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Does the Use of Worker Flows Improve the Analysis of Establishment Turnover? Evidence from German Administrative Data

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ABSTRACT

Does the Use of Worker Flows Improve the Analysis of Establishment Turnover? Evidence from German Administrative Data^{*}

Economists have long been interested in analyzing entries and exits of establishments. In many countries administrative datasets provide an excellent source for detailed analysis on a fine and disaggregate level. However, administrative datasets are not without problems: restructuring and relabeling of firms is often poorly measured and can potentially create large biases. Information on worker flows between establishments can potentially alleviate these measurement issues, but it is typically hard to judge how well correction algorithms based on this methodology work. This paper evaluates the use of the worker flow methodology using a dataset from Germany, the Establishment History Panel (BHP), merged to information on all worker flows between establishment IDs and survey data. We first document the extent of misclassification that stems from relying solely on the first and last appearance of the establishment identifier (EID) to identify openings and closings. We show that the misclassification bias of using only the EID is very severe: Only about 35 to 40 percent of new and disappearing EIDs with more than 3 employees are likely to correspond to real establishment entries and exits. Among larger establishments misclassification is even more common. We provide 3 pieces of evidence that using a classification system based on worker flows is superior to using EIDs only: First, establishment birth years generated using the worker flow methodology is much higher correlated with establishment birth years from an independent survey. Second, establishment entries and exits which are identified using the worker flow methodology move closely with the business cycle, while events which are identified as simple ID changes are not. Third, establishment exits have a big negative impact on workers' earnings trajectories which is not present for ID changes.

JEL Classification: L1, M1, J6

Keywords: firm dynamics, plant closings, establishment entry and exit

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1 Introduction

The availability of administrative firm and establishment level datasets has spurred new research in many areas of economics, spanning Labor, Industrial Organization and Trade. This work relies crucially on following establishments or firms over time. Unfortunately longitudinal firm/establishment identifiers (EID) often have problems: For example EIDs change spuriously due to changes of ownership or legal form, due to restructuring of the firm, or coding errors. When not taken into account a change of the EID will appear as a spurious establishment exit and a new entry. This is particularly problematic in research projects that focus on entering and exiting firms, for example analyzing the role of firm entries and exits for employment growth (and the lack thereof) during the great recession.¹

A possible solution to this problem has gained popularity more recently (See for example Benedetto, Haltiwanger, Lane, McKinney 2007 and Vilhuber 2009): If individual workers can be linked to the EIDs and the individuals can also be followed over time, one can identify ID changes as events where large groups of worker simultaneously leave an exiting EID and enter a new EID. Thus using information on worker flows offers a way to generate consistent EIDs over time and correct for mistakes. While this method is quickly gaining popularity, it is not well known how big the potential bias is from using uncorrected establishment IDs or how well the method works.

In this paper we evaluate the method of using worker flows to identify true establishment entries and exits using German administrative data. We provide three separate ways to evaluate whether the worker flow method improves upon using simply uncorrected EIDs: First, we investigate whether EID entries and exits that we identify as corresponding to establishment entries and exits are more highly correlated with the business cycle, than EID entries and exits that we identify as spurious. Second, we combine the administrative data with an establishment level survey to compare establishment entry years derived using the worker flow method with the establishment entry year in the survey. And third, we analyze individual work histories around entries and exits of EIDs. All three methods show that establishment deaths and births identified using the worker flow method, clearly correspond to real economic events and improve upon the simple measure of uncorrected establishment identifiers.

This paper is related to a number of papers that have documented problems with and attempted to correct longitudinal person identifiers. For example Abowd and Vilhuber (2005) describe the method used by the Longitudinal Employer-Household Dynamics Program (LEHD) at the U.S. Census and Vilhuber (2009) provides a broader overview. On the firm or establishment level, the problems are in some ways more difficult: while for person identifiers at least it is clear that the underlying unit of observation remains the same over time, firms and establishments change

¹For examples, see Foster, Grim and Haltiwanger (2013), or Fort, Haltiwanger, Jarmin and Miranda (2012).

ownership, are restructured, break-up or relocate in ways that make it ambiguous what exactly the underlying unit of observation is that is to be tracked over time.

However a consensus has emerged that it is useful for economic research to distinguish cases where identifiers change due to a change in ownership, the legal form of the firm or simply a change of accountants. In this case the change of a firm identifier should not be counted as a firm exit in one and an entry in the next period. Furthermore it is generally thought that firm restructuring events such as merger, acquisitions and outsourcing should generally not be considered as components of job creation and destruction (For a discussion see Persson 1999; Baldwin et al. 2002; Benedetto, Haltiwanger, Lane and McKinney 2007; Vilhuber 2009; Geurts, Ramioul and Vets 2009).

To deal with problems of longitudinal linkages, researchers and statistical agencies have employed probabilistic matching methods based on similarities in partial firm identifiers as well as information about name, location and economic activity (Eurostat/OECD 2007; Vilhuber 2009). More recently information on worker flows between employers has been used, since it is usually presumed that if the work force is identical in two consecutive years, then there is a high probability that these records relate to the same firm or establishment. This approach has been used for administrative datasets, among others, in Italy (Revelli 1996, Contini 2007), Finland (Vartiainen 2004), the U.S. (Benedetto et. al. 2007), and Belgium (Geurts et. al 2009). This study follows most closely the approach taken by Benedetto et. al. (2007). Our main contribution relative to this literature is that rather than just using the worker flow methodology to correct for problems in the EIDs, we document how successful this approach is with fixing these identifiers.

As an illustration for the importance of the bias from not using corrected EIDs, we investigate the role of establishment turnover for job creation and destruction using corrected and uncorrected identifiers. The notion that producer entry and exit is an important form of reallocation of production factors and thus contributing to aggregate growth has inspired a long line of theoretical and empirical research. One aspect of this reallocation mechanism that has been particularly prominent in the political sphere is the role of this churning process in the creation and destruction of jobs. New and small producers are often referred to as an important job growth engine, while the demise of a plant is usually lamented for the number of jobs it destroys.² For this reason job creation and destruction has long been studied by economists to enhance the understanding of the business cycle and the adjustment processes in the economy (David, Haltiwanger and Schuh 1996; Bartelsman, Scarpetta and Schivardi 2005; Brown, Haltiwanger and Lane 2006). These studies typically decompose net job creation into the contributions of entering and exiting firms in addition to reallocation between existing firms. We demonstrate that in the German administrative data, using only EID entries and exits may dramatically overstate, by as much as 100 percent, the role

²The impact of job destruction due to plant closings on the displaced workers has also received a lot of attention in the literature, see for example Jacobson, Lalonde, and Sullivan (1993) and von Wachter, Song and Manchester (2009).

of establishment turnover for job creation and destruction. Correcting for spurious EID entries and exits reduces the absolute measures for job creation and destruction by up to 13 percent and aligns them closer with the business cycle.

This paper continues as follows: Section 2 discusses the data we are using and describes our methodology, in particular our system to classify appearances and disappearances of EIDs. Section 3 takes this classification system to the data and evaluates how well the worker flow method does in identifying true economic events. Section 4 provides the application to job creation and destruction measures, by showing the bias that arises from using uncorrected EIDs. Section 5 concludes.

2 Data and the Worker Flow Method

2.1 Data

The establishment history panel (BHP) is created from German social security records. Employers are required to file a report for all employees who are employed during a year. This report contains information on the duration of employment, the total pay over that period and a number of demographic variables (such as education, nationality, gender, and age). The pay information is generally very accurate (since it determines the social security contributions) but top coded. There is also information on industry, occupation and work status (full-time, part-time, apprentice) available. Since employers and individuals are uniquely identified through establishment and person IDs, it is possible to construct complete job and earnings histories for individual workers, and to follow establishments over time. Compared to other similar datasets (such as the Unemployment Insurance Data or the LEHD in the US) the German social security data is quite rich in terms of demographic and employment information. The data covers all employment subject to social security contributions, but excludes certain types of government employees and the self-employed.³ Overall about 80 percent of the working population in Germany is in the dataset.

Establishments are identified on the basis of establishment identification numbers (EID). Those numbers are allocated to each organizational unit in a specific region and industry consisting of at least one worker liable to social insurance.⁴ The definition of an establishment in this data does not necessarily correspond exactly to a meaningful economic unit like a firm or a plant. An establishment may consist of one or more branches. As long as they all belong to the same industry and authority district (Kreis) they might all be covered under the same EID. Once an establishment is assigned an EID this number remains constant over time. This holds especially if

³Also marginal part-time employment had been exempt from social security until 1999, so that up to this date it is not included in this data.

⁴Since 1999 establishments with at least one marginal part-time worker are also assigned an EID.

the establishment moves to another region or is temporarily closed. The latter prevents classifying a reopened establishment as a true entry. On the other hand, an ownership or industry change triggers the assignment of a new EID to an establishment, despite not being a truly new opening.

The BHP is created by collapsing social security records data on the establishment year level.⁵ Only employment spells that cover June 30th are used so that for each establishment and year there is a record with information on characteristics and size of the employees on this date. The resulting data is a panel comprising the universe of German social security liable employment since the year 1975. Our analysis is based on BHP data for the time period 1975-2004. The strength of this data is clearly its large scope (about 2 million observations per year covering about 25 million jobs) and time span. One important weakness, and the motivation for this paper, is that it is difficult to identify establishment entry and exit in the BHP. While for each EID it can be easily determined when it appears for the first and last time, it is not clear that these dates correspond to true entries and exits. An important concern is that if an EID changes for other reasons, this would appear as an exit and an entry without any corresponding economic event. That this can happen is acknowledged in the documentation of the BHP (Dundler et al. 2006), but it is hard to judge how often this actually happens and whether this biases empirical work that ignores the issue.

Establishments and Firms

It is helpful to clarify what we mean by establishment entry and exit before discussing how to identify these events. We understand an establishment to be a local economic unit consisting of workers and capital, and producing some sort of goods or services. Examples are a manufacturing plant, a restaurant, a local branch of a bank, or a gas station. This is different from the firm as an economic unit, which may consist of several establishments, which may create new or destroy old establishments, and which may buy or sell them. It can be the case that a firm disappears but an establishment belonging to the firm continues to exist (e.g. after being taken over by a competitor) and vice versa.

It is not completely clear under which conditions one would consider an establishment in year t to be the same establishment in year $t + 1$. If all workers are still employed at the same location but possibly by a different owner or as part of a different company, one would probably consider this a continuing establishment that experienced an ownership change. On the other hand if only the location is the same and the new owner replaced all old workers with new ones, one would likely consider this a new establishment. In between these two extremes the distinction becomes fuzzy and in practice somewhat arbitrary definitions will have to be made. In addition to ID Changes, which allow following an establishment from one year to another, and clear creations or

⁵The social security data is available to the scientific community in several different forms, ranging from individual level panel data (the IABS) to linked employer-employee data (the LIAB). For more information see <http://fdz.iab.de>.

destructions of establishments, it is also possible for establishments to break up into several units or for several establishments to merge.

For this paper we completely ignore the capital aspect of establishments (for data reason) and focus on the employee side. We therefore define a new establishment to be an establishment where a new group of workers get together and start producing something, and we define a continuing establishment to be an establishment where a large part of the workforce has been employed together in the previous year. We will also take care to classify break ups and spin-offs appropriately. Since we do not have direct information on ownership structure or firm identities, it should be kept in mind that we are limited in that dimension.

2.2 The Worker Flow Method for Correcting Establishment IDs

In this paper we directly address the problem of spurious EID entries and exits by providing and evaluating a new way to identify establishment entry and exit based on worker flows. Having access to the underlying social security records of the BHP we observe directly how many workers move between each establishment pair between two consecutive years. We will call all workers who move from an establishment A to an establishment B, a cluster of workers. Such a cluster will represent an inflow in establishment B and an outflow in establishment A. Using the individual level social security data, we created a dataset on all worker flows, where a unit of observation is one clustered flow. Of all the clustered inflows to an EID, we call the largest one (most number of workers) in a given year the maximum clustered inflow (MCI). Similarly we define the largest flow of all the clustered outflows in a year the maximum clustered outflow (MCO).⁶

Our strategy to classify new EIDs into new establishments, Spin-Offs, and id changes is based on whether the workers in a new establishment all come from the same EID or not. In practice this is done by looking whether not more than a certain percentage of the current work force at an entering EID was employed together in the previous year. To check this it is sufficient to know the total number of workers currently employed, and the maximum clustered inflow to the EID. Similarly, in order to classify exiting EIDs it is enough to have information on the maximum clustered outflow. We therefore restrict our flow data to the MCI and MCO and merge those to each establishment year observation in the BHP.

⁶In addition to inflows from other establishments, there are also workers that were not employed in a social security liable job on June 30th of the previous year. In our flow data we cannot distinguish between whether these workers were unemployed at that time or worked in a job not covered by our data (self-employed, government or jobs below the earnings threshold for social security). The MCI (and similarly the MCO) is the maximum of all inflows from other establishments, so if no workers come from other establishments the MCI would be 0.

Classifying Entering Establishment IDs

Not all new EIDs are also new establishments since an EID can change for a number of reasons. However it is true that the way EIDs are assigned in Germany implies that almost all new establishments will receive a new unique EID.⁷ This allows us to focus on new EIDs to identify new establishments. Based on the previous discussion a new EID can correspond to either a new establishment or a continuing establishment. A new establishment is an establishment where the workforce consists largely of workers that have newly come together to the production process (either be as a new firm or as part of an existing firm).

