit this information once we see these members on the board of other firms in the full sample. However, we do not have information on many other board members in the full sample. Overall only about one third of the board members are identified as being either Jewish or non-Jewish.

The non-significant results for Jewish firms in the full sample are very likely driven by the bias towards large corporations. Because we do not have information on the religious affiliation of about two thirds of the board members – in particular board members of small firms – our measure for Jewish firms is not a valid measure. It remains to further research to collect information on the religious affiliation of all board members in the full sample.

4.7 Conclusion

At the core of the German economic elite was a well integrated group of German-Jewish managers. In 1932, Jewish board members represented with about 16 percent a highly disproportional share across firms compared to their overall share in the German population of less than one percent. The share of executive board members was even higher and about one fifth of all members had some Jewish origin. At the same time, the vast majority of firms had at least one Jewish board member highlighting the integration of Jews into the German economic system.

When Hitler was appointed Chancellor in January 1933, the end of Jewish (business) life in Germany was heralded. Within a few weeks, Jewish life was severely aggravated and already by 1935 Jews were deprived their right of citizenship.

For the first months of 1933, we investigate the heterogeneous stock market performance of Jewish and non-Jewish corporations at the Berlin stock exchange. By doing so, we exploit recently collected information on religious affiliations of board members. Based on the 1932 composition of boards, firms with more than 30 percent Jewish board members were estimated to under-perform the Berlin stock exchange by about 6 to 9 percent during the first months of 1933. This result is mainly driven by firms in which Jews represented a substantial part of the executive board. The magnitude of the effect is similar to the one found for out-performing firms that had close ties to the Nazis (Ferguson & Voth, 2008). Already right away in 1933 – before many of the atrocious and inhumane policies against Jews were implemented – about one third of the Jewish elite members were removed from the boards to avoid conflicts with the new rulers. Between 1932 and 1933 the average share of Jewish board members dropped from 16 to 11 percent, severely challenging the myth of Hjalmar Schacht protecting Jewish businessmen until 1938. Unfortunately, the question about the reaction of investors to the removal of Jewish board members remains open. The dataset does not allow to identify exact points in time at which board members left or were removed. But the results point to a reverse channel. In particular those firms that suffered a strong decline in their stock prices during the first months of the Nazi era were the ones that removed a large part of their Jewish board members.

This research project opens further questions and research directions. In particular, the

role of individual elite members – often referred to as the "big linkers" – is interesting to investigate further. Previous work has rather focused on the determinants of why we observe a disproportional share of Jews among these inner core of the economic elite (Windolf, 2011). Instead, looking at the stock market performance of firms in which these big linkers were present could be a way to quantify their importance.

The biggest challenge for further research, however, consists in extending the sample by identifying the religious background of more elite members of the listed firms. This task will be very time consuming and is very likely work for a larger research project if it is done as accurate as done by Münzel (2006). At the same time, this gives an impression about the importance of his work. When extending the sample, one could collect information on the exact timing when removals took place. This could help to better understand the economic consequences of the expulsion of Jews from German business life.

C. Appendix

C.1 Dataset

C.1.1 Variable Description

Table C.1: Variable Description

Variable	Definition
DivY	The dividend yield is computed as the paid dividends in 1931/32 divided by the average share price in December 1932.
Jew	Jew is a dummy that takes the value of 1 for firms with more than 30% Jewish board members, and 0 otherwise.
Jew_change	Jew_change is a dummy that takes the value of 1 if the removal of Jewish board members corresponds to more than 20% of overall board members, and 0 otherwise.
Jew_EB	Jew_EB is a dummy that takes the value of 1 for firms with more than 30% Jewish executive board members, and 0 otherwise.
Jew_SB	Jew_SB is a dummy that takes the value of 1 for firms with more than 30% Jewish supervisory board members, and 0 otherwise.
Liquidity	The liquidity of a stock is computed as the share of days in which the stock is traded divided by 513, the maximum trading days in our sample.
log(MarketCap)	Logarithm of the market capitalization of a firm. The market capitalization is computed as the product of the number of shares multiplied by the average share price in December 1932.

