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DISCUSSION PAPER

// ENRICO DE MONTE, THORSTEN DOHERR, JAKOB EHLICH,
LENA FÜNER, SANDRA GOTTSCHALK,
SIMONA MURMANN, AND HANNA HOTTENROTT

The ZEW Mannheim Enterprise Panel for the Analysis of Longitudinal Business Dynamism (MUP–LBD)

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Enrico De Monte,¹ Thorsten Doherr,¹ Jakob Ehlich,¹ Lena Füner,^{1,2,3} Sandra Gottschalk,¹
Simona Murmann,¹ and Hanna Hottenrott^{1,2}

¹ ZEW – Leibniz Centre for European Economic Research, L7 1, 68161 Mannheim, Germany

² Technical University of Munich, Arcisstraße 21, 80333 Munich, Germany

³ Institute for Employment Research (IAB) of the German Federal Employment Agency (BA), Regensburger Strasse 104,
D-90478 Nuremberg

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Abstract

The ZEW Mannheim Enterprise Panel for the Analysis of Longitudinal Business Dynamism (MUP-LBD) is a comprehensive micro database of businesses observed in Germany, covering the period 2000–2023 and comprising about 8.7 million active business units. The database encompasses all types of businesses — from very small sole proprietors to large corporations — including both those registered at the commercial business register and those that are not. We describe the data sources, the processing steps required to construct a longitudinal research dataset, and the measurement of business entry and exit. The MUP-LBD further contains information on businesses' industry affiliation, geographic location, employment, and turnover. Based on this data, we document key facts on business dynamism in Germany, including declining entry rates, rising exit rates, a shrinking employment share of young firms, and structural shifts across sectors. By making these data accessible to researchers, we aim to foster a better understanding of the ongoing transformation of the German economy.

Keywords: Longitudinal business-level data, business entry, business exit, firm age, firm size

JEL Classification: C08, L26

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¹Corresponding authors: Enrico De Monte (enrico.demonte@zew.de), Jakob Ehlich (jakob.ehlich@zew.de), Lena Füner (lena.fuener@zew.de), Sandra Gottschalk (sandra.gottschalk@zew.de), Hanna Hottenrott (hanna.hottenrott@zew.de), Simona Murmann (simona.murmann@zew.de).

1 Introduction

The ZEW Mannheim Enterprise Panel for the Analysis of Longitudinal Business Dynamism (MUP-LBD) is the most comprehensive micro database of companies in Germany outside of official business statistics produced by statistical offices. The source data have been provided by *Verband der Vereine Creditreform e.V.*, Germany's largest and oldest credit rating agency, as part of a long-standing collaboration between *Creditreform* and the ZEW — Leibniz Centre for European Economic Research. Through this ongoing collaboration with *Creditreform*, a deep understanding of the data-generating process has been developed, enabling us to construct a longitudinal panel of data on business activity for research purposes – commonly referred to as the ZEW Mannheim Enterprise Panel (MUP, or sometimes MEP).

The MUP-LBD, which, compared to the MUP, comprises explicit measures of relevant businesses' year of entry and exit, is inspired by the United States' *The Longitudinal Business Database (LBD)* (Jarmin and Miranda, 2002; Chow et al., 2021), with which the US Census Bureau has set high standards for firm-level databases. In fact, especially in the US, the accessibility to the LBD has allowed researchers to better understand the changing business environment, i.e. the driving forces behind business entry and exit and the resulting dynamics in terms of job growth and destruction. Ultimately, this also led to a complete set of policy recommendations towards a prospering, adaptable, and innovative business environment.² Other European countries, such as France and especially the Scandinavian countries, made administrative business-level data likewise accessible to research. Instead, Germany significantly lags behind in terms of accessibility to detailed business-level data, and, as a result, research and knowledge on business dynamism and its effects on the German economy are substantially underdeveloped. Importantly, as research in the field has demonstrated, only the accessibility to *exhaustive* databases that also capture small businesses enables one to fully understand a changing business environment, as small businesses typically create disproportionately more jobs compared to incumbent, larger companies (Haltiwanger, Jarmin, and Miranda, 2013).