Continuing establishments correspond to the case where a large fraction of the workforce at the new establishment was employed together in the year before. We will call the EID where the largest cluster of workers has been employed together in the prior year the predecessor. If the workers at the new EID that were employed together in the year before also constituted most of the predecessor's employment, then the new EID and the predecessor correspond to very similar working arrangements and we will thus call them the same establishment, that underwent a change of the establishment identifier.

The other possibility for a continuing establishment is that a large fraction of the workers have been employed together in the previous year, but that they did not actually represent a large fraction of the workforce of the predecessor. We call this case a Spin-Off or break up, since a part of the predecessor is spun-off to create a new production unit. This can be further distinguished in whether or not the predecessor continues to exist or not. If not, we refer to a Spin-Off as pushed, since the group of workers is pushed out by the closing/disappearance of the larger unit. If the predecessor continues to exist we label the Spin-Off as pulled. Some new EID do not fit any of these patterns very well. We will come back to those later. From this discussion we can classify new EIDs into the following five broad categories:

- New establishments:
A group of workers who come together to form a new production unit
- Continuing establishments: Spin-Off / Break Up pushed
- Continuing establishments: Spin-Off / Break Up pulled
- ID Change (because of ownership change, take over, change of legal form, restructuring)
- Other / Not classifiable / Unclear

⁷Except for the qualifications in the data section of how an establishment is defined in the BHP, there is only one qualification: If a business owner essentially shuts down his business for a number of years and then reopens it, she may use the same EID again even though this may reasonably referred to as a new establishment by our definition.

In order to apply these classifications to the data it is necessary to define cutoffs for what it means that most workers did not work together in the previous year etc. Our definitions and cutoffs follow Benedetto et. al. (2007) and are displayed in Table 1. For very small establishments the ratio of MCI to employment is not a very meaningful statistic (since for example for an establishment with exactly one worker in its first year this ratio can only be 0 or 1). We therefore put all establishments with less than 4 workers in the first year into an extra category which we call New Establishments (small). For the establishments with more than 3 employees we use the MCI to categorize them. If the MCI is less than 30 percent of all inflows in the first year of an EID, we call this a New Establishment (mid&big). For 30 to 80 percent of MCI/inflows and less than 80 percent MCI/predecessor employment we put the new EID into a category which we call new establishment (chunky) to indicate that these are likely new establishments but that there is some possibility of misclassification.

Most establishments with a higher than 80 percent MCI/inflow ratio can be considered to be continuing establishments. To distinguish between the different continuing establishment categories it is necessary to look at the predecessor. If the MCI corresponds to less than 80 percent of the predecessors total employment (in the previous year), we call the continuing establishment a Spin-Off, if it is more than 80 percent and the predecessor exits we call it an ID-change. If the predecessor exits from the previous to the current year, we call the Spin-Off pushed, otherwise pulled. The remaining fields seem odd combinations for various reasons and are thus labeled Unclear (we come back to this in the results section).

Classifying Exiting Establishment IDs

Our method for classifying exiting establishments follows the same principle. All exiting establishments with less than 4 workers are classified as small establishment deaths, since for those the ratio of MCO to employment in the last year is not a meaningful statistic. All establishments where the ratio of MCO to employment in the year before the exit is less than 30 percent are classified as atomized deaths. Exiting establishment IDs where the MCO/last employment ratio is between 30 and 80 percent are classified as chunky deaths. It is certainly debatable what the best classification for this group is. One could both imagine that establishments of this kind are true exits, where a relatively large chunk of workers happens to end up at the same establishment, or some kind of spin-offs or takeovers that only take a relatively small fraction of workers. Since we think that any cutoff is ultimately arbitrary we put them in a separate category, which allows us later to see the importance of this group. For symmetry with the entry classification we label establishments with less than 80 percent MCO/outflow ratio and more than 80 percent MCO/successor employment ratio Spin-Offs (in this case pushed, since the predecessor exits).

Exiting EIDs where a very large fraction – we take 80 percent as the cutoff – of workers stay

together indicate that these are not true exits. If these worker go to a new EID in the following year and this group makes up most of the workers at the new establishment ID, then we take this as a strong indication that this is actually simply a change of the EID and we classify this as an ID change. If the workers enter an existing EID and make up less than 80 percent of the workforce at this EID, this may correspond to a takeover of the exiting establishment and we label this takeover / restructuring. The remaining categories are labelled unclear again.

2.3 Applying the Worker Flows Method to German Establishments

Table 2 Panel A shows the total number of establishments in each of our seven entry categories, pooling all establishment entries from 1976 to 2003. The vast majority (83 percent) of all new EIDs are New Establishments (small), with the two second largest groups being the other two New Establishment classes, accounting for 6 percent each. The other categories account for far fewer establishments: ID-changes for about 0.8 percent and Spin-Offs (pulled) and Spin-Offs (pushed) for 1.7 and 1.1 percent respectively. About 0.9 percent are classified as Unclear. While thus 95 percent of all new EIDs appear to be truly new establishments (excluding the chunky category), and Spin-Offs and ID-changes appear to be pretty rare, this masks the fact that most of these new establishments are very small. The table therefore also shows total employment in each of these establishment classes (in the year the EID appears). This changes the relative importance of these categories substantially. ID Changes and Unclear entries now account for nearly 10 percent of employees in new EIDs. Spin-Offs combined have about 3 million employees in their first year out of a total of 17 million in new EIDs. New establishments still account for most employees (about 73 percent), but the group of small establishments is now much less important (though still the largest) while the chunky and mid&big groups account for 4 and 3 million employees each. Given the ambiguity of the chunky new establishment category, the group of unambiguous establishment entries is thus significantly reduced when either considering employment weighted number (accounting for only 50 percent of all employment) or when considering only EIDs with more than 3 employees (accounting for only 37 percent of all new EIDs).

The impression that spurious entries, due to the non-new establishment categories, are more important among large new EIDs, is confirmed further when we break up the entry classifications by employment size in the first year (See Appendix Table A-2). By definition New Establishments (small) only appear in the smallest size class. Among the larger establishments it is apparent that the two new establishment categories become relatively less important as employment increases. It is probably not surprising that there are few truly new establishments that start out very big and those that do would often be new establishments set up by large multi-establishment firms or some kind of outsourcing of parts of an establishment, both of which may show up as Spin-Offs (pulled).

The total number of establishments in each exit category is reported in Table 2 Panel B. The Small Deaths account for the vast majority of exits, with nearly 83 percent. Among the exiting EIDs with more than 3 employees, the Atomized and Chunky Death categories are clearly the largest with 290,000 and 240,000 establishments respectively. Establishment deaths that are associated with a Spin-Off occurring, are less frequent, with a total of 86,000 establishments. Exiting EIDs that probably do not correspond to an actual dissolution of the establishment – Takeovers and ID Changes – make up about 37,000 establishments each. Finally about 0.7 percent of all establishments are classified as Unclear. Again these raw numbers overstate the importance of the Small Death category for employment. The numbers on employment in each of the categories reveal that the Small Death category, while still the largest, only accounts for about 30 percent of employment in exiting EIDs. The other two death categories are relatively more important for employment, having a share of about 23 percent each. Finally takeovers, ID Changes and Unclear exits do represent a sizable fraction of the workforce in exiting EID, representing a combined total of about 13 percent. This is again reinforced when we break up the exit types by establishment size in the year prior to exit (Appendix Table A-3): Among the smaller size classes the atomized and chunky death classes clearly dominate, accounting for most of the exits. However, these categories become less important among the larger establishments, where ID Changes and Takeovers are relatively more important. It is particularly interesting that among large establishment exits with 100 workers or more, less than one in four exits fall into the atomized death category. This clearly highlights the importance of controlling for spurious exits in studies of job-displacement.

To summarize, while spurious entries and exits are less important among smaller establishments, they become significantly more important when establishments are employment weighted or similarly when looking at larger establishments. While this supports the notion that it is potentially important to apply the worker flow method to control for spurious entries and exits, based on this categorization alone it is unclear whether the worker flow method does in fact improve in identifying exits and entries that correspond to real economic events.

3 Evaluating the Worker Flow Method

In this section we evaluate the performance of the worker flow categorization of establishment entries and exits using three independent methods, that allow us to judge whether the categories of entries and exits correspond closer to the economic events that we want to capture.

3.1 Cross Validation with Survey Data

As a first way to gauge whether the worker flow method is able to distinguish between real establishment entries and spurious entries, we compare the entry years that are implied by our method with the years of the foundation of the establishment according to a survey based self-assessment of the establishments. If the categorization of entering EIDs in the administrative data is meaningful, then for categories capturing true entries, the correlation between survey based foundation year of an establishment with the administrative birth year (based on the first appearance of the EID), should be significantly higher than for the other categories.

We derive the year of establishment foundation from the Establishment Panel (EP), a large, representative survey of German establishments.⁸ The Establishment Panel is a panel of establishments that are interviewed yearly starting in 1993. The size of the panel varies over time but in recent years about 15,000 establishments are interviewed every year. The Establishment Panel can be linked on the establishment level to the establishment identifiers in the Establishment History Panel. We define as the birth year in the BHP, the year in which the EID first appeared. In the EP the birth year is the answer to the question when the establishment was founded. Establishments are also asked whether the foundation was a) a new firm or branch, b) a new establishment, or c) neither of these.

Table 3 shows the correlation coefficients between the birth years in the BHP and EP for the three EP establishment categories and the seven BHP establishment entry categories based on worker flows. Column (1) shows the correlation between survey birth year and administrative birth year in the 'new firm or branch' category of the EP. The correlation is highest in the New establishment small and mid&big categories, providing support for our classification of these establishments as true entries. The correlation is weaker for the other categories, though also not zero. It is interesting that the correlation is still about 0.49 for ID-Changes. This might be because ID-changes could be associated with ownership changes and that survey respondents interpret 'founding year of the establishment' to be the year when ownership changed.

Column (2) shows the same correlations for the 'new establishment' category in the survey, again the correlation between birth years is highest for the New estab (mid&big) category, close to 0.9. Strikingly the correlation between birth years is negative for the ID changes in this column and pretty low for the New Establishment (chunky) category, supporting our suspicion that this category may contain many spurious entries. Finally Column (3) provides correlations for the other category, which are generally weaker, as would be expected given that in this case the foundation year in the survey data may be spurious.

Overall the comparison with the survey based in formation supports our categorization in so far

⁸More information regarding the EP can be found at: <http://fdz.iab.de>

as that the correlations between birth years tend to be higher in the establishments categories that we would expect to correspond to true entries in both datasets. Notice that both datasets capture slightly different concepts. E.g. in the survey respondents may well state the age of the mother-firm rather than the establishment in a multi-level firm, thus measuring something different than the administrative establishment unit. Similarly respondents to the survey may or may not view an ownership change as a new 'foundation-year' of an establishment. So while the patterns seem to support our categorization, the imperfect correlations may not be surprising.

3.2 The Cyclicalness of Entries and Exits

Economic upswings are usually associated with an increase in the formation of new establishments and firms, while recessions tend to be associated with plant closures and job destruction. If our entry and exit classification system does indeed capture differences in underlying economic events, then we should expect that the entry of EIDs classified as new establishments goes up in a boom and down in a recession, while the reverse should hold for EID exits classified as establishment exits. On the other hand the spurious entry and exit categories should be less correlated with the business cycle.

Figure 1 (a) shows the number of entering EIDs by entry category and year for West Germany (Appendix Table A-4 contains the exact numbers underlying this figure for West and East Germany).⁹ On average there are about 120,000 new EIDs per year, with a slight increase to about 130-140,000 after 1990. 1999 (and to a lesser extent the following 2 years) is a clear outlier with a sharp spike in the New Establishment (small) category. In this year the reporting requirements for the social security system were changed to cover marginally employed workers. While we attempted to correct for this by dropping these employment relationships, the underlying structure of the reporting rules make it impossible to correct for this perfectly which almost certainly explains the spike.¹⁰

The corresponding establishment exits are shown in Figure 1 (b). Again there appears to be an overall trend towards more establishment turnover throughout the 90s and early 2000s. The various true exit categories seem to increase similarly as the spurious exits, such as ID Changes.

⁹For East Germany (see Appendix) the data starts in 1991 and by focusing on 1992 and later we should not pick up establishments which are simply covered by the social security system for the first time. Nevertheless, we still find a very large number of new establishments, more than 160,000, in 1992. Nearly all of them fall in the new establishment categories. The number of new EIDs drops sharply in 1993 and then shows a declining pattern, though with some outliers, across all categories until 2004.

¹⁰Apart from this outlier the number of EIDs in the New Establishment (small) category shows essentially no time trend. This is markedly different from all other categories which show fairly strong increases over time. Perhaps most striking is the fact that ID-Changes are more than three times as common towards the end of our sample period compared to the beginning. Similarly there is a very strong increase of both Spin-Off categories. There is also a pronounced increase in the Unclear and Chunky New Establishment categories, while the New Establishment (mid&big) category shows only a moderate increase over time which reverts back to its starting value in the last 2 years.

In Figures 1 (a) and (b), recessions (1982, 1993 and 2003) are indicated by vertical bars. These figures give a visual impression of the cyclical (and acyclical) of the different time series: it appears that establishment entries in the medium/big category and small category are markedly lower in recessions, while the corresponding establishment exit categories increase in downturns.