C.1.2 Overview of Industries

Table C.2: Distribution of Firms across Industries

Industry	Sample 1		Sample 2	
	All Firms	Jewish Firms	All Firms	Jewish Firms
construction	9	2	45	7
coal	10	1	29	2
food	12	2	65	3
chemicals	11	1	38	3
electric	10	1	16	1
utilities	12	5	34	5
steel	20	1	46	5
machinery	7	1	75	2
banks	12	3	48	10
transport	11	0	55	2
insurance	13	0	40	1
rest	27	3	201	11
Total	154	20	692	52

C.1.3 Overview of Listed Stocks at the Berlin Stock Exchange

A.-G. f. Papp.
A.-G.f.Verk. V
Aach.-Münch
Aachen Kleinb.
Aachen Rück
Accumulat. V
Adler Cement
Adlerhütten
Albingia A
Albingia C
Alexanderwerk
Alfeld-Delligsen
AlgKunstzijde V
Allg. Bau Lenz
Allg. Boden
Allg. Dt. Credit
Allg. El.-Ges. V
Allg. Häuserbau
Allg. Lokalb. V
Allianz Leben
Allianz Ver.
Alsen Cement
Ammend. Pap.
Amperwerke
Anhalt. Kohlen
Anhalt. Kohlen Vorz.
Anker-Werke
Annab. Steing.
Annawerk
Aschaff. Akt. Br
Aschaff. Papier V
Askaniawerke
Atlas-Werke
Augsbg. z. Hasen
Augsbg.-Nrnbg.
Bachm. & Lad.
Badische Bank
Baer & Stein
Balcke Masch.
Baltimore
Bamb. Mälzerei
Bank f. Brau V
Bank v. Danzig
Bankv. F. Schl-H
Banning
Barmen-Elberf.
Barmer Bankv.
Baroper Walz
Basalt, Linz
Bast
Brd.Städteb. B
Brdbg. Elektr.
Breitenb. Cem.
Brem.-Bes. Oel
Bremer Gas
Bremer Vulkan
Bremer Wollk. V
Brown Boveri
Brschw. Ind.
Brschw. Jute
Brschw. Kohlen
Brschw. Maschinen
Brschwg. Hyp.
Brschwg. Ldes.
Brschwg. Strb.
Brüning & Sohn
Buderus V
Busch & Gebr. Jaeger
Busch Optische
Butzke - Joseph
Byk-Gulden
Canada V
Capito & Kl.
Carlshütte
Carton Loschw.
Charlottenhütt.
CharlWasser V
Chem. Buckau
Chem. Grünau
Chem. Heyden V
Chem. Ind. Gelsenk.
Chem. Pommerensd
Chem. Schuster
Chem. Wke. Albert
Chem. Wke. Brockhues
Chemie, I.G. 100%
Chemie, I.G. 50%
Chillingworth
Christ. & Unm.
Chromo-Papier
Colonia Feuer
Comm.u.Privat
Comp. Hisp. E
Comp. Hisp. V
Concord. Bgb.
Concord. Chem.
Concord. Spinnerei
Cont. Gummi V
Cont. Linol. V
Cröllwitz Pap.
Dte. Ton-u.Stzg.
Dter. Eisenh. V
Dter. Metallhand.
Dürener Metall
Dürkoppwerke
Dürkoppwerke Vorz.
Düss. Dieterich
Düss. Eisenhütten
Düss. Hoefel
Düss. Kammgarn
Düss. Maschinen
Dyckerh. & W.
Dynamit
Egestorff Salz
Eichenberg
Eilenbg. Kattun
Eintracht Br. V
Eisen Sprottau
Eisenb.-Verk. V
Elektr. Lichtu.Kr V
Elektr. Liegnitz
Elektr. Schlesien V
Elektr.-Lief. V
Elektra Dresd.
Elsbach
Email. Gnüchtel
Engelhardt V
Enzinger-Union
Erdmannsdorf
Erlang-Bambg.
Eschw. Bergw.
Eutin-Lübeck
Excelsior
Fahlberg, List
Falkenst. Gard
Faradit
Farbenind. V
Feibisch
Fein-Jute
Feldmühle V
Felten & Guill. V
Flensbg. Schiff
Flohr, Carl
Flöther Masch.
Ford Motor
Frankf. Chauss.
Frankf. Maschinen
Frankona C, D
Fraust. Zucker
Friedrichshütte
Hamburg. El. V
Hammersen
Hanau Hofbr.
Hann. Boden
Hann. Msch. Eg.
Hann. Straßb.
Hansa Dampf V
Harburg Eisen
Harburg Gummi V
Harkort Brück.
Harkort Brück. St.-Pr.
Harpener V
Hdlg. F. Grundb.
Hedwigshütte
Heidenau Pap.
Heilmann & Litt.
Hein, Lehmann
Heine & Co.
Hemmoor Cem.
Hermes 100%
Hermes 25%
Hess. U. Herk.
Hildebr. Mühle
Hildesh.-Peine A
Hilgers A.-G.
Hilpert Armat.
Hindrichs-Auff.
Hirsch Kupfer
Hirschb. Leder
Hochofen Lüb.
Hochtief
Hoesch-K. N. V
Hoffm. Stärke
Hohenlohe
Holsten Brau.
Holzmann V
Hotelbetrieb V