The motivation for creating the MUP-LBD is, therefore, to enable and foster research on the transformation of the German economy over the past few decades, by offering an exhaustive and detailed dataset that documents the life cycle of companies located in Germany.³ The data contains measures of year-to-year changes in private-sector entrance and exit of business activity, within and across geographic locations and industries, and provides information for very young and small businesses. The unstructured raw data transmitted by *Creditreform* to ZEW requires extensive pre-processing for rendering the data useful for research purposes. Specifically, only by constructing a longitudinal panel business database, which comprises the most fundamental information on company characteristics, can we build the MUP-LBD to enable researchers to investigate relevant business units over their life cycle. The observational unit in the MUP-LBD refers to any legally independent business unit based in Germany, i.e., a single company (or business), to which *Creditreform* assigns the so-called *crefo* identification number, which is tracked over time. Covering the period from 2000 to 2023, in the MUP-LBD, a total number of about 8.7 million active legal business units are observed, translating into an average of about 3.9 active units per year.

It is worth mentioning that, at this stage, specific businesses observed in the data are not enhanced with ownership relations with other observed units. More specifically, while legally independent, a company with an

²See, for instance, studies in the field of business dynamics related to i) firm and job growth (Haltiwanger, Jarmin, and Miranda, 2013; R. Decker et al., 2014; R. A. Decker et al., 2016; Sterk, Sedláček, and Pugsley, 2021), ii) productivity growth (R. A. Decker et al., 2017; R. A. Decker et al., 2020), iii) innovation (Arora, Belenzon, and Sheer, 2021; Akcigit and Goldschlag, 2023; Akcigit and Ates, 2023), iv) market power (De Loecker, Eeckhout, and Unger, 2020), and v) demographic changes and migration (Azoulay et al., 2022; Karahan, Pugsley, and Şahin, 2024).

³The MUP-LBD is accessible for external researchers in a factually anonymized form of Scientific Use Files at the ZEW Research Data Center (ZEW-FDZ). In addition to the usage of these Scientific Use Files, external researchers have the opportunity to work with formally anonymized data within FDZ premises at ZEW on request. Formally anonymized data sets contain neither names nor addresses, but all other original variables. ZEW also provides a secure remote access connection via the bwCloud. The ZEW-FDZ has been accredited by the German Data Forum (RatSWD). The use of its data is limited to noncommercial research projects. More information on the ZEW-FDZ can be found here: <https://www.zew.de/zew-forschungsdatenzentrum>. Interested data users can also contact the ZEW-FDZ via E-mail: fdz@zew.de.

individual identification number might be entirely owned by a parent company. Even though the raw data provided by *Creditreform* allows, to some extent, to conduct profiling – that is, to detect firm clusters, in which a set of legal units belong to the same enterprise – the MUP-LBD presented here is unstructured in this respect and, hence, does not claim to provide a profiled firm-level dataset. Instead, we aim to build a business panel of all relevant legal units active in Germany, allowing researchers to conduct further research based on aggregations of the data. We will describe the nature of the data, as well as available information allowing us to measure both the year of creation (entry) and cessation (exit) of the observed legal businesses.⁴

In this paper, we provide empirical evidence derived from the MUP-LBD comprising the following facts:

- The entry (exit) rate decreases (increases) over the time period considered, from about 7% (3%) in 2000 to about 5% (7%) in 2023.
- As a consequence, the stock of active firms drops from 3.6 million (2000) to 3.3 million (2023).
- The number of businesses registered at the German business register increases from about 1.2 million businesses to about 1.7 million businesses.
- Both the number of active young businesses (with an age up to five years) and the aggregate employment share of young businesses decrease over time from about 15% (2000) to about 10% (2023).
- The share of businesses belonging to the manufacturing sector has decreased between 2000 and 2023 from about 8% to 6.5%, which translates into a decrease in the manufacturing sector’s share of employment, from about 25% (2000) to about 19% (2023).

Finally, the MUP-LBD will not only be invaluable to researchers as a stand-alone dataset but is intended to be used in conjunction with other data. This is extremely important for studying business dynamism in relation to other fields. In Germany, linking different administrative and exhaustive data sources – such as worker-level employment data and firm-level tax data – represents, so far, an almost impossible challenge because of strict data protection regulations. The ZEW data infrastructure, with the MUP-LBD at its center, aims to improve this situation. In particular, by establishing the linkage of the MUP-LBD to other internal data, such as the Mannheim Innovation Panel (MIP) and the MUP-ownership data, as well as to external data, such as the linkage with administrative establishment-level data observed and processed by Germany’s Federal Employment Agency (BA) and its Institute for Employment Research (IAB), and the linkage to patents registered at the European Patent Office (EPO).⁵ Existing linkages of the here-presented MUP-LBD to other data sources will be discussed in detail below.