We assess this more carefully by computing correlation coefficients between the time series of the different entry and exit categories and business cycle indicators. As business cycle indicators we use the growth rate of real GDP, as well as the year to year change in the unemployment rate measured in percentage points.¹¹ Table 4 Panel A displays the correlation between number of establishments and number of employees in each of the seven entry categories with the two business cycle indicators. Since the change in the unemployment rate and GDP growth are quite highly negatively correlated (as one might expect from Okun's law), the patterns emerging from the two measures are pretty similar. Since several categories show strong increases over time, the raw correlation between such categories and the business cycle indicators (which are essentially trendless) will be highly affected by the long term trends and is thus not very informative. For this reason we detrend the establishment and employment time series using the Hodrick-Prescott filter.¹²

ID Changes and Spin-Offs Pulled are not strongly correlated with the business cycle and only the detrended time series show a weak (and statistically insignificant) counter cyclical correlation. For the Spin-Off Pushed category the correlation is very strongly counter-cyclical once the long term trend is taken out (correlation of 0.7 with the change in the UR). Since we think of these as spin-off which are forced by plant closings it makes sense that these are more common during downturns. On the other hand the New Establishment (mid&big) and New Establishment (small) time series appear to follow the business cycle quite closely, showing clear and statistically significant correlations of around 0.4 to 0.6 with the business cycle measures. The New Establishment (chunky) and Unclear categories are also pro-cyclical, but with somewhat weaker correlations and generally not statistically significant on conventional levels, except for the Unclear category.

The fact that only those entry categories which we consider to be relatively unambiguously new establishments are strongly procyclical indicates that our classification corresponds to real economically different events and we find this reassuring. Furthermore the ambiguity of the Unclear and New Establishment (chunky) categories is reflected in the weaker correlation with the business cycle, which points towards our suspicion that these categories correspond to true establishment entries as well as spin-offs and restructuring events.

For the exits in Table 4 Panel B, Atomized Deaths and Spin-Offs Pushed (which we argued

¹¹ See appendix Figure B-3 for the time series of unemployment and GDP growth.

¹² We use a smoothing parameter value of 1600, which is commonly used for quarterly data, since we found that the more standard values for annual data take out too much of the cyclical variation. The results are very similar if instead of HP filtering, we simply take out a linear time trend.

should also be considered true exits) show nearly the same pattern of a very robust positive correlation with the change in the unemployment rate (about 0.7) and a weaker negative correlation with GDP growth. Interestingly the Small Death category is nearly uncorrelated with the business cycle, and thus shows a markedly different pattern than the New Small category. Also quite different from the respective entry categories, both the Chunky Death and the Unclear categories appear to be somewhat procyclical (although only marginally statistically significant), which may indicate that there are relatively few true exits in these categories and instead that they involve a significant amount of restructuring. The Takeover/Restructuring category is nearly acyclical as well as the ID Change category, which exhibits the same pattern as the corresponding entry category.

This evidence supports the common practice in displacement studies of the Jacobson, Lalonde and Sullivan (1993) type to view only worker separations from disappearing establishments that are large and atomized (in our parlance) as true displacements. The strong correlation of these establishment exits (in particular compared to the other EID exit categories) with economic downturns clearly indicates that these are more likely to correspond to real establishment closings and lumping all EID exits together may severely downward bias our displacement effects in the absence of such corrections.

3.3 The Evolution of Establishment and Worker Characteristics around Establishment Events

We now turn to how characteristics of establishments and workers evolve around establishment events. We begin by investigating the evolution of new EIDs over time depending on their entry type. There are two simple descriptive ways to achieve this. On the one hand one can pick a cohort of entering EID and follow them over time. On the other hand one can pick a year and analyze establishments of different ages in that year. The former approach has the problem that the variation with age is confounded by overall time trends, while the latter has the disadvantage that age is possibly confounded by differences of establishments across cohorts. We show results based on the latter approach.

Table 5 shows characteristics in establishments of different age in 2000 by their entry category. The first Panel shows how employment varies with establishment age (we speak of establishment age here even though we really mean the age of the EID, i.e. time since the first appearance of the EID). New establishments small and mid&big show fairly strong employment growth over the first few years. For example New Establishments (small) have on average only 1 employee in their first year, but nearly 4 in their fourth year. New establishments (mid&big) start out larger with about 12 employees, but this also quickly increases to 19 by age 4 and continues to rise afterwards. Since we would probably expect new establishments to grow this provides some support for our defi-

dition of new establishments. The New Establishments (chunky) category also shows increasing employment with age, but the relationship is not quite monotone. Also consistent with the fact that the other categories do not represent true establishment entries, they show no clear relationship between time since entry and employment.

The correlation between employment and establishment age can of course be driven by selection. This possibility is particularly important since new establishments have a very high probability of exiting again, so that the increase in average employment may be a simple composition effect. For this reason Table 5 Panel B shows how employment growth varies with establishment age. Here growth is computed on the establishment level (Employment current year minus employment last year divided by employment last year) and then averaged over the establishments. It is clear that the increase in employment in Panel A is not just driven by selection and instead all three new establishment categories show strong growth over the first couple of years, while the other categories show little growth.¹³

As we would expect new establishments IDs to evolve differently after appearing in the data depending on whether they are a true new establishments, or spurious entries, we would expect worker trajectories to be different if they are employed in a new EID or exiting EID depending on whether these EIDs are true entries or exits. To analyze this we merge the establishment history panel with a 2 percent random sample of the German individual level social security data, which allows us to follow workers throughout their work histories and observe their employment status and wages.

We would expect that workers in EIDs experiencing true establishment exits should have sharp declines in yearly earnings after the exit, while workers in EIDs that disappear due to an ID Change should be relatively less affected (though if this is due to an ownership change it may still have some impact on these workers). For the other categories we might expect negative earning effects but less pronounced. For establishment entries it is less clear what to expect on the worker side, although we might expect that prior to true entries, many workers will have been unemployed at least for a while (since these all must be truly new hires), which may be associated with lower earnings, while this should not be the case for ID Changes. We analyze this for workers in entering and exiting EIDs in 1996, but the results are very similar for other years.

Figure 2 (a) shows total yearly earnings of workers in entering EIDs in 1996, by entry categories. For comparison purposes the figure also shows worker histories of workers employed in other EIDs (not entering in 1996). The worker histories look fairly similar across the different categories and quite similar to the continuing EID workers. One exception to this is the marked downward dip in the year prior to EID entry in the new establishment mid&big category.

¹³Schmieder (2012) investigates how these high growth rates in new establishments are associated with wages, showing a negative relationship between establishment age and wages within establishments.

This is consistent with many workers in truly new establishments being recruited from unemployment, rather than simply continuing employment relationships with existing employers (who simply change EIDs). The levels are also interesting, showing clearly that Spin-off's pulled occur mainly in high paying jobs and are not associated with negative wage effects.¹⁴

The bottom panel of Figure 2 shows the worker histories of workers in different EID exit categories in 1996. Workers in EIDs undergoing atomized deaths experience sharp lasting earnings losses, very similar to the findings of the displacement literature. The earnings losses are less pronounced, but still visible for the exit categories: small death, spin-off pushed and chunky deaths. The other categories show no earnings losses around the EID exit, confirming the classification of these exits as likely not constituting true establishment exits.

4 Application: Correcting Measures of Job Creation and Job Destruction

New establishments are often considered to be important contributors to overall job growth. However, as discussed before, spurious entries and ID Changes can significantly overstate the contribution by new entries. In order to assess the magnitude of this problem Figure 3 (a) shows job creation over time by new EIDs. The solid black line represents the uncorrected measure which corresponds simply to total employment in new EIDs in their first year of appearance. In a typical year, there are about 300,000 - 400,000 jobs in new EIDs, which represents about 25 percent of total job creation in the economy, or about 2 percent of all jobs. It is not completely clear, which of the entry categories should be considered new entries, or corresponding to true job creation. If we apply the most conservative measure and use only the New Small and New (mid&big) category, the job creation number by new establishments is nearly cut in half and new establishments account for only about 13 percent of overall job creation. Furthermore the strong increase over time disappears and job creation by new establishments appears quite stable (though procyclical) in the long run. The Figure also shows corrected measures which are less conservative and for example include the Chunky entries or event the Spin-Offs.

Figure 3 (b) shows the same for job destruction. Again the most conservative correction measure, shows a much smaller contribution of establishment exits to overall job destruction (about 15 rather than 25 percent) and decreases the long term time trend, although there is still a significant increase over time. Unsurprisingly our corrected measures for job creation and job destruction by entries and exits are also closer correlated with the business cycle.

¹⁴The same impression arises when looking at employment rather than earnings, see Appendix Figures B-4 and B-5.

We also analyzed total job creation and job destruction after taking out the creation and destruction by spurious entries and exits (Correcting in the same way as in Figures 3 (a) and (b)). Using the most conservative measure, it appears that the uncorrected overall job creation measure is about 13 percent higher (increasing in recent years) than our corrected measure, a quite significant upward bias.¹⁵ Similarly the uncorrected total job destruction time series is about 11 percent higher than the corrected one. For less conservative corrections, the difference is smaller but still appears to be economically significant.

The impact of these corrections is strongest when we consider net job creation (defined as job creation minus job destruction) and destruction measures uncorrected and corrected for spurious entries and exits. In absolute numbers, the correction for net-job creation measures has a smaller impact, since the biases tend to cancel each other out. However since net job creation has a lower level (on average around 0), the relative bias (the ratio of spurious net-job creation to total net-job creation) in any particular year can be large and ranges from -60 to +30 percent in years where net job creation is close to zero. On average (over all years) the relative bias is about 16 percent, a quite significant number in economic terms.

5 Conclusion

Every year there is a large number of newly appearing and disappearing establishment identifiers in the data. In this paper we provide a way of classifying these events in order to distinguish true establishment entries and exits from ID Changes and Restructuring events. We find that clear cut establishment entries and exits account only for roughly half of the employment in entering and exiting EIDs. There is a large number of establishments which come out of Spin-Off events or some sort of firm restructuring. There is also a sizable number of establishment identifiers, which disappear or appear in ways which are not easily classified. Finally there are sizable numbers of pure ID Changes, particularly important among larger establishments.

Our rules to identify true entries and exits create time series that closely line up with the business cycle, while the other categories appear relatively acyclical. Across the board there are interesting time patterns which warrant further investigation. For example there has been a strong increase in establishment restructuring events in West Germany, while East Germany experienced a decline over the same time period.

Correcting job creation and destruction measures for spurious ID Changes and Restructuring events has very sizable effects on the overall numbers. Not correcting for such events overestimates the contribution of entries and exits to job creation and destruction by a factor of around 2. Furthermore overall job creation and destruction rates are severely biased and about 5 percent (for

¹⁵See Appendix

moderate corrections) to 10-13 percent (for more conservative corrections) lower when correcting for spurious events.

The bias created by time inconsistent establishment identifiers and firm restructuring events appears to be quite significant and may be even more problematic within particular industries, regions, or establishment size classes. It is hard to know exactly how big this problem is for the interpretation of previous studies which identified establishment turnover solely using the EID entries and exits (sometimes in conjunction with arbitrary size cutoffs), but it seems important to take the potential biases into account.

Fortunately our study indicates that using worker flows will allow for significant improvements of the firm linkages and thus improve the overall data quality of the BHP. Working together with the Research Data Center of the IAB, we have made the 6 crucial variables, on which all our definitions are based, available to users of the BHP, thus allowing researchers to either replicate our entry and exit categories, or create their own classification system. In addition to classifying entries and exits, these variables should also be useful for other purposes. For example Schmieder, von Wachter and Bender (2010) use the same information on worker flows to distinguish true Mass-Layoffs from spurious exits and spin-off events to study earnings losses of displaced workers.

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Tables

Table 1: Classifying Entering and Exiting Establishments by Clustered Worker Flows

Panel A: Entries		Predecessor exits MCI / Predecessor Employment			Predecessor continues MCI / Predecessor Employment			No predecessor MCI=0
		<30%	30-80%	>80%	<30%	30-80%	>80%	
	<u>MCI Inflows</u>							
≤3 empl.	-	New Estab (small)	New Estab (small)	New Estab (small)	New Estab (small)	New Estab (small)	New Estab (small)	New Estab (small)
>3 empl.	<30%	New Estab (mid & big)	New Estab (mid & big)	New Estab (mid & big)	New Estab (mid & big)	New Estab (mid & big)	New Estab (mid & big)	New Estab (mid & big)
	30-80%	New Estab (chunky)	New Estab (chunky)	Unclear	New Estab (chunky)	New Estab (chunky)	Unclear	
	>80%	Spin-off pushed	Spin-off pushed	ID Change	Spin-off pulled	Spin-off pulled	Unclear	

Panel B: Exits		Successor is entrant MCO / Successor Employment			Successor is existing estab. MCO / Successor Employment			No successor MCO=0
		<30%	30-80%	>80%	<30%	30-80%	>80%	
	<u>MCO Outflows</u>							
≤3 empl.	-	Small Death	Small Death	Small Death	Small Death	Small Death	Small Death	Small Death
>3 empl.	<30%	Atomized Death	Atomized Death	Spin-off pushed	Atomized Death	Atomized Death	Atomized Death	Atomized Death
	30-80%	Chunky Death	Chunky Death	Spin-off pushed	Chunky Death	Chunky Death	Chunky Death	
	>80%	Unclear	Unclear	ID Change	Take-Over / Restruct.	Take-Over / Restruct.	Unclear	

Notes: MCI stands for Maximum Clustered Inflow: the size of the largest cluster of inflowing current workers. Inflows stands for all the total number of workers that arrived since the previous year at an EID, which for a new EID is the same as total current employment. MCO stands for Maximum Clustered Outflows: the size of the largest cluster of outflowing current workers. Outflows are all workers that leave the EID until the next year.