Hourd.-Bergm.
Höxter-Godelh.
Hubertus Brk.
Huta, Breslau
Hutschenr. C.M.
Hutschenr., Lor.
HüttenwKayser
Ilse Bergbau G.-Sch. V
Ilse Bergbau V
Inag
Ind. Plauen
Isenbeck & Cie.
Jacobsen, W.
Laurahütte V
Lausitzer Eisb.
Lehmann
Leipz. Br. Rieb.
Leipz. Br. Rieb. Vz. A
Leipz. Feuer 1
Leipz. Feuer 2
Leipz. Feuer 3
Leipz. Immobil.
Leipz. Landkraft
Leipz. Piano
Leonhard Brk.
Leonische Wke.
Leopoldgrube V
Lichtenb. Terr.
Liebermann, Gg.
Liegn.-Raw. A
Liegn.-Raw. B
Lindener Brau.
Linde's Eis
Lindström
Lingel Schuh
Lingner-Werke
Lorenz, C.
Löw.-Böhmisch
Lüb.-Büchen
Lübeck. Comm.
Lüdensch. Met.
Lüneb. Wachs
Luxemb. Henri
Luxembg. Inter.
Magdb. Feuer
Magdb. Hagel 25%
Magdb. Hagel 50%
Magdb. Leben
Magdb. Rück 100%
Magdb. Rück 25%
Magdebg. Bau
Magdebg. Bergwerk
Magdebg. Bergwerk St.-Pr. B
Magdebg. Gas
Magdebg. Mühlen
Magdebg. Str.
Magirus
Magirus Vorz.
Mannesm.-R. V
Mannheimer
Mansfeld V
Marie cons.
Marie.-Beendf.
Nordd. Eiswke.
Nordd. Kabel
Nordd. Lloyd V
Nordd. Steingut
Nordd. Tricot
Nordd. Wolle
Nordh.-Wernig.
Nordpark
Nordsee
Nordstern Lebensvers.
Nordw. Kraftw.
Nürnb. Hercules
Oberb. Ueberl.
Oberschl. Eb.
Oberschl. Koks G.-Sch.
Oberschl. Koks V
Odenw. Hartst.
Oeking Stahl
Oest. Esb. Vk.
Oest. Siem. Sch.
Oesterr. Cr.
Oldb. Landesbk.
Oldb. Spar- u.L.
Orenstein V
Osnabr. Kupfer
Ostafrika
Ostpr. Dampfw.
Otavi V
Passage Bau
Peipers & Cie.
Pennsylvania
Phoenix Bgb. V
Phoenix Braunkohle
Pinnau Mühlen
Pintsch, Julius
Pittler Leipzig
Plauen Gardin.
Plauen Tüll
Plauener Bank
Polyphon V
Pomm. Eiseng.
Ponarth Brau.
Pongs & Zahn
Pongs Spinner.
Poppe & Wirth
Porz. Tettau
Porz. Veilsdorf
Prang Dampfm.
Preßluftwerkz.
Preßspan
Sächs.-Th.Cem.
Sachsenwerk m Div.-Gar.
Sachsenwerk o.Div.-Gar.
Sachsenwerk Vorz. B.
Sächsische Bk.
Sächsische Boden
Sachtleben
Saline Salzung.
Salzdetfurth V
Sangerh. Msch.
Sarotti
Sauerbrey, G.
Saxonia Zement
Schantung
Schering-Kahlb.
Schieß - Defries
Schlegel-Sch.
Schles. Bergb. St.-Pr.
Schles. Bergb. V
Schles. Beuthen
Schles. Cellulose
Schles. Dampf
Schles. Elektr. A
Schles. Elektr. B V
Schles. F. 100%
Schles. Leinen
Schles. Portl.-Zem.
Schles. Textil
Schles.F. 25%
Schlesw.-Holst.
Schneider
Schöfferhof
Scholten, W.A.
Schönbusch
Schönebeck
Schött, Herm.
Schub.&Salz.V
Schücht. & Kr.
Schuckert V
Schultheiß V
Schulz jr., Fritz
Schwabenbräu
Schwand. Ton
Schwanebeck
Schwelmer
Segall Strumpf
Seidel & Naum.
Seiffert, Franz
Selle-Eysler
Siegen-Solingen
Thuringia B
Tielsch Porz.
Tietz, Leonh. V
Trachenberg
Transatlant.
Transradio
Triptis Porzell.
Tritonwerke
Triumph Werke
Tucher
Tuchf. Aachen
Tüllfabr. Flöha
Ung. Cred.
Unger, Gebr.
Union Bau
Union Chem. Prod.
Union Hagel
Union Werkz. Diehl
Varziner Pap.
Ver. Altenburg.
Ver. Bautz. Pap.
Ver. Berl. Mörtel
Ver. Böhlerstahl
Ver. Chem. Charl.
Ver. Dt. Nickel
Ver. Eisb. Betr.
Ver. Flanschen
Ver. Glanzstoff
Ver. Gothania
Ver. Gumb.Msch.
Ver. Harzer Kalk
Ver. Laus. Glas
Ver. Märk. Tuch
Ver. Met. Haller
Ver. Mosaik
Ver. Pinsel
Ver. Schimisch.
Ver. Schuh Bern
Ver. Smyrna
Ver. Stahl Zypen
Ver. Stahlwke. V
Ver. Thür. Metall
Ver. Trikotfabr.
Ver. Ultramarin
Vereinsbk. Hbg.
Veritas Gummi
Victoria-Werke
Vogel Draht V
Vogt & Wolf
Vogtl. Masch.