The remainder of the documentation of the MUP-LBD is organized as follows: Section 2 provides information on the source data and initial processing to establish a longitudinal database with a set of fundamental variables. Section 3 presents the construction of the MUP-LBD and provides a set of aggregate statistics resulting from the presented metrics of business entry and exit. Section 4 discusses the link between the MUP-LBD and other internal and external datasets. Finally, Section 5 concludes.

2 Source data and pre-processing

2.1 General information

The source data is provided by the German credit rating agency *Creditreform*. The agency’s purpose is to deliver relevant information on the financial background of specific companies upon request to their clients. For example, a newly created company applies for a loan at a bank, which, in turn, will potentially contact *Creditreform* to

⁴There exist older documentations as well as numerous reports based on business-level data provided by *Creditreform* and processed by ZEW. See, for instance, Almus, Engel, and Prantl (2000), Egel et al. (2002), Bersch, Gottschalk, et al. (2014), Bersch, De Monte, et al. (2021), De Monte, Kann, et al. (2022), De Monte, Ehlich, and Gottschalk (2025) and Gottschalk (2025).

⁵This data infrastructure is currently being further developed in a collaborative research project between ZEW and Halle Institute for Economic Research (IWH), funded by the Leibniz Association (Leibniz Collaborative Excellence K525/2023).

obtain information on the company's financial standing. *Creditreform* pursues different ways to collect information on a company's business activities. An important source of information is the commercial business register (Handelsregister), which, since 2008, has been scraped electronically. However, since not all companies are required to register, *Creditreform* also collects information on companies' activities through its own research. This involves conducting web searches and extracting information from print and online media, as well as utilizing information from reports provided by companies' business partners. In doing so, the agency gathers a wide range of information on companies' activity: date of creation, sector of activity, financial information, information on bankruptcy and insolvency proceedings, sales, employment, as well as ownership information and activities related to merger & acquisition (M&A) activities; Thereby, *Creditreform* seeks to track all kinds of businesses, from very small companies such as freelancers or self-employed individuals, to medium-sized and large companies, listed on the commercial register. Any observed legally independent business activity becomes assigned a so-called crefo identification number, a longitudinal identification number that will be tracked from the moment of initial registration.

As the data provided by *Creditreform* are not purely administrative in nature, the observed units are not legally required to regularly provide presumably correct information on their business activity. As a consequence, the variables contained in the source data are not always updated at the same frequency and are more prone to measurement error. This is particularly the case when it comes to the reported number of employees and turnover. Moreover, information on some companies might be updated more regularly, such as those registered in the commercial business register and those that are more actively engaged with other companies and institutions.

An additional consideration in the data generating process is the organization of *Creditreform* itself. The agency's structure is decentralized, with local branches collecting data on business activity within a specific geographic area in Germany. As a consequence, at the borders of these regions, two adjacent local branches might collect data on the same business unit, which can lead to duplicate entries in the database. Namely, the same company gets assigned multiple identification numbers. The issue is more pronounced in the early 2000s than in the last 10 years, since the agency's data collection has been improved to disambiguate the observations in this respect. We will address this issue in more detail below.

2.2 The MUP: a longitudinal year-by-year business database

ZEW receives the crefo identifiers from *Creditreform*. In the process, it is necessary to consider that each data transmission contains information on both currently active legal business units (with potentially updated values of specific variables) and those that have ceased their activity but remain part of the *Creditreform* database. Overall, there is information on more than 16.7 million observed legal business units (of which some also belong to foreign countries).⁶

To construct the exhaustive MUP year-by-year panel of the transmitted information, we track each crefo ID over time in terms of the most important variables (i.e., sector of activity, legal form, employment, turnover, etc.). More precisely, in the raw data, there are two types of time-varying variables: Type I are variables accompanied by a specific date of reference. Examples include the values for the number of employees and annual turnover, which are both provided with a reference date/year and are used to appropriately assign the information within the MUP database. Type II variables are those without a specific reference date, such as variables containing information on companies' industry affiliation and legal form. For this type of variable, we track changes by comparing the transmitted information over time. In terms of businesses' industry affiliation, for example, there are two reasons for industrial affiliation to be changed by *Creditreform*: Firstly, because the company shifted its activity towards another industry, or secondly, because a new classification scheme was implemented. The latter case is very prominent in 2008 (NACE Rev. 2), where we observe a change in the NACE codes for almost all observed businesses. The MUP maintains a similar structure, in that each observation represents a change in one