Table 2: The Distribution of Entering and Exiting Establishment IDs over Entry/Exit Classifications (1976-2003)

Panel A: Entering establishment IDs				
	# Establishments	Percent	# Workers	Percent
New estab (small)	3,950,679	83.10	4,990,187	29.76
New estab (mid & big)	295,800	6.22	3,026,472	18.05
New estab (chunky)	291,163	6.12	3,996,527	23.83
Spin-Off Pulled	78,900	1.66	2,222,568	13.25
Spin-Off Pushed	53,609	1.13	883,627	5.27
ID change	38,881	0.82	711,358	4.24
Unclear	45,196	0.95	939,927	5.60
Total	4,754,228	100	16,770,666	100

Panel B: Exiting establishment IDs				
	# Establishments	Percent	# Workers	Percent
Small death	3,494,502	82.88	4,321,132	30.01
Atomized death	293,127	6.95	3,377,142	23.46
Chunky death	239,519	5.68	3,247,262	22.56
Spin-Off Pushed	86,451	2.05	1,628,907	11.31
Takeover	36,652	0.87	661,479	4.59
ID change	37,625	0.89	681,140	4.73
Unclear	28,267	0.67	479,912	3.33
Total	4,216,143	100	14,396,974	100

Table 3: Correlation Coefficients between Birth Year in Administrative Data (BHP) and Survey Data (Establishment Panel BP).

	New firm or branch (according to survey)	New Establishment (according to survey)	Not a new firm or branch (according to survey)
ID Change	0.49	-0.08	0.47
Spin-Off Pulled	0.49	0.73	0.47
Spin-Off Pushed	0.61	0.57	0.58
New Estab. (small)	0.68	0.45	0.56
New Estab. (mid & big)	0.82	0.88	0.53
New Estab. (chunky)	0.55	0.52	0.54
Reason Unclear	0.51	0.58	0.51

Note: The table shows correlation coefficients between establishment birth years in the administrative dataset (BHP) and the survey (BP). Each column shows a different new establishment category according to the survey (BP).

Table 4: The Correlation Between Establishment Entry and Exit Categories and Business Cycle Indicators

	# Establishments		# Employees	
	Change in UR	GDP Growth	Change in UR	GDP Growth
Panel B: Entry Variables Detrended (Hodrick-Prescott Filtered)				
ID Change	0.28	-0.037	0.17	0.087
	[0.17]	[0.85]	[0.41]	[0.66]
Spin-Off Pulled	0.34	-0.31	0.22	-0.27
	[0.087]	[0.10]	[0.27]	[0.17]
Spin-Off Pushed	0.70*	-0.39*	0.48*	-0.31
	[0.000063]	[0.039]	[0.013]	[0.10]
New Small	-0.45*	0.38*	-0.64*	0.41*
	[0.021]	[0.043]	[0.00040]	[0.031]
New Medium/Big	-0.63*	0.48*	-0.69*	0.54*
	[0.00062]	[0.0096]	[0.000082]	[0.0028]
Chunky	-0.28	0.27	-0.31	0.35
	[0.16]	[0.16]	[0.12]	[0.064]
Unclear	-0.55*	0.45*	-0.12	0.19
	[0.0036]	[0.016]	[0.54]	[0.33]
Panel B: Exit Variables Detrended (Hodrick-Prescott Filtered)				
ID Change	0.25	-0.021	0.24	0.053
	[0.23]	[0.92]	[0.23]	[0.79]
Takeover/Restructuring	-0.016	0.26	-0.0090	0.23
	[0.94]	[0.19]	[0.97]	[0.24]
Spin-Off Pushed	0.70*	-0.37	0.66*	-0.33
	[0.000072]	[0.056]	[0.00022]	[0.091]
Small Death	0.13	0.15	0.31	-0.00099
	[0.52]	[0.46]	[0.12]	[1.00]
Atomized Death	0.68*	-0.34	0.65*	-0.32
	[0.00012]	[0.084]	[0.00029]	[0.11]
Chunky Death	-0.14	0.39*	-0.072	0.35
	[0.48]	[0.046]	[0.73]	[0.074]
Unclear	-0.39*	0.37	-0.014	0.23
	[0.048]	[0.058]	[0.94]	[0.25]

Note: The table reports correlation coefficients between the respective variables. The first two columns show the correlation between the number of establishments in each of the establishment categories with the business cycle indicators (in the column headings), the second two columns the correlation between the number of employees in the categories with the business cycle indicators. P-Values are given in brackets.

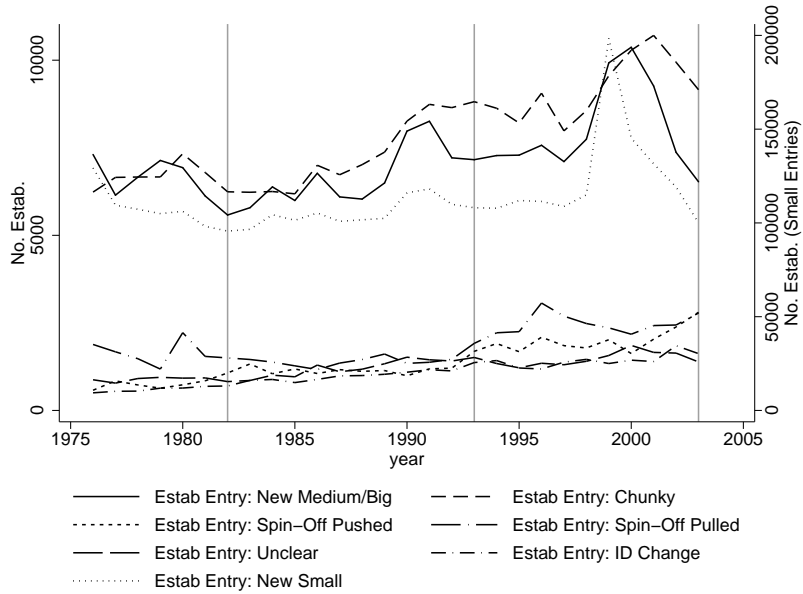
* indicates that the correlation coefficient is statistically significant on the 5 percent level.

Table 5: Establishment Size by Entry Category and Establishment Age

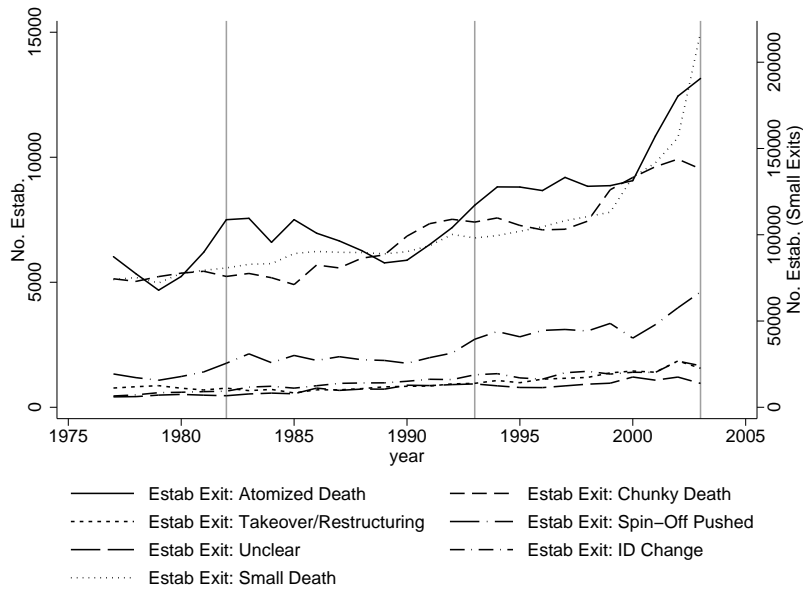
	Establishment Age in Years									
	0	1	2	3	4	5	6-10	11-15	16-20	21-25
Panel A: Establishment Size										
ID Change	19.1	18.8	18.5	21.8	18.9	16.2	13.9	17.3	17.8	15.9
Spin-off / pulled	36.6	45.1	41.4	42.0	45.3	48.3	40.8	31.7	32.7	36.8
Spin-off / pushed	20.0	21.6	14.3	16.0	16.9	18.1	14.3	16.6	18.0	16.7
New estab. (small)	1.1	1.6	3.1	4.0	3.7	4.4	4.3	4.9	5.6	6.2
New estab. (mid & big)	11.7	14.6	17.1	18.4	19.1	20.4	20.1	23.1	23.4	24.9
New estab. (chunky)	15.2	18.8	18.7	19.3	21.9	20.2	18.7	20.6	19.9	24.4
Reason Unclear	23.1	26.0	21.2	24.3	27.4	25.0	19.2	21.7	21.1	27.5
Panel B: Employment Growth										
ID Change	-0.034	0.008	-0.001	0.025	-0.001	0.006	0.002	-0.001	-0.011	-0.011
Spin-off / pulled	0.063	0.005	0.013	0.044	0.004	0.007	0.006	0.002	0.002	0.002
Spin-off / pushed	0.009	-0.001	-0.014	0.010	-0.005	0.004	-0.013	0.000	0.008	0.008
New estab. (small)	0.252	0.122	0.100	0.086	0.080	0.059	0.040	0.033	0.027	0.027
New estab. (mid & big)	0.075	0.045	0.049	0.030	0.049	0.027	0.018	0.011	0.020	0.020
New estab. (chunky)	0.060	0.033	0.017	0.043	0.030	0.018	0.010	0.011	0.006	0.006
Reason Unclear	-0.031	0.026	0.000	0.027	0.024	0.008	0.005	0.011	0.000	0.000

Figures

Figure 1: Number of New Establishments in each Entry and Exit Category from 1976 - 2004



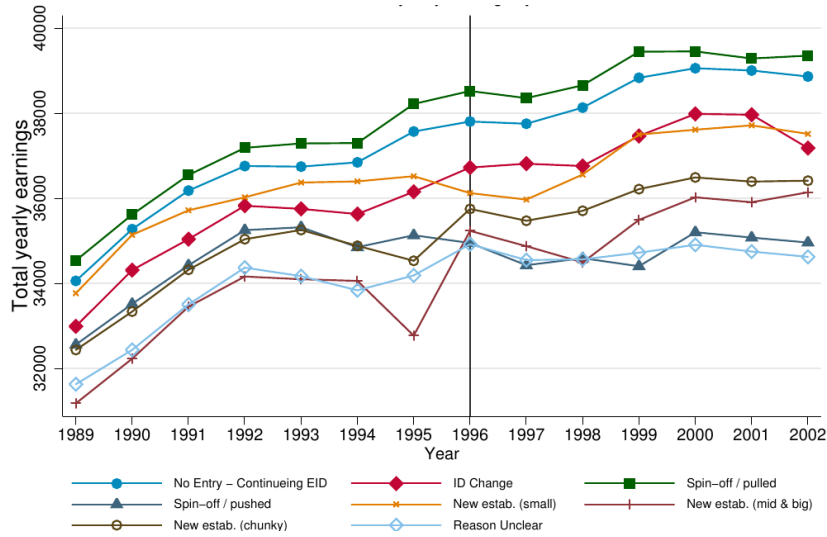
(a) Entry Categories



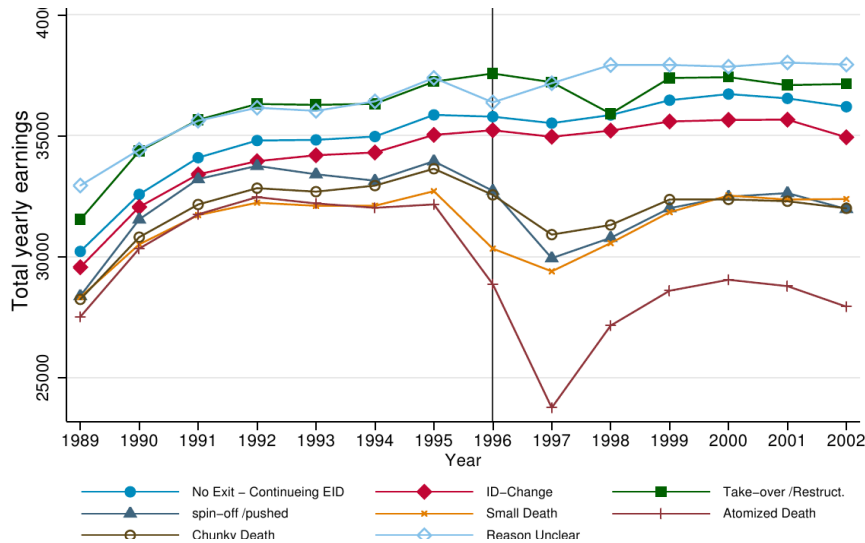
(b) Exit Categories

Notes: The top figure shows the number of establishments in each of the 7 entry categories by year. Vertical lines indicate recession years. Data: Establishment History Panel. The bottom figure shows the number of establishments in each of the 7 exit categories by year. Vertical lines indicate recession years. Data: Establishment History Panel.