Bav. u. St. Pauli
Bayer. El. Lief.
Bayer. El.-Werke
Bayer. Granit
Bayer. Hartstein
Bayer. Hypoth.
Bayer. Motoren V
Bayer. Spiegelglas
Bayer. Verein
Bazar
Bemberg V
Bendix Holz
Berg.-Märk.
Berger Tiefb. V
Bergmann
Berl. GubenerHut
Berl. Handelsg.
Berl. Holz-Kontor
Berl. Hyp.-Bank
Berl. Karlsruhe V
Berl. Kassenver.
Berl. Kindl-Brau.
Berl. Kindl-Brau. St.-Pr.
Berl. Kraft A V
Berl. Masch. V
Berl. Neurode
Berl. Paketfahrt
Berl.-Borsigw.
Berlin. Feuer 100%
Berlin. Feuer 25%
Berlin. Hagel
Berlin. Hagel B
Berthold Mess.
Beton u. Mon.
Bielefeld Mech.
Bk. El. Werte Lit. B
Bk. El. Werte V
Bk. El. Werte Vorz.
Blumenfeld
Bochum-Gelsk.
Bodg. Schönh
Bohrisch Brau.
Bolle Weißbier
Borna Braunk.
Bösperde
Bosw. & Knauer
Brauh. Nürnbg.
Braunk.u.Br. V
Brd.Städteb. A

Csakath.-Ag.
Daimler Benz V
Danziger Hyp.
Danziger Privat
Darmst. U. Nat.
Dess. Landesbk
Disch Hotel
Dittm.-Neuhaus
Dittmann, F. G.
Dolerit-Basalt
Dommitzsch
Doornkaat
Dörffler
Dortm. Akt.-Br.
Dortm. Ritter
Dortm. Union V
Dresdn. Trsp 100%
Dresdn. Trsp 50%
Dresdner Bank
Dresdner Bau
Dresdner Chromo
Dresdner Gardinen
Dresdner Schnellpr.
Dt. Ansiedlung
Dt. Bk. U. Disc.
Dt. Centralboden
Dt. Eff. U. Wechs.
Dt. Eisenb. Betr
Dt. Golddisk. B
Dt. Hyp. Berlin
Dt. Reichsb. V
Dt. Uebersee
Dt.-Asiat. Bk.
Dt.-Atl. Tel. V
Dt.-Ostafrika
Dte. Asphalt
Dte. Babcock
Dte. Baumwoll
Dte. Cont. Gas V
Dte. Erdöl V
Dte. Jute
Dte. Kabel V
Dte. Lin.-Wke. V
Dte. Postu.Eisb.
Dte. Schachtbau
Dte. Spiegelglas
Dte. Steinzeug
Dte. Tafelglas
Dte. Telephon V

Frister, R.
Froebeln Zuck.
Gebh. & Koenig
Gebhard & Co.
Gebler-Werke
Gehe & Co.
Geiling
Geismann
Geisweid. Eisen
Gelsk. Bgw. V
Genschow
Germania Zem.
Gerresh. Glas
Ges. f. el. Unt. V
Gildemeister
Girmes & Co.
Gladb. Feuer
Gladbach Wolle
Glas Brockwitz
Glas Schalke
Glauzig. Zucker
Glückauf Brau
Goedhart
Goldschmidt V
Görl. Waggon
Gr. Kasseler
Gr. Kasseler Vorz.
Gr.-Licht. Terr.
Grauert
Gritzner Msch.
Großenh. Webst
Großm. & Kisch
Großmann,Gebr.
Grün & Bilfing.
Gruschwitz
Guano-Werke
Gundlach
Günther & Sohn
Haberm. U. G.
Hackethal
Hageda
Halberst. Blank.
Halle Bankv.
Halle Maschin.
Halle-Hettstedt
Hambg. Hochbahn
Hambg. Pack. V
Hambg. Südamer. V
Hamburg Hyp.