⁶ZEW uses the MUP as the basis for sampling several business surveys such as the Mannheim Innovation Panel (MIP, which is the German part of the Community Innovation Survey (CIS), see Section 4.1.3), the IAB/ZEW Start-up Panel (see Section 4.2.2), as well as for the construction of the linked MUP-BhP data, described in Section 4.2.1.

of the relevant variables as reported by *Creditreform*. This allows us to keep the panel small in terms of memory size. Hence, the pre-processing of the data consists of creating a dataset on the history of changes of all relevant variables.⁷

Another important aspect of the panel consists of summarizing complex information into simpler longitudinal indicators. More specifically, the raw data transmission contains various indicators on the status of activity of a company, that is, whether it has ceased its activity, whether it is subject to ongoing insolvency procedures, or whether it is engaged in an M&A event, or whether it has been identified by the agency to be a duplicate. We combine all available status information into a single time-varying status variable, which is then used to measure the date of exit for a given unit. Appendix A.1 describes the variables contained in the panel, such as date of foundation, industrial affiliation, geographical location, as well as revenues, number of employees, and the above-mentioned status variable.

In the following, we turn to the MUP-LBD, which aims at defining the life-cycle, i.e., the businesses' year of entry and exit, over the covered period.

3 The MUP-LBD

The longitudinal year-by-year database of German business activity (MUP) excludes any observed unit, whether it is still active or not, which is why it results in a larger panel of more than 16.7 million observed business units. The MUP-LBD is constructed from this panel but includes only economically relevant business units located in Germany, necessitating further data manipulation, which we describe below. Further, the MUP-LBD consists of cross-sections, covering the period 2000–2023, each containing all considered active business units up to their specific year of exit. More specifically, the MUP-LBD, contains an explicit measurement of the year of business entry and exit, which is derived from the information contained in the longitudinal panel described above. Especially, a business exit is not always obvious. More precisely, while the status of activity measured in the MUP panel already contains an indicator about business exit, for many businesses, especially those not registered at the business register, the indicator does not contain any information, even when such businesses are very likely to be inactive. We show how to treat the data to deal with ambiguous cases to generate a plausible stock of active businesses. The most important information contained in the MUP-LBD when it comes to quantifying dynamics is the available dates on the birth and death of legal business units. Other contained variables, such as companies' industrial affiliation, geographical allocation, employment, and turnover are, of course, of fundamental importance, too, for investigating heterogeneity of business dynamism in various dimensions.

3.1 Construction of the MUP-LBD

To construct the MUP-LBD, we filter the raw data provided by *Creditreform* with regard to the following:

1. We exclude businesses (crefo ids) not registered at the businesses register if there is never any update after that initial observation.⁸
2. We exclude all businesses identified in the source data as duplicate records at any point in time.⁹

⁷Hereby, the first observations in this panel dates back to 1970 (occurring if, for instance, *Creditreform* entered a specific value of employment or turnover to a period in the very past). However, it was not until the year 2000 that the agency started to exhaustively collect information on all businesses in Germany. Statistics based on the MUP-LBD presented in the next section, cover the period 2000–2023. The database is updated once per year. Although the analysis presented here covers data only through 2023, the dataset generally includes observations for all years up to the year preceding the current calendar year.

⁸Registered businesses are not concerned from this cleaning procedure as deregistration from the register ultimately excludes them. The exclusion of these units is important because for many such businesses, there is no information available on the cessation of activity. If not treated appropriately, this would lead to the inclusion of many economically irrelevant business units that had most likely already ceased operations before the year 2000.

⁹This information is provided by the variable `crefo_status`, indicating if an observed business unit has been identified by *Creditreform* to be a duplicate. For more information, see Section A.1.2 and in particular Table A2.

3. We only consider businesses with a physical presence in Germany and exclude businesses that belong to foreign regions.
4. We identify the year when businesses exit and exclude unit-specific observations thereafter (given exit). Specifically, some businesses' year of exit will be identified before 2000, which are consequently excluded from the MUP-LBD. See Section 3.3 for more details.