Figure 2: Total Yearly Earnings of Workers Employed in 1996 in Entering and Exiting Establishment IDs by Establishment Classification



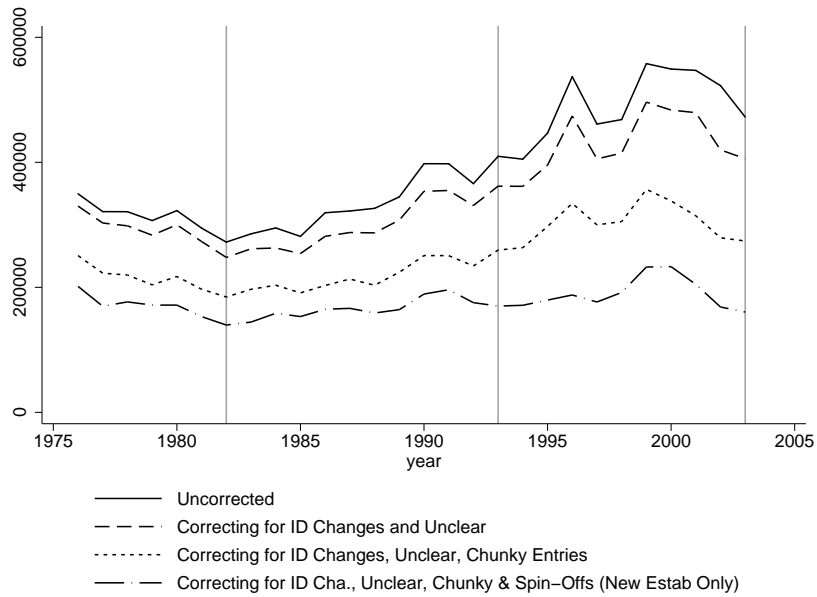
(a) Entry Categories



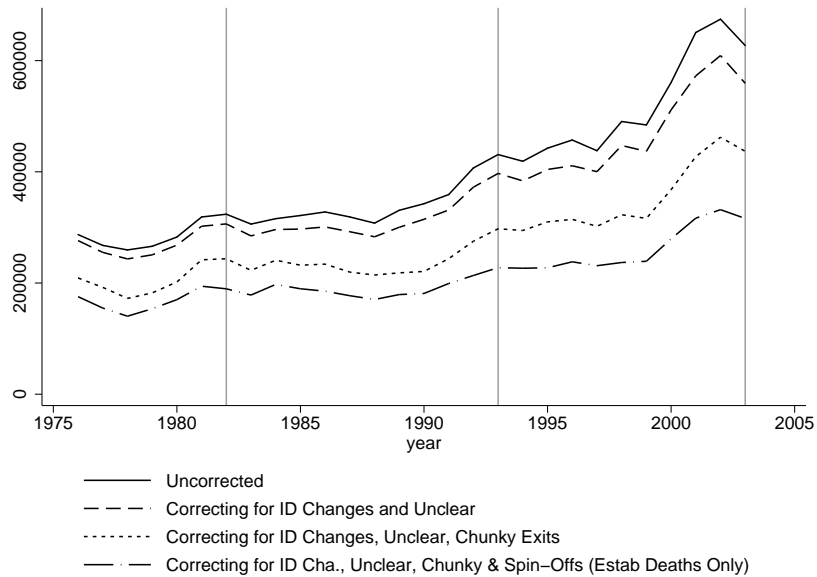
(b) Exit Categories

Notes: The figures show workers who were employed in establishments with new EIDs (top figure) or exiting EIDs (bottom figure) in 1996. For each worker employed in the different entry and exit categories in 1996, total yearly earnings are computed for each year between 1989 and 2002 and plotted by establishment type of 1996. The top figure shows workers in the different entry categories in 1996, while the bottom figure shows the total yearly earnings of workers in each of the seven exit categories by year. Data: Establishment History Panel.

Figure 3: Correcting Measures of Job Creation and Job Destruction by New and Exiting Establishments for Spurious Entries and Exits



(a) Entry Categories



(b) Exit Categories

Notes: The top figure shows corrected and uncorrected measures of job creation by year. Vertical lines indicate recession years. Data: Establishment History Panel. The bottom figure shows corrected and uncorrected measures of job destruction by year. Vertical lines indicate recession years. Data: Establishment History Panel.

A APPENDIX TABLES

Table A-1: The Distribution of Clustered Worker Flows among Entering and Exiting Establishments (1976 - 2004)

Panel A: Entries		Predecessor exits			Predecessor continues			No predecessor
		MCI / Predecessor Employment			MCI / Predecessor Employment			MCI=0
		<30%	30-80%	>80%	<30%	30-80%	>80%	
<u>MCI</u> <u>Inflows</u>								
≤3 empl.	-	124,863	187,893	199,348	1,076,374	181,330	43,249	2,137,606
		2.63	3.95	4.19	22.64	3.81	0.91	44.96
>3 empl.	<30%	27,949	19,234	10,566	185,437	18,229	3,366	31,017
		0.59	0.40	0.22	3.90	0.38	0.07	0.65
		26,462	123,057	37,752	101,279	40,365	3,230	
		0.56	2.59	0.79	2.13	0.85	0.07	
		10,996	42,613	38,881	54,802	24,098	4,214	
		0.23	0.90	0.82	1.15	0.51	0.09	

Panel B: Exits		Successor is entrant			Successor is existing estab.			No successor
		MCO / Successor Employment			MCO / Successor Employment			MCO=0
		<30%	30-80%	>80%	<30%	30-80%	>80%	
<u>MCO</u> <u>Outflows</u>								
≤3 empl.	-	124,863	187,893	199,348	1,076,374	181,330	43,249	2,137,606
		2.63	3.95	4.19	22.64	3.81	0.91	44.96
>3 empl.	<30%	27,949	19,234	10,566	185,437	18,229	3,366	31,017
		0.59	0.40	0.22	3.90	0.38	0.07	0.65
		26,462	123,057	37,752	101,279	40,365	3,230	
		0.56	2.59	0.79	2.13	0.85	0.07	
		3,158	23,059	37,625	24,277	12,375	2,050	
		0.07	0.55	0.89	0.58	0.29	0.05	

Notes: The first row in each cell shows the number of establishments, the second row the percentage of the total (among entries and exits). MCI stands for Maximum Clustered Inflow: the size of the largest cluster of inflowing current workers. Inflows stands for all the total number of workers that arrived since the previous year at an EID, which for a new EID is the same as total current employment. MCO stands for Maximum Clustered Outflows: the size of the largest cluster of outflowing current workers. Outflows are all workers that leave the EID until the next year.

Table A-2: The Distribution of Establishment Entry Categories by Establishment Size in Year of Entry

Panel A: Number of Establishments								
Number of Employees	ID - Change	Spin-off pulled	Spin-off / pushed	New estab. (small)	New estab. (mid&big)	New estab. (chunky)	Unclear	Total
≤3				3,950,679				3,950,679
4-9	23,920	40,751	32,035		223,767	189,552	27,479	537,504
10-19	8,246	17,609	11,955		45,394	60,659	9,816	153,679
20-49	4,413	12,290	6,706		20,749	30,092	5,059	79,309
50-99	1,283	4,501	1,913		4,257	7,308	1,567	20,829
100-249	754	2,584	817		1,341	2,887	849	9,232
250-499	168	736	142		221	494	252	2,013
500-999	7/	295	3/		48	137	124	710
1000+	2/	134	/		23	34	50	273
Total	38,881	78,900	53,609	3,950,679	295,800	291,163	45,196	4,754,228

Panel B: Number of Workers in Establishment Type								
≤3				4,990,187				4,990,187
4-9	134,527	235,190	186,434		1,191,253	1,075,007	160,023	2,982,434
10-19	108,725	235,982	157,679		601,661	809,100	131,756	2,044,903
20-49	131,382	371,269	200,541		605,412	887,678	150,062	2,346,344
50-99	87,753	310,513	129,741		282,668	493,186	107,708	1,411,569
100-249	111,644	388,131	119,620		194,604	423,171	128,156	1,365,326
250-499	57,311	252,191	48,499		74,517	164,336	87,939	684,793
500-999	49,022	198,914	20,089		30,207	89,934	85,822	473,988
1000+	30,994	230,378	/		/	54,115	88,461	471,122
Total	711,358	2,222,568	883.6//	4,990,187	3,026.4//	3,996,527	939,927	16,770,666

Note: Data confidentiality rules prohibit the publication of table cells with less than 20 observations. For this reason cells with less than 20 observations have been replaced by “/”. Furthermore certain digits in the total counts have similarly been replaced by “/” to make it impossible to infer the cell counts indirectly.

Table A-3: The Distribution of Establishment Exit Categories by Establishment Size in Year prior to Exit

Panel A: Number of Establishments								
Number of Employees	ID - Change	Takeover / Restructuring	Spin-off / pushed	Small Death	Atomized Death	Chunky Death	Unclear	Total
≤3				3,494,502				3,494,502
4-9	23,094	21,589	51,890		205,728	155,387	17,128	474,816
10-19	8,118	8,044	17,449		53,866	50,846	6,480	144,803
20-49	4,211	4,741	10,954		25,770	24,875	3,244	73,795
50-99	1,247	1,416	3,791		5,645	5,700	860	18,659
100-249	701	661	1,882		1,770	2,180	393	7,587
250-499	166	153	364		276	413	108	1,480
500-999	7/	3/	99		6/	86	4/	396
1000+	/	/	22		/	32	/	105
Total	37,625	36,652	86,451	3,494,502	293,127	239,519	28,267	4,216,143
Panel B: Number of Workers in Establishment Type								
≤3				4,321,132				4,321,132
4-9	130,837	122,783	297,728		1,121,023	887,946	99,784	2,660,101
10-19	106,760	106,881	235,032		718,318	673,998	84,519	1,925,508
20-49	125,143	141,657	329,951		752,926	729,853	95,700	2,175,230
50-99	85,551	97,192	260,665		379,241	384,408	58,061	1,265,118
100-249	105,547	97,431	277,574		251,065	317,098	57,725	1,106,440
250-499	56,632	50,630	122,586		91,457	136,819	36,885	495,009
500-999	46,526	26,592	65,339		39,727	57,362	27,954	263,500
1000+	24,144	18,313	40,032		23,385	59,778	19,284	184,936
Total	681,140	661,479	1,628,907	4,321,132	3,377,142	3,247,262	479,912	1.44e+07

Note: Data confidentiality rules prohibit the publication of table cells with less than 20 observations. For this reason cells with less than 20 observations have been replaced by “/”. Furthermore certain digits in the total counts have similarly been replaced by “/” to make it impossible to infer the cell counts indirectly.

Table A-4: Establishment Entry Categories by Year: Number of Establishments

Panel A: West Germany								
	ID - Change	Spin-off pulled	Spin-off / pushed	New estab. (small)	New estab. (mid&big)	New estab. (chunky)	Unclear	Total
1976	503	1,884	577	129,286	7,307	6,235	876	146,668
1977	547	1,674	845	109,455	6,147	6,654	781	126,103
1978	552	1,477	728	107,275	6,661	6,665	912	124,270
1979	637	1,182	637	104,953	7,138	6,667	945	122,159
1980	640	2,221	732	106,188	6,932	7,330	923	124,966
1981	689	1,543	847	98,169	6,124	6,794	929	115,095
1982	699	1,500	1,071	95,663	5,580	6,243	824	111,580
1983	859	1,455	1,328	96,602	5,789	6,230	856	113,119
1984	885	1,381	1,048	104,372	6,383	6,251	1,008	121,328
1985	796	1,274	1,185	101,405	5,994	6,185	961	117,800
1986	887	1,168	1,055	105,311	6,772	7,000	1,295	123,488
1987	987	1,353	1,165	100,861	6,097	6,731	1,105	118,299
1988	997	1,454	1,118	101,671	6,035	7,018	1,178	119,471
1989	1,033	1,611	1,139	102,444	6,494	7,375	1,333	121,429
1990	1,092	1,344	991	116,058	7,975	8,260	1,521	137,241
1991	1,163	1,376	1,188	118,157	8,257	8,739	1,447	140,327
1992	1,129	1,460	1,208	109,933	7,213	8,646	1,411	131,000
1993	1,367	1,915	1,688	108,100	7,160	8,816	1,513	130,559
1994	1,425	2,218	1,910	107,840	7,278	8,628	1,340	130,639
1995	1,213	2,250	1,678	111,946	7,289	8,208	1,217	133,801
1996	1,183	3,067	2,092	111,463	7,571	9,058	1,348	135,782
1997	1,378	2,692	1,850	108,795	7,105	7,983	1,305	131,108
1998	1,459	2,482	1,785	114,966	7,743	8,561	1,404	138,400
1999	1,340	2,359	2,020	198,391	9,924	9,555	1,569	225,158
2000	1,436	2,177	1,626	145,207	10,370	10,284	1,857	172,957
2001	1,396	2,424	2,036	131,542	9,262	10,708	1,658	159,026
2002	1,849	2,440	2,384	119,153	7,369	9,941	1,638	144,774
2003	1,623	2,781	2,803	100,078	6,530	9,158	1,386	124,359
2004	1,844	2,366	2,310	107,494	6,692	8,754	1,692	131,152
Total	31,608	54,528	41,044	3,272,778	207,191	228,677	36,232	3,872,058