Jeserich Asph.
John Schornst.
Jülicher Zucker
Junghans V
Kahla Porzell.
Kaiser-Keller
KaliAschersl. V
Kali-Chemie V
Kamerun
Karstadt V
Kartonpapier
Keramag
Kgsbg. Lagerh.
Kirchner & Co.
Klauser Spinn.
Klöcknerwerke V
Knorr, C. H.
Koch Nähm.
Koehlmann
Kolb & Schüle
Kollm. & Jourd.
Köln. Hagel
Köln. Rück gr.
Köln. Rück kl.
Kölner Gas
Kölsch-Fölzer
König Wilhelm
König Wilhelm abg.
König Wilhelm St.-Pr.
König-Brauerei
Königsb.-Cranz
Königstadt
Kont. Asphalt
Kopenh Dmpf
Körbisd. Z.
Körting Gebr.
Kötitzer Leder
Kraftwk. Thür.
Krauß & Comp.
Krefft, W.
Kromschröder
Kronprinz Met.
Krüger, Gebr.
Kühltransit B
Kunz Treibr.
Küppersbusch
Kyffhäuserhütt
Lahmeyer V
Landré-Breith.

Markt-u.Kühlh.
Martini & Hün.
Masch. Buckau
Masch. Kappel
Masch. Starke
Masch.-Unt. V
Maximiliansh. V
Mech. Linden
Mech. Sorau
Mech. Zittau
Meckl. Fr. Wilh.
Meckl. Fr. Wilh. St.-A.
Mecklbg. Dep.
Mecklbg. Hyp.u.Wechs.
Mecklbg.-Strelitz
Meinecke, H.
Meininger Hyp.
Meißner Ofen
Mercur Wolle
Metallges. V
Meyer Kauffmann
Meyer, Herm.
Mez A.-G.
Miag
Mimosa
Minimax
Mitteld. Boden
Mitteld. Stahl
Mix & Genest
Montecat. V
Mühle Rüning.
Mülh. Bergwk.
Müller Gummi
Münch. Localb.
München. Licht
Mundlos
Müser, Gebr.
NationalAllg.
Natronzellst.
Ndlaus. Kohle V
Neckarwerke
Neptun Dampf
Neu Guinea
Neue Amperkr.
Neue Realbesitz
Neu-Westend
Niederbarnim
Niederlausitz.
Niederlausitzer

Preuß, J. O.
Preußengrube
Prignitz Pr.-A.
Radeb. Export.
Rasquin Farb.
Rathgeber
Rauchw. Walter
Ravensb. Spinn.
Reichelbräu
Reichelt Metall
Reichsbk. V
Reinecker, J. E.
Rh. Braunk. V
Rh. Chamotte
Rh. Elektr. V
Rh. Elektr. Vorz.
Rh. Metallw.
Rh. Möbelstoff
Rh. Spiegel
Rh. Stahl V
Rh.-Westf. El. V
Rh.-Westf. Kalk
Rh.-Westf. Sprengst.
Rh.-Westf. Stahl
Rhein. Hyp.-Bk.
Rhein. West. Boden
Rheinfelden
Rhein-M-D Vz
Richter, David
Riebeck Mont.
Riedel-Haën
Rinteln A
Rinteln B
Ritter, Gebr.
Rockstrohwke.
Roddergrube
Rosenthal Porz
Rositz Zucker
Rostocker Bk.
Rostocker Br.
Rostocker Str.
Ruberoidwerke
Rückforth, Ferd
Runge-Wke.
Ruscheweyh
Rütgerswke. V
Sächs. 25%
Sächs. 50%
Sächs. Webstuhl

Siegersdf. Wke.
Siemens & Halske V
Siemens Glas
Sinner
Somag
Sonderm.& St. A
Sonderm.& St. B
Sprengst. Carb.
Stader Leder
Stadtberger
Staßfurt Chem.
Staßfurt Gen.-Sch.
Steatit-Magnes
Steinf. Waggon
Steingut Cold.
Stett. Straßenb.
Stett. Straßenb. Vorz.
Stettin. Cham.
Stettin. Cham. G.-Sch.
Stettin. El.-Werke
Stettin. Oderwerke
Stettin. Papier
Stettin. Portl.Cem.
Sticker. Plauen
Stock & Co.
Stodiek & Co.
StöhrKammg V
Stolb. Zink V
Stollwerck
Strausb.-Herzf.
Sturm, A.-G.
Südd. Bodencr.
Südd. Eisenb.
Südd. Immob.
Südd. Zucker V
Svenska B V
Tack & Cie.
Tempelh. Feld
Terr. Bot. Gart.
Terr. Rud.-Joh.
Terr. Südwesten
Teutonia Cem.
Thale Eisen
Thomée, Friedr.
Thörl's Ver. Oel
Thür. Bleiweiß
Thür. El. U. Gas
Thür. Gas V
Thuringia A