This cleaning procedure yields a set of about 8.7 million unique crefo id's observed as being active in the MUP-LBD throughout the period 2000–2023. See Appendix A.2 for more detailed information on the cleaning procedure that constructs the MUP-LBD. In the following, we describe the measurement of business entry and exit and show some resulting descriptive statistics.

3.2 Measurement of business entry

We use the terms firm birth, new business formation, and firm entry interchangeably. From the variable `gr_jahr`, which identifies the year of entry, we construct a binary variable (0/1) indicating whether a company entered. Companies active during the sample period, 2000–2023, that are not provided with any date of foundation have most likely been founded long before the covered period starts. Generally, a business can be founded some time before it becomes registered at the commercial business register. When investigating entry dynamics for registered companies only, we use a business unit's first year of being registered at the commercial business register as the date of foundation, which is also provided in the source data.

3.3 Measurement of business exit

Compared to companies' year of entry, measuring the year of exit is more complex. This is because at the end of a company's life cycle, information on its activity often becomes scarce or is only reported with some lag. To determine the date of exit, we make use of the variable `crefo_status`, described in Section A.1.2, which summarizes all available information on a company's current status of activity. Three different types of cessation of activity can be distinguished:

- **regular** cessation of activity (with no specific reason)
- cessation of activity by **insolvency**,
- cessation of activity by an **M&A event**.

Moreover, companies might disappear from the data without any signal of cessation of activity. We call this case cessation of activity by **non-report**. For some companies, especially those that are not required to register at the commercial business register, we do not observe any updates in relevant variables for several years. Especially for very small businesses and micro-enterprises, which do not engage in larger economic activity (in terms of investments and loans), *Creditreform* conducts only a few or irregular inquiries, leading to observational gaps in the data or simply to no further observations from a specific moment on, since there is no change in any relevant variable being reported. Therefore, we also make use of the observed duration of non-reporting information in the most important variables to identify the year of exit. Generally, to identify the year of exit for businesses, we first separate all business units into two groups: those registered in the business register and those not.

We first describe the identification of business exit registered businesses, which is schematically depicted in Figure 1. For `crefo` ids referring to registered businesses, the data provided by *Creditreform* contains both the date of first registering at the business register - usually the moment of registering at the District Court (Amtsgericht) - and the date of the last entry at the business register - which usually indicates some corporate changes or a deregistration. If the `crefo\_status` variable of a specific `crefo` id indicates cessation of activity, we set the year of exit of registered businesses to the year of its last entry at the business register (see the left branch of Figure 1).¹⁰

¹⁰It is possible that the year at which the status variable of activity reports cessation of activity differs from the year of last

There exist `crefo` ids of registered business units, however, for which the `crefo` status variable never reports any cessation of activity despite the fact that we do not observe any update in any relevant variable (here employment and turnover) over a longer time span. To capture the exit of those business units, we proceed as follows (see the right branch depicted in Figure 1). Those registered businesses for which either turnover or employment was reported at least once during the observed period (indicated in Figure 1 by “reported obs. once”), but which are not reported for a longer period with out any update in one of the two variables we set the year of exit to the minimum between the year of last observation and the year of last entry at the business register.¹¹ In the case in which neither turnover nor employment is never reported at any point in time (indicated in Figure 1 by “never reported obs.”), we simply use the year of the last entry at the business register to identify to year of exit (as long as the last entry at the business register was reported at least five years before the most current year in the data base (2024)).¹² Thus, companies registered for the first time within the sample period will be considered active up to five years after registering, if no other indication of cessation of activity.¹³