Panel B: East Germany								
	ID - Change	Spin-off pulled	Spin-off / pushed	New estab. (small)	New estab. (mid&big)	New estab. (chunky)	Unclear	Total
1992	114	3,070	1,124	115,417	32,786	8,454	481	161,446
1993	284	3,878	729	51,233	6,590	5,987	745	69,446
1994	395	2,466	719	41,531	6,035	5,103	728	56,977
1995	441	2,302	764	37,710	5,280	4,716	679	51,892
1996	521	2,317	1,136	31,929	3,896	4,483	618	44,900
1997	544	1,512	921	29,585	3,434	3,759	538	40,293
1998	556	1,104	931	48,786	3,563	3,673	595	59,208
1999	543	807	893	53,505	3,771	3,451	604	63,574
2000	559	828	776	34,633	3,001	3,129	603	43,529
2001	523	870	862	29,213	2,511	2,961	506	37,446
2002	661	743	890	26,520	2,057	2,655	502	34,028
2003	549	1,516	739	24,181	1,962	2,367	460	31,774
2004	612	785	686	23,453	1,736	2,079	452	29,803
Total	6,302	22,198	11,170	547,696	76,622	52,817	7,511	724,316

Table A-5: Establishment Entry Categories by Year: Number of Workers in Establishments

Panel A: West Germany								
	ID - Change	Spin-off pulled	Spin-off / pushed	New estab. (small)	New estab. (mid&big)	New estab. (chunky)	Unclear	Total
1976	6,403	42,624	8,247	162,757	72,400	85,592	14,053	392,076
1977	7,001	43,326	11,655	137,676	59,939	86,255	11,775	357,627
1978	7,921	33,229	11,357	135,952	66,958	84,056	15,301	354,774
1979	11,168	24,982	8,948	134,857	66,874	85,265	12,690	344,784
1980	9,200	37,481	9,725	138,092	64,524	89,162	13,959	362,143
1981	9,316	35,244	11,162	127,391	55,713	81,853	12,930	333,609
1982	12,080	31,912	16,090	121,937	46,210	68,904	13,502	310,635
1983	13,292	33,616	21,938	123,630	49,994	70,408	11,617	324,495
1984	14,644	32,571	14,722	133,322	57,307	64,947	18,103	335,616
1985	12,326	25,455	15,199	128,831	55,053	68,766	16,026	321,656
1986	18,360	26,540	13,978	136,057	59,826	85,260	21,902	361,923
1987	16,515	31,366	18,645	130,509	64,070	79,249	18,806	359,160
1988	16,485	29,984	16,356	132,024	54,305	88,999	23,480	361,633
1989	13,428	44,577	17,561	132,872	58,685	87,902	24,367	379,392
1990	16,831	48,035	15,614	148,459	73,187	107,811	28,393	438,330
1991	18,443	42,995	14,650	153,191	80,299	109,335	25,106	444,019
1992	15,155	45,680	16,218	143,795	65,406	102,556	20,767	409,577
1993	19,693	66,986	27,315	141,979	62,887	109,199	29,667	457,726
1994	20,306	69,184	28,045	142,592	65,342	105,401	24,712	455,582
1995	21,514	91,419	31,324	146,835	70,045	104,450	30,809	496,396
1996	21,938	111,502	41,125	146,381	78,854	147,292	42,776	589,868
1997	29,731	99,108	31,373	140,979	71,982	112,905	28,680	514,758
1998	27,742	93,713	27,018	150,064	78,972	117,366	28,748	523,623
1999	26,200	90,773	40,274	173,692	103,573	149,096	37,289	620,897
2000	27,419	79,612	32,501	163,065	120,933	155,978	42,874	622,382
2001	32,627	82,724	36,252	152,292	101,440	178,760	41,161	625,256
2002	47,372	79,929	42,735	137,507	76,560	154,129	60,298	598,530
2003	39,406	77,663	49,841	129,536	75,292	143,321	30,873	545,932
2004	40,547	89,441	41,456	124,614	70,851	130,249	51,655	548,813
Total	573,063	1,641,671	671,324	4,070,888	2,027,481	3,054,466	752,319	1.28e+07
Panel B: East Germany								
	ID - Change	Spin-off pulled	Spin-off / pushed	New estab. (small)	New estab. (mid&big)	New estab. (chunky)	Unclear	Total
1992	1,676	84,826	28,416	177,046	368,820	140,088	7,136	808,008
1993	5,268	97,942	15,839	69,015	73,573	96,985	13,610	372,232
1994	6,995	58,419	14,058	57,836	75,365	88,210	16,480	317,363
1995	8,375	51,591	19,605	52,771	61,554	66,051	14,650	274,597
1996	7,760	68,988	17,010	44,724	45,617	89,310	14,618	288,027
1997	13,958	28,389	12,675	41,232	37,056	46,593	10,503	190,406
1998	8,658	18,842	11,896	65,364	39,076	44,724	10,816	199,376
1999	7,788	11,704	12,280	68,560	39,144	40,464	12,680	192,620
2000	9,886	15,833	10,968	45,348	31,473	38,832	10,228	162,568
2001	11,435	15,339	12,496	38,745	28,003	41,314	15,681	163,013
2002	13,731	15,132	12,657	34,541	22,709	33,743	11,728	144,241
2003	12,081	31,294	10,355	32,948	21,934	31,227	11,749	151,588
2004	14,633	15,561	9,707	29,135	19,393	27,499	10,180	126,108
Total	122,244	513,860	187,962	757,265	863,717	785,040	160,059	3,390,147

Table A-6: Establishment Exit Categories by Year: Number of Establishments

Panel A: West Germany								
	ID - Change	Takeover / Restructuring	Spin-off / pushed	Small Death	Atomized Death	Chunky Death	Unclear	Total
1975	373	807	898	70,092	5,405	4,600	391	82,566
1976	453	771	1,334	74,017	6,025	5,140	417	88,157
1977	498	824	1,186	75,222	5,339	5,036	428	88,533
1978	586	866	1,081	72,065	4,683	5,228	488	84,997
1979	602	763	1,232	77,665	5,232	5,365	516	91,375
1980	628	694	1,416	79,387	6,204	5,441	485	94,255
1981	644	767	1,761	80,768	7,503	5,233	463	97,139
1982	807	667	2,138	82,882	7,559	5,353	534	99,940
1983	842	716	1,785	83,262	6,599	5,183	568	98,955
1984	767	574	2,075	89,099	7,506	4,909	540	105,470
1985	863	700	1,875	90,329	6,963	5,692	769	107,191
1986	958	699	2,025	89,840	6,655	5,574	676	106,427
1987	974	748	1,903	89,702	6,266	5,965	729	106,287
1988	979	818	1,874	88,931	5,776	6,098	726	105,202
1989	1,042	840	1,760	90,206	5,882	6,845	883	107,458
1990	1,121	850	1,986	93,627	6,507	7,344	870	112,305
1991	1,108	936	2,170	100,218	7,187	7,519	908	120,046
1992	1,301	959	2,722	98,146	8,082	7,408	937	119,555
1993	1,345	1,072	3,030	99,534	8,815	7,575	859	122,230
1994	1,176	984	2,820	102,032	8,810	7,274	793	123,889
1995	1,127	1,127	3,075	104,628	8,668	7,097	788	126,510
1996	1,382	1,160	3,113	108,133	9,195	7,121	857	130,961
1997	1,440	1,194	3,053	110,512	8,839	7,444	926	133,408
1998	1,329	1,378	3,355	113,080	8,865	8,700	964	137,671
1999	1,402	1,451	2,768	133,369	9,064	9,192	1,211	158,457
2000	1,395	1,403	3,305	141,628	10,846	9,623	1,085	169,285
2001	1,847	1,855	3,981	156,269	12,445	9,925	1,209	187,531
2002	1,664	1,562	4,613	217,369	13,152	9,534	956	248,850
2003	1,926	1,870	4,095	157,378	11,935	8,687	1,203	187,094
Total	30,579	29,055	68,429	2,969,390	226,007	196,105	22,179	3,541,744

Panel B: East Germany								
	ID - Change	Takeover / Restructuring	Spin-off / pushed	Small Death	Atomized Death	Chunky Death	Unclear	Total
1991	106	401	825	18,233	3,809	2,340	290	26,004
1992	263	454	796	22,308	3,101	2,531	451	29,904
1993	362	508	893	23,536	3,698	2,963	496	32,456
1994	401	536	963	24,532	4,219	2,884	449	33,984
1995	440	501	1,293	25,074	4,702	2,869	406	35,285
1996	502	487	1,355	25,339	4,881	2,860	337	35,761
1997	534	514	1,448	26,139	4,840	2,817	390	36,682
1998	525	630	1,365	39,206	4,432	3,139	432	49,729
1999	551	477	1,239	46,739	4,778	2,819	394	56,997
2000	524	483	1,401	41,216	5,142	2,951	352	52,069
2001	664	590	1,396	38,955	4,719	2,839	405	49,568
2002	571	460	1,236	40,470	4,002	2,478	342	49,559
2003	623	548	1,099	38,890	3,745	2,297	411	47,613
Total	6,066	6,589	15,309	410,637	56,068	35,787	5,155	535,611

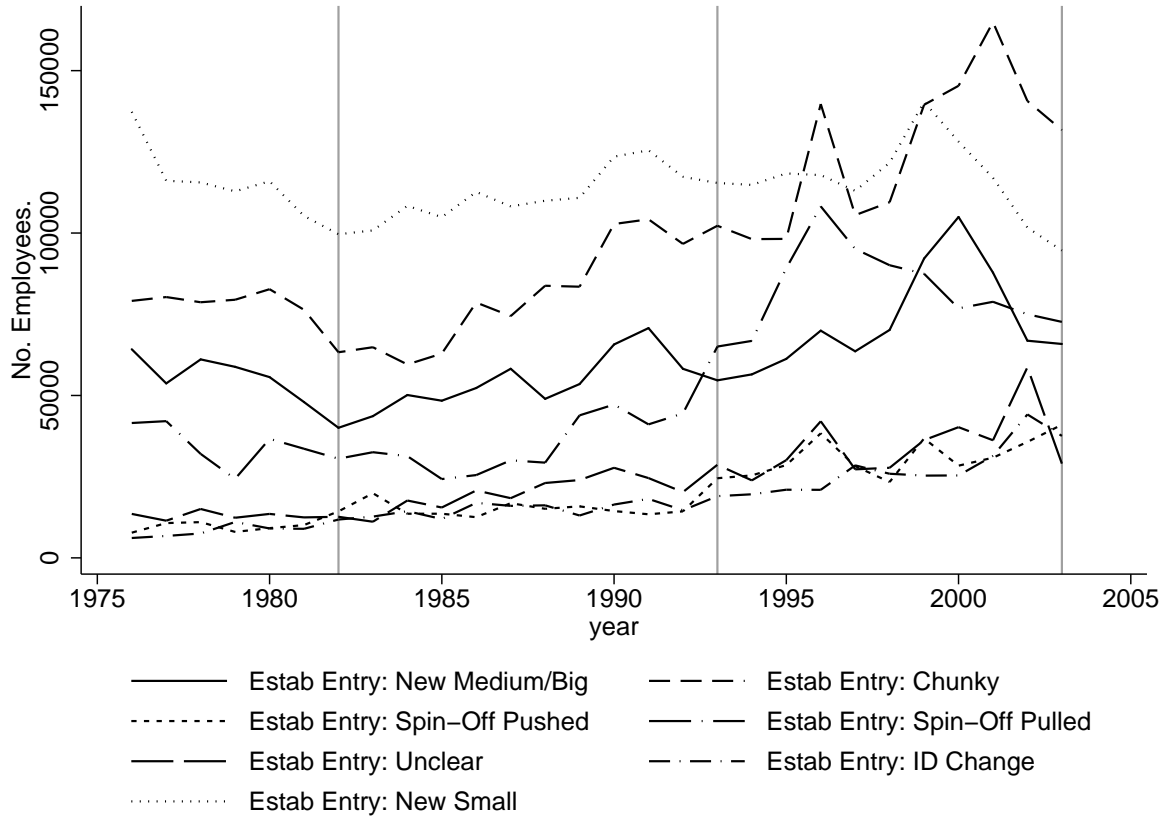
Table A-7: Establishment Exit Categories by Year: Number of Workers in Establishments