Vogtl. Masch. Vorz.
Vogtl. Spitzen
Vogtl. Tüllfabr.
Voigt & Haeffn.
Volkstedt Porz.
Voltohm
Vorwohler Cem.
Wagner & Co.
Wanderer
Warsteiner
Wasser Gels. V
Wayß & Freytag
Wegelin & Hübner
Wegelin, Aug.
Wenderoth
Werschen-W.
Westd. Boden
Westd. Handels
Westeregeln V
Westf. Draht
Westf. Kupfer
Westsicillian.
Wicking Cem.
Wickrath Led.
Wicküler-Küpp.
Wiener Bkv.
Wihard, H.& F.
Wilke Dampfk.
Wilm. Rheingau
Wißner Metall
Wittener Guß
Wittkop Tiefb.
Wrede Malz
Wunderlich
Zeiß Ikon
Zeitzer Masch.
Zellst. Waldh. V
Zellst. Waldh. Vorz. B
Zellstoff-Ver. V
Zschipk.-Finst.
Zuck. Kl. Wanzl.
Zuck. Rastenburg

C.1.4 Jewish Firms in 1932

Table C.4: Jewish Firms in 1932

Stock Name	Jewish Share		Abnormal Returns		
	1932	1933	Jan-Mar	Jan-Apr	Jan-May
X Bk. El. Werte Vorz.	.615	.4			
Bk. El. Werte Lit. B	.615	.4			
Bk. El. Werte V	.615	.4	-.272	-.272	-.24
Elektr.-Lief. V	.5	.083	-.036	-.085	-.028
Schles. Elektr. B V	.474	.421	-.081	-.189	-.233
Schles. Elektr. A	.474	.421			
Orenstein V	.467	.2	-.229	-.351	-.288
CharlWasser V	.467	.063	-.178	-.44	-.435
Cont. Gummi V	.462	.091	-.056	-.032	.051
Tietz, Leonh. V	.455	.231	-.235	-.265	-.476
Ver. Schimisch.	.444	0	-.178	-.089	.067
Dte. Kabel V	.429	0	-.078	-.097	-.058
Berl. Kraft A V	.412	.273	-.054	-.224	-.242
Ges. f. el. Unt. V	.4	.367	-.1	-.151	-.065
Engelhardt V	.389	.389	-.143	-.196	.041
Schultheiß V	.361	.111	-.11	-.197	-.084
Holzmann V	.353	.083	-.402	-.398	-.407
Schles. Portl.-Zem.	.348	.105	-.144	-.088	-.043
Eintracht Br. V	.313	.357	.097	.181	-.008
Ver. Laus. Glas	.3	.071	-.3	-.285	-.341

The table reports statistics for firms with at least 30% Jewish board members in 1932.

C.1.5 Firms that Remove Jewish Board Members

Table C.5: Firms that Removed Jewish Board Members

Stock Name	Change	Jewish Share	Abnormal Returns		
		1932	Jan-Mar	Jan-Apr	Jan-May
Ver. Schimisch.	-.444	.444	-.178	-.089	.067
Dte. Kabel V	-.429	.429	-.078	-.097	-.058
Elektr.-Lief. V	-.417	.5	-.036	-.085	-.028
CharlWasser V	-.404	.467	-.178	-.44	-.435
Cont. Gummi V	-.371	.462	-.056	-.032	.051
Holzmann V	-.27	.353	-.402	-.398	-.407
Orenstein V	-.267	.467	-.229	-.351	-.288
Schultheiß V	-.25	.361	-.11	-.197	-.084
Schles. Portl.-Zem.	-.243	.348	-.144	-.088	-.043
Ver. Laus. Glas	-.229	.3	-.3	-.285	-.341
Tietz, Leonh. V	-.224	.455	-.235	-.265	-.476
X Bk. El. Werte Vorz.	-.215	.615			
Bk. El. Werte V	-.215	.615	-.272	-.272	-.24
Bk. El. Werte Lit. B	-.215	.615			

The table reports statistics for firms with a drop of at least 20% of their Jewish board members between 1932 and 1933.