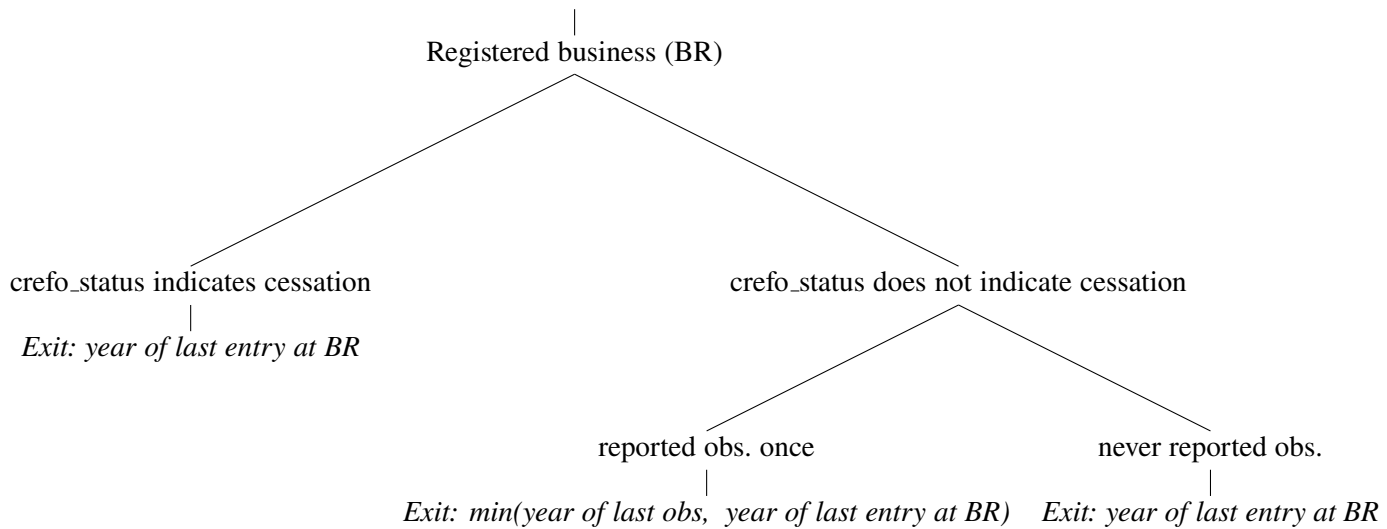


Figure 1: Measurement of exit of registered businesses

Consider now the measurement of business exit of non-registered businesses, depicted in Figure 2. Compared to registered businesses, the difference in the identification of business exit for non-registered businesses consists in the fact that we cannot here rely on the information of the last entry at the business register. More precisely, we can only measure exit by the variable `crefo\_status` as well as by the duration of non-report in the crucial variables employment and turnover. Hence, whenever the status variable indicates cessation of activity, we set the

entry at the business register. More specifically, in some cases, the *Creditreform* internally reports a business exit before the last entry in the business register, which might be the case if the agency was aware of the cessation of activity through its own research prior to the actual deregistration at the business register. It also happens, however, that the year of cessation of activity reported by the status variable lags some years behind the last entry at the business register, which indicates that *Creditreform* detects business exit only with some lag.

¹¹More precisely, consider the case of a registered business unit for which the year at which the last time either employment or turnover is reported is the year 2015. At the same time, the last entry at the business register is reported to be 2018. The year of exit by “non-report” would be set to the year 2020 (five years after the last observation in employment or turnover), while the year of last entry at the business register, given by 2018, allows us to conjecture as being most probably the year of (undetected) deregistration. To assign the year of exit, we take the minimum between the year of non-report and the year of last entry at the business register. In this example, the year of exit is, hence, set to 2018.

¹²For example, consider the case of a registered business unit that never reports any value in employment and turnover and which was first registered (and founded) even before the sample period, but whose last entry at the business register was reported to be in 2015. Then, the year of exit would likewise be set to the year 2015 since this year most likely represents the year of deregistration. If, instead, the last entry was reported in 2022, we would not assign any year of exit, because of the condition of at least 5 years between the year of last entry and the most current year in the database.

¹³Some registered units only appear in a single year in the data, without any time series in employment and turnover. Given such units that were first registered in the sample period, say, in 2000, we consider them active for a maximum of five years.

year of exit to the year the status variable reports for the first time cessation of activity. Those `crefo` ids for which at least once either turnover or employment was reported (during the sample period), we consider them to be active for a maximum of five years after the last observation in one of the two variables. Instead, those non-registered businesses that never report employment or turnover and for which there is never reported cessation of activity by the status variable, we only consider them to be active for a maximum of five years, as long as their year of foundation lies within the sample period.¹⁴