Panel A: West Germany								
	ID-Change	Takeover / Restructuring	Spin-off / pushed	Small Death	Atomized Death	Chunky Death	Unclear	Total
1975	4,323	14,367	16,213	89,376	69,221	62,744	5,864	262,108
1976	5,516	11,452	22,150	94,327	81,208	67,177	5,334	287,164
1977	6,445	15,658	21,527	94,427	60,562	62,963	6,120	267,702
1978	10,827	15,543	16,528	90,942	49,376	70,965	5,346	259,527
1979	8,766	10,631	17,872	98,735	55,008	68,459	6,640	266,111
1980	8,686	9,189	22,556	101,394	68,756	66,314	5,766	282,661
1981	10,897	15,294	32,161	104,186	90,119	60,403	5,702	318,762
1982	11,494	10,065	43,991	105,728	83,868	62,650	6,011	323,807
1983	13,887	13,388	31,186	106,061	72,259	61,893	7,366	306,040
1984	11,533	8,943	34,507	113,195	84,352	55,308	7,915	315,753
1985	14,337	12,474	29,918	114,989	74,696	64,956	10,090	321,460
1986	15,918	13,129	35,627	113,863	71,384	66,905	11,035	327,861
1987	15,128	12,690	29,703	114,162	63,023	72,690	11,460	318,856
1988	12,372	13,950	30,052	113,454	56,951	68,801	12,170	307,750
1989	16,503	13,195	25,890	115,542	63,692	81,962	14,059	330,843
1990	15,819	14,538	25,146	118,992	62,224	93,707	12,199	342,625
1991	14,316	12,759	31,882	127,342	71,788	87,569	13,461	359,117
1992	19,661	15,216	46,381	126,285	87,295	97,215	14,920	406,973
1993	19,878	17,477	52,471	128,883	98,784	99,537	14,045	431,075
1994	20,676	15,033	52,837	132,260	94,370	89,206	14,632	419,014
1995	20,570	20,831	61,725	134,562	92,855	94,315	17,701	442,559
1996	30,492	21,108	55,285	139,655	98,537	96,340	15,822	457,239
1997	24,511	21,685	49,133	143,042	88,115	98,347	13,162	437,995
1998	26,251	22,649	63,284	146,779	90,130	124,497	16,922	490,512
1999	26,248	25,135	52,002	147,071	92,078	120,617	21,182	484,333
2000	31,189	27,880	60,509	160,267	119,171	143,568	18,060	560,644
2001	47,469	34,849	75,714	175,867	140,823	145,410	30,519	650,651
2002	41,047	34,628	95,664	190,343	141,596	146,929	24,361	674,568
2003	42,181	42,515	78,223	193,138	122,998	122,366	25,715	627,136
Total	546,940	516,271	1,210,137	3,634,867	2,445,239	2,553,813	373,579	1.13e+07

Panel B: East Germany								
	ID-Change	Takeover / Restructuring	Spin-off / pushed	Small Death	Atomized Death	Chunky Death	Unclear	Total
1991	1,655	12,611	65,565	24,106	146,752	80,603	7,936	339,228
1992	4,645	11,877	27,045	29,778	50,596	60,413	8,595	192,949
1993	6,366	8,867	25,496	31,889	55,904	49,291	9,002	186,815
1994	7,843	13,940	32,057	34,196	59,088	50,124	6,707	203,955
1995	6,706	7,966	28,305	34,830	67,475	46,851	7,853	199,986
1996	12,118	6,803	28,987	35,685	65,804	39,835	5,143	194,375
1997	7,989	8,273	28,364	36,851	61,926	40,120	5,156	188,679
1998	7,609	9,449	23,799	52,531	51,288	39,312	7,234	191,222
1999	9,922	6,228	22,502	60,616	54,436	33,137	7,818	194,659
2000	11,595	8,955	25,705	54,274	56,336	40,329	5,711	202,905
2001	14,050	8,450	25,233	51,003	53,255	36,421	6,839	195,251
2002	12,780	8,399	22,260	49,027	45,496	31,526	5,925	175,413
2003	15,142	8,868	19,776	50,957	39,497	30,026	5,512	169,778
Total	118,420	120,686	375,094	545,743	807,853	577,988	89,431	2,635,215

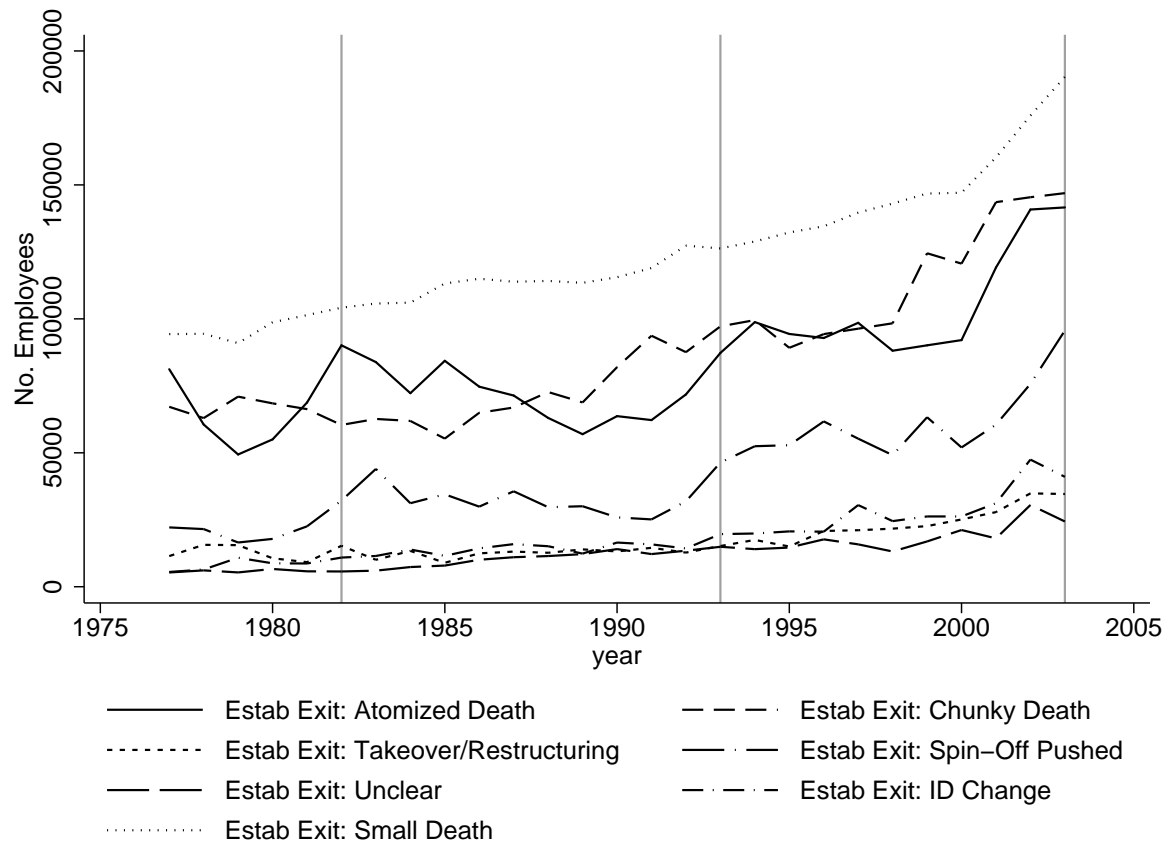
B APPENDIX FIGURES

Figure B-1: Number of Employees in each Establishment Entry Category from 1976 - 2004



Notes: The figure shows the number of employees in each of the 7 entry categories by year. Vertical lines indicate recession years. Data: Establishment History Panel.

Figure B-2: Number of Employees in each Establishment Exit Category from 1976 - 2004



Notes: The figure shows the number of employees in each of the 7 exit categories by year. Vertical lines indicate recession years. Data: Establishment History Panel.

Figure B-3: Business Cycle Indicators 1976 - 2004

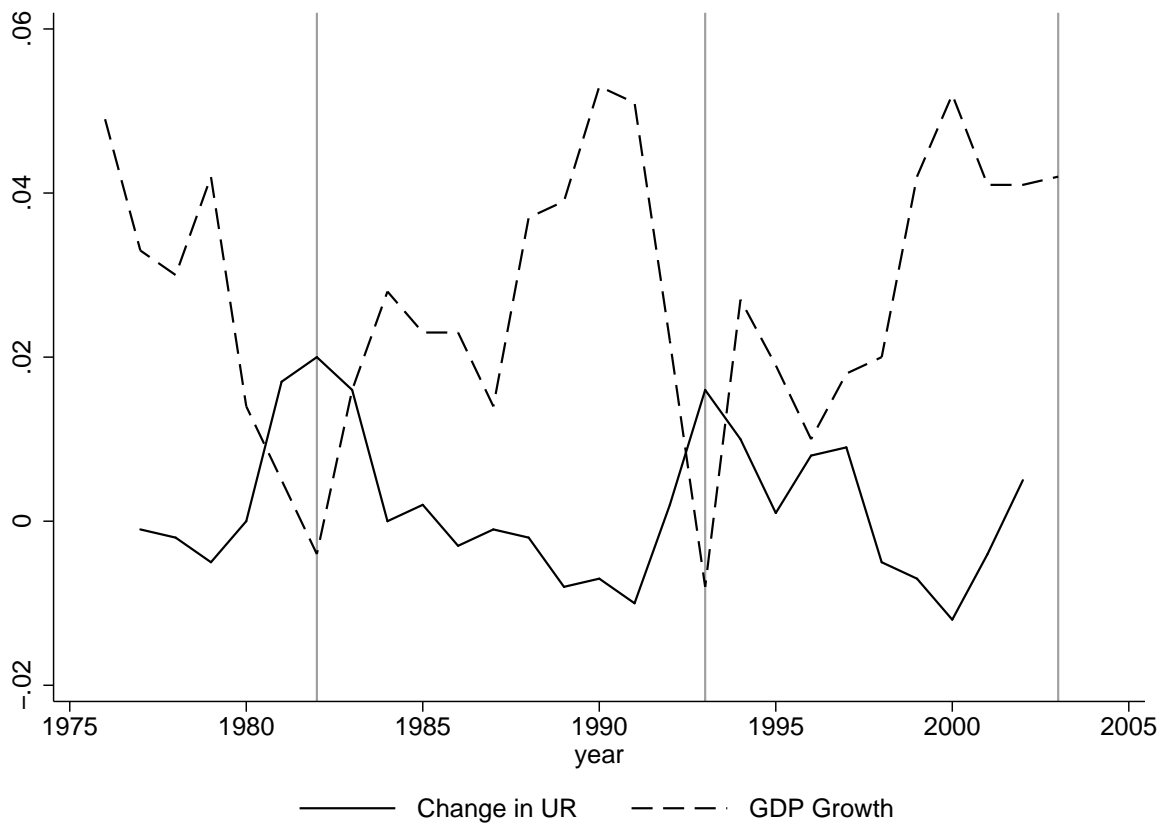
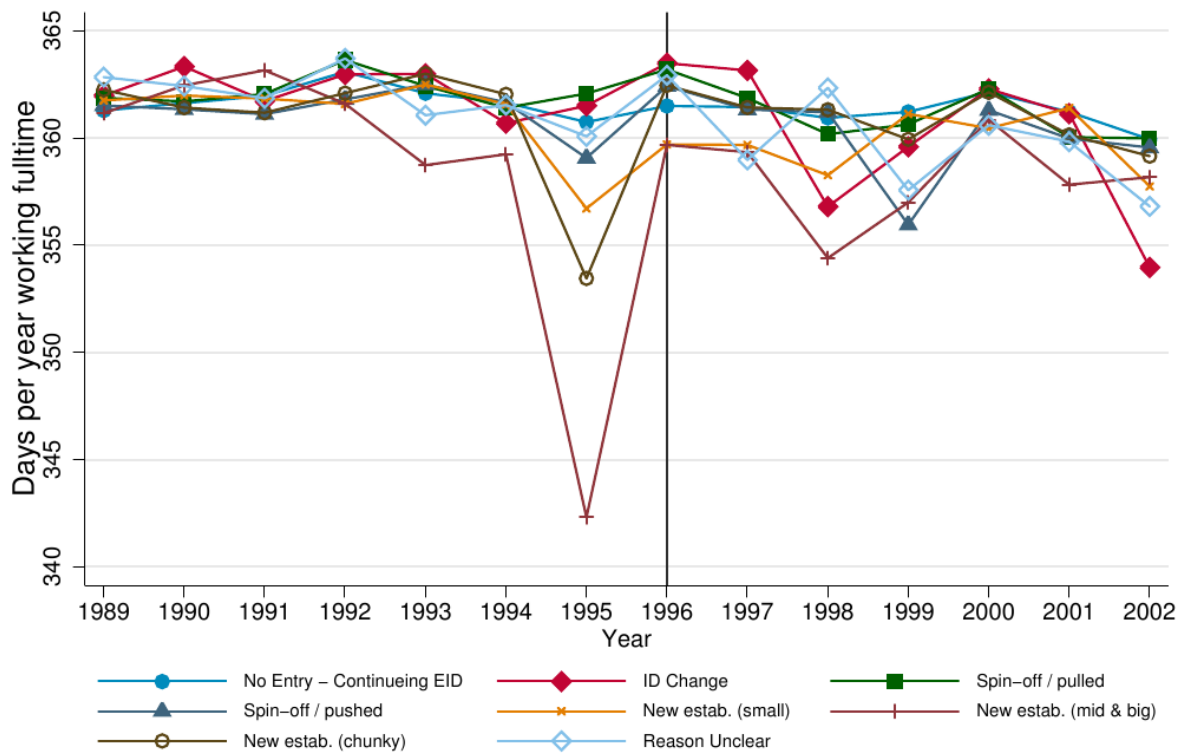
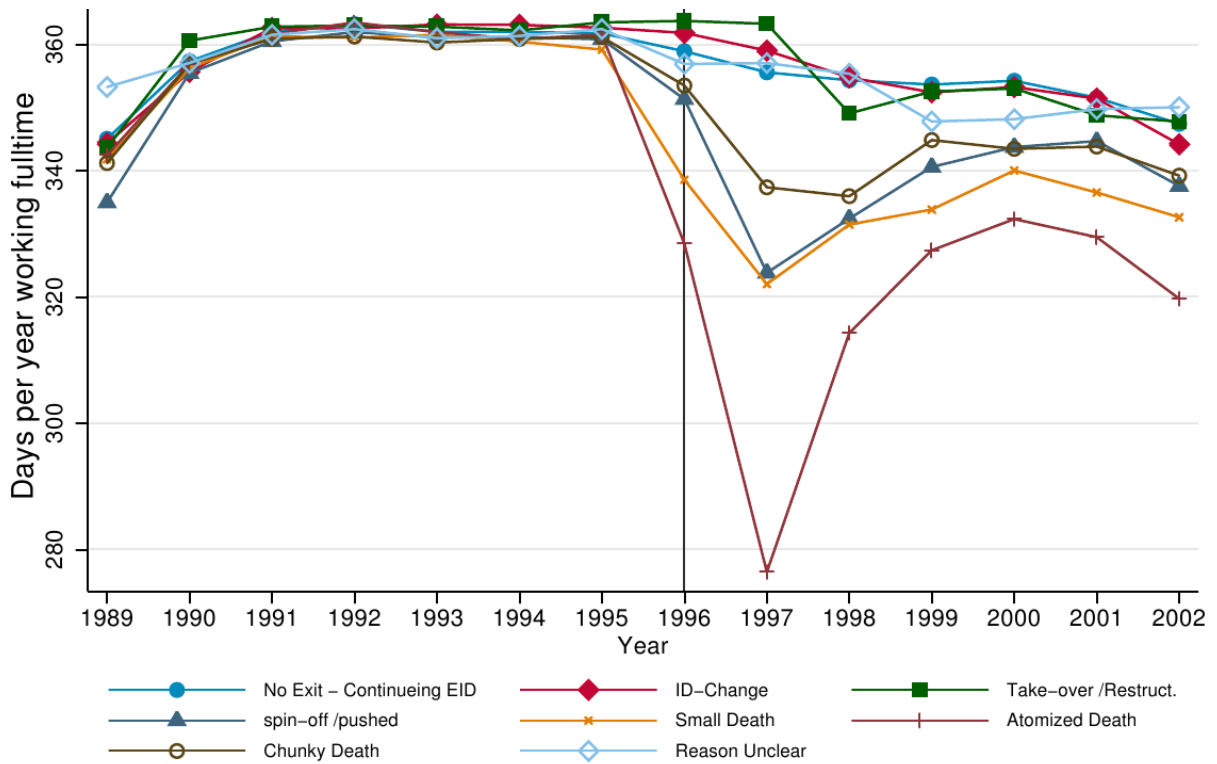