C.1.6 "Big Linkers" in the Sample

The following tables of "Big Linkers" take into account only supervisory board mandates at firms that are listed at the Berlin stock exchange.[1]

Table C.6: Big Linkers 1932

# positions 1932	Name	Jew
13	Wolff, Otto, Köln	0
10	Andreae, Fritz, Berlin	1
10	Arnhold, Hans, Berlin	1
10	Carp, Werner, Hahnerhof b.Ratingen	0
10	Joerger, Carl, Berlin	0
9	Fuld, Ludwig, Mannheim	1
9	Jeidels, Dr. Otto, Berlin	1
9	Koenigs, Franz, Amsterdam	0
9	Reinhart, Friedrich, Berlin	0
8	Bodenheimer, Siegmund, Berlin	1
8	Fürstenberg, Hans, Berlin	1
7	Bürgers, Robert, Köln	0
7	Harter, Carl Aug., Berlin	0
7	Landau, Eugen, Berlin	1
7	Schmidt-Branden, Paul, Berlin	0
6	Arnhold, Adolf, Dresden-Berlin	1
6	Goetz, Dr.Carl, Berlin	0
6	Ravené, Dr.Louis, Berlin	0
6	Reinhart, Friedrich, Berlin	0
6	Ritscher, Samuel, Berlin	1
6	Schlieper, Gustaf, Berlin	0
6	Spans, Wilhelm, Aachen	0
5	Bergmann, Carl, Berlin	0
5	Krahmer, Kurt, Dresden	1
5	Mosler, Georg, Berlin	1
5	Naumann zu Königsbruck, Dr.Walter,Königsbrück	0
5	Pilder, Dr.phil.Hans, Berlin	0
5	Reinhold, Dr.Peter, Berlin	0
5	Schön, Alfred, Zwickau	0
5	Urbig, Franz, Berlin	0

The table reports big linkers that held more than 5 supervisory board positions in firms noted in Berlin during 1932. Jewish board members are reported with a 1; non-Jewish board members with a 0.

[1] Alternatively, one could define "Big Linkers" in terms of all corporations in Germany.

Table C.7: Big Linkers 1933

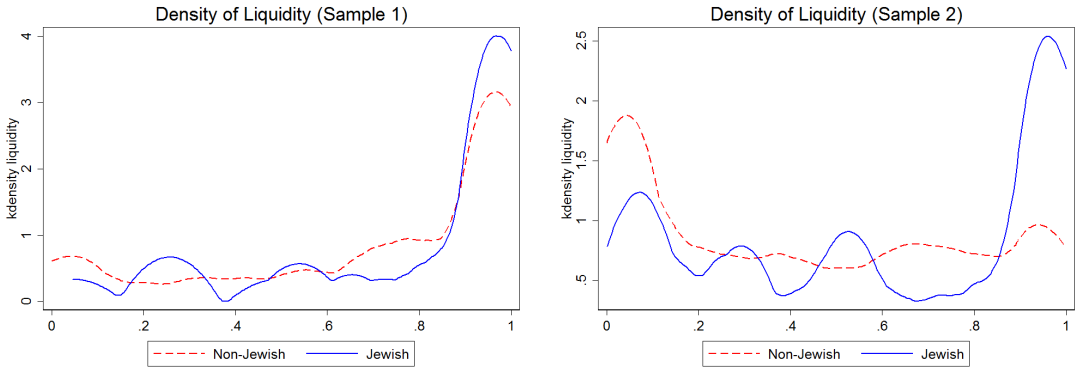
# positions 1933	Name	Jew
14	Wolff, Otto, Köln	0
9	Andreae, Fritz, Berlin	1
9	Goetz, Dr.Carl, Berlin	0
9	Joerger, Carl, Berlin	0
9	Reinhart, Friedrich, Berlin	0
9	Schlieper, Gustaf, Berlin	0
8	Andreae, Fritz, Berlin	1
8	Bürgers, Robert, Köln	0
7	Bergmann, Carl, Berlin	0
7	Fürstenberg, Hans, Berlin	1
7	Harter, Carl Aug., Berlin	0
7	Jeidels, Dr. Otto, Berlin	1
7	Ritscher, Samuel, Berlin	1
6	Arnhold, Hans, Berlin	1
6	Bodenheimer, Siegmund, Berlin	1
6	Fuld, Ludwig, Mannheim	1
6	Ravené, Dr.Louis, Berlin	0
6	Reinhart, Friedrich, Berlin	0
6	Spans, Wilhelm, Aachen	0
5	Arnold, Hans, Berlin	0
5	Becker, Dietrich, Essen	0
5	Berliner, Ludwig, Berlin	1
5	Blinzig, Alfred, Berlin	0
5	Dräger, Max, bei Hohennauen	0
5	Krahmer, Kurt, Dresden	1
5	Mosler, Georg, Berlin	1
5	Naumann zu Königsbruck, Dr.Walter,Königsbrück	0
5	Nebelung, Kurt, Dresden	0
5	Oertel, Dr.jur.Christian, Köln	0
5	Pilder, Dr.phil.Hans, Berlin	0
5	Reinhold, Dr.Peter, Berlin	0
5	Schwabach, Dr.jur.Paul von, Berlin	1
5	Schön, Alfred, Zwickau	0
5	Siebert, A., Leipzig	0