Figure B-4: Days Employed of Workers in Entering Establishment IDs by Establishment Entry Classification



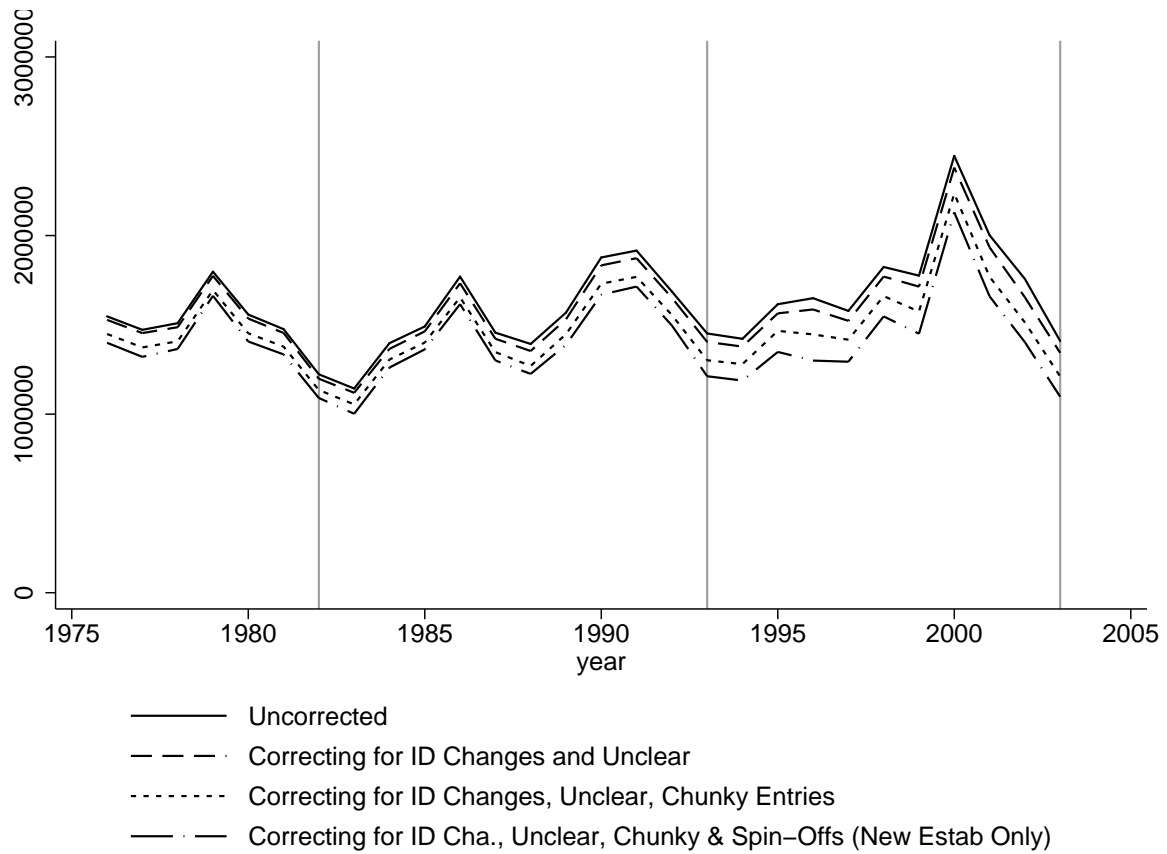
Notes: The figure shows number of days working in the respective year for workers who were employed in establishments with new EIDs in 1996. Each line corresponds to a different EID entry category in 1996. Data: Establishment History Panel.

Figure B-5: Days Employed of Workers in Exiting Establishment IDs by Establishment Exit Classification



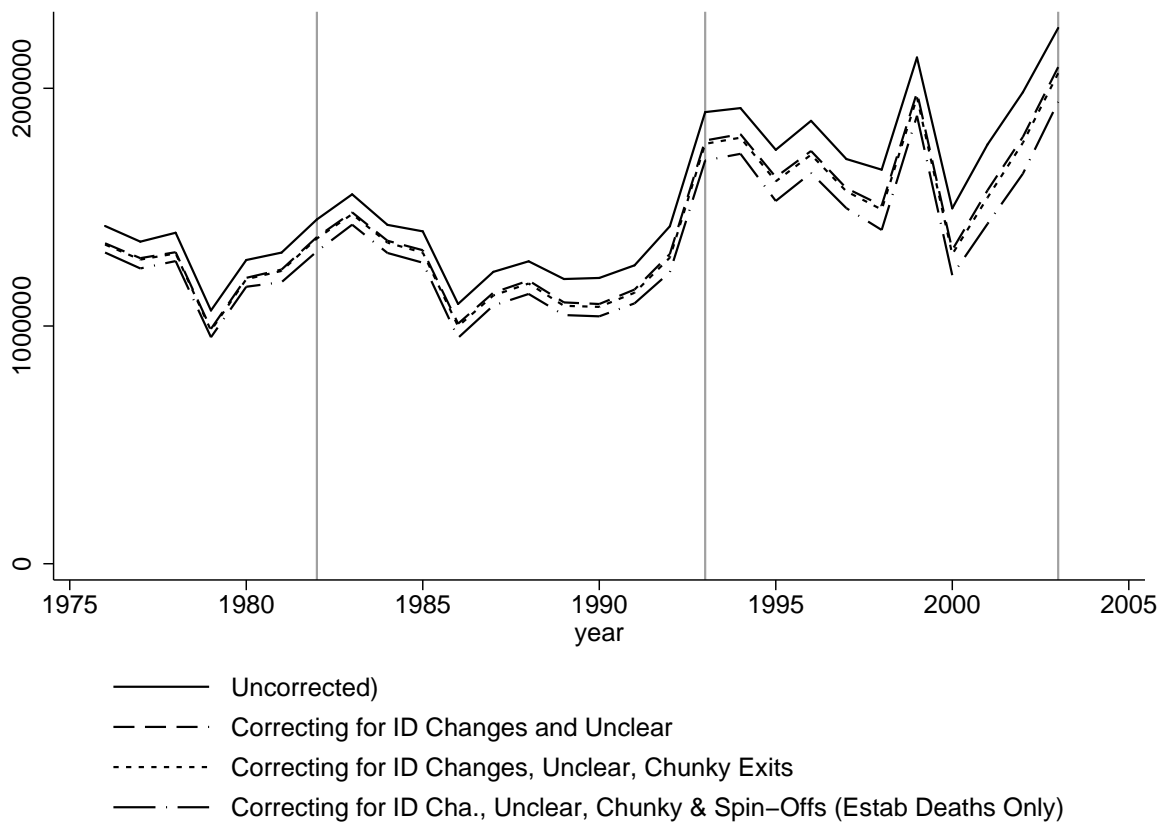
Notes: The figure shows number of days working in the respective year for workers who were employed in establishments with exiting EIDs in 1996. Each line corresponds to a different EID exit category in 1996. Data: Establishment History Panel.

Figure B-6: Correcting Total Job Creation Measures for Spurious Entries



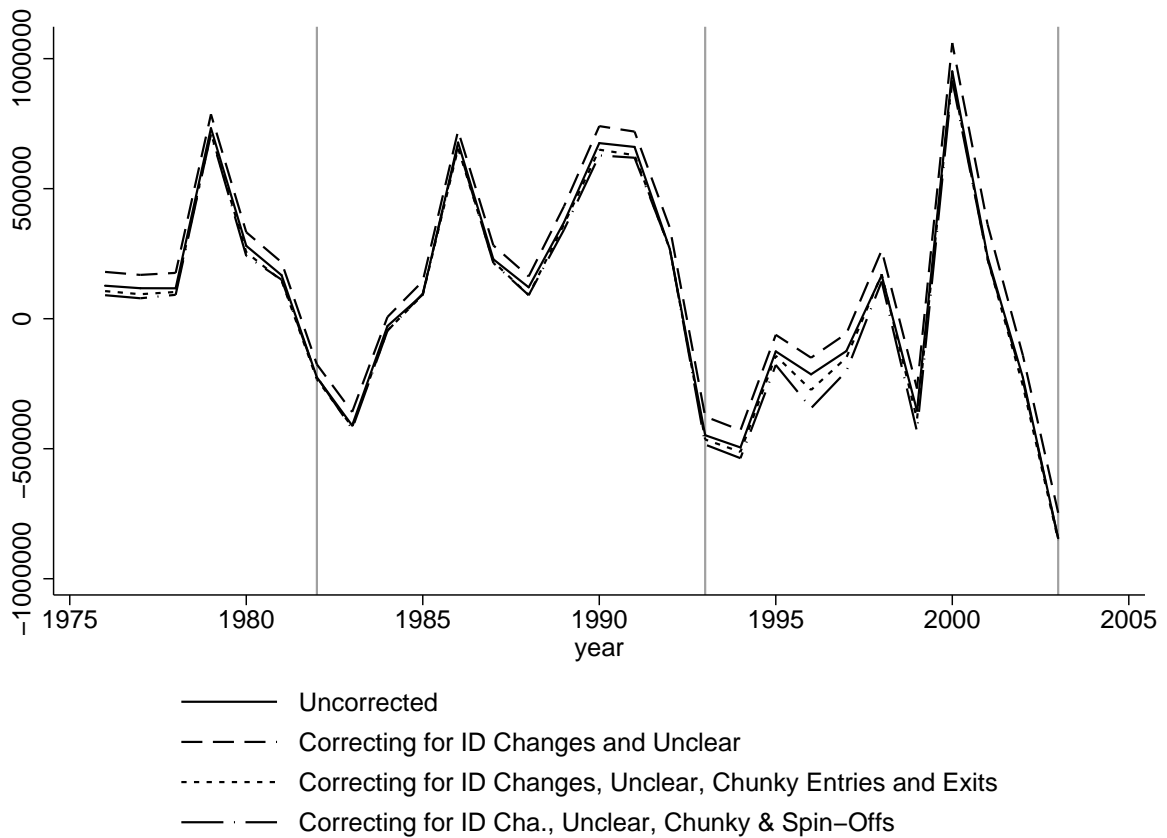
Notes: The figure shows corrected and uncorrected measures of total job creation by year. Vertical lines indicate recession years. Data: Establishment History Panel.

Figure B-7: Correcting Total Job Destruction Measures for Spurious Exits



Notes: The figure shows corrected and uncorrected measures of total job destruction by year. Vertical lines indicate recession years. Data: Establishment History Panel.

Figure B-8: Correcting Total Net Job Creation Measures for Spurious Entries and Exits



Notes: The figure shows corrected and uncorrected measures of net job creation by year. Vertical lines indicate recession years. Data: Establishment History Panel.