The table reports big linkers that held more than 5 supervisory board positions in firms noted in Berlin during 1933. Jewish board members are reported with a 1; non-Jewish board members with a 0.

C.1.7 Liquidity of Stocks

We measure the liquidity of stocks by counting the days on which an individual stock was traded and computing for each stock a monthly share of trading days traded. Next, we average this number over the period April 1932 to December 1933.[2] Figure C.1 plots the distribution of the liquidity of stocks. A very large share of stocks is traded on most of the potential 513 trading days in the period. The plots confirm what the descriptive statistics showed already about the samples. While sample 1 contains almost entirely liquid stocks, the full sample (depicted at the right) captures also a lot of smaller, less liquid stocks.

Figure C.1: Liquidity of Stocks



The figure shows the distribution the liquidity of stocks over the period April 1932 to December 1933. The sample is divided into Jewish and non-Jewish firms. The liquidity is proxied by the share of trading days on which the stocks are traded.

[2]The results are virtually the same if we do not compute monthly shares first, but only compute the overall trading days traded.

C.2 Alternative Cutoffs for Jewish Firms – Executive and Supervisory Board

Table C.8: Alternative Cut-Offs to Define Jewish Firms – Executive and Supervisory Board – Sample 1

	Executive Board			Supervisory Board		
	(1)	(2)	(3)	(4)	(5)	(6)
0%	-0.027	-0.077**	-0.053	-0.039	-0.026	0.018
(J=31/125)	(0.40)	(0.05)	(0.22)	(0.48)	(0.69)	(0.80)
5%	-0.027	-0.077**	-0.053	-0.031	-0.016	0.022
(J=31/124)	(0.40)	(0.05)	(0.22)	(0.55)	(0.79)	(0.75)
10%	-0.018	-0.071*	-0.049	-0.039	-0.018	-0.020
(J=29/104)	(0.58)	(0.09)	(0.29)	(0.31)	(0.70)	(0.70)
15%	-0.041	-0.104**	-0.085	-0.039	-0.038	-0.044
(J=22/82)	(0.27)	(0.02)	(0.10)	(0.27)	(0.37)	(0.36)
20%	-0.031	-0.082*	-0.067	-0.037	-0.056	-0.047
(J=17/64)	(0.43)	(0.08)	(0.22)	(0.24)	(0.14)	(0.30)
25%	-0.038	-0.099*	-0.073	-0.034	-0.061	-0.071
(J=13/49)	(0.41)	(0.06)	(0.24)	(0.22)	(0.10)	(0.13)
30%	**-0.083****	**-0.136****	**-0.106**	**-0.040**	**-0.063***	**-0.054**
(J=11/35)	**(0.04)**	**(0.01)**	**(0.12)**	**(0.10)**	**(0.07)**	**(0.18)**
35%	-0.099**	-0.157**	-0.153**	-0.025	-0.058	-0.030
(J=8/24)	(0.03)	(0.02)	(0.04)	(0.32)	(0.13)	(0.49)
40%	-0.099**	-0.157**	-0.153**	-0.058**	-0.101***	-0.057
(J=8/17)	(0.03)	(0.02)	(0.04)	(0.01)	(0.01)	(0.25)
45%	-0.051	-0.106	-0.111	-0.053**	-0.099**	-0.064
(J=6/13)	(0.28)	(0.16)	(0.22)	(0.03)	(0.02)	(0.24)
50%	-0.051	-0.106	-0.111	-0.046	-0.040	0.007
(J=6/9)	(0.28)	(0.16)	(0.22)	(0.11)	(0.30)	(0.90)

The table reports the coefficients of the Jewish dummy, based on the specified threshold. Each row stems from a different set of regressions, always including the full set of controls. The chosen cut-off for the baseline is 30% and marked in bold. For each regression the number of firms counted as Jeish is reported as "J", separately for the EB and SB. All regressions are estimated with robust standard errors. Robust pval in parentheses *** p<0.01, ** p<0.05, * p<0.1

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