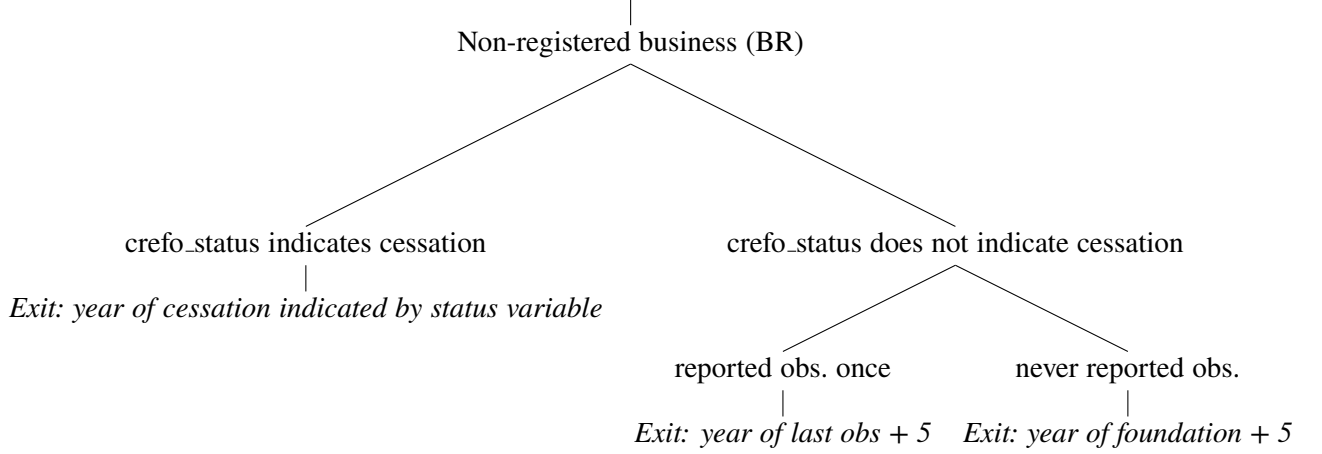


Figure 2: Measurement of exit of non-registered businesses

3.4 Descriptive aggregate statistics

In the following, we present results at the aggregate level, based on the above-described measurement of business entry and exit. The results not only provide information on the evolution of the number of active businesses, driven by the ongoing process of entry and exit, but also allow for gaining insights into further information provided in the MUP-LBD, such as turnover, employment, and businesses' industrial and geographical classifications.

Let $e_{nt} \in \{0, 1\}$ denote the variable indicating business entry. A new business formation at t (year) is then indicated by $e_{nt} = 1$ and zero otherwise. Analogously, let $x_{nt} \in \{0, 1\}$ denote the variable of business exit, where $x_{nt} = 1$ denotes the year at which the individual business is measured to cease its activity. To build aggregates, we rely on these definitions, where the total number of business entrants and the total number of ceased business activity in a given year are counted by

$$E_t = \sum_{n \in \mathcal{N}_t} \mathbf{1}_{[e_{nt}=1]} \quad \text{and} \quad X_t = \sum_{n \in \mathcal{N}_t} \mathbf{1}_{[x_{nt}=1]}, \quad (1)$$

respectively, where $\mathbf{1}$ is an index variable equal to 1 if the condition in parenthesis is fulfilled. According to this notation, a business n is considered to be active until the year of exit, i.e. $x_{nt} = 1$ and $n \in \mathcal{N}_t$, where $\mathcal{N}_t$ denotes the set of active business at t and N_t the total number of active businesses.

3.4.1 Stock of businesses, entry and exit rates over time

At the aggregate level, the evolution of the stock of active companies is formally described by the identity given by

$$N_t = E_t + N_{t-1} - X_{t-1}, \quad (2)$$

¹⁴That is, `crefo` ids that are reported to be founded before the sample period and that are never reported with non-missing values in either employment or turnover are excluded from the MUP-LBD.

where the current total number of active businesses is determined over time by the number of active businesses of the preceding period, the number of entrants of the current period, and the number of exiting companies of the preceding period.

Figure 3 shows the evolution of the stock of active companies, considering all companies (solid line) and only those registered at the official commercial business register (dashed line). The stock of all active companies increases between 2000 and 2009 from about 3.6 million to about 4.2 million. Thereafter, the stock of active businesses decreases to about 3.2 million companies in 2023. In contrast, the number of active companies registered at the business register increases steadily from 2000 on, from about 1.2 million to 1.7 million in 2023. The stock of businesses includes all types of legal forms, such as sole proprietorship, liberal profession, partnerships, corporations, and associations with or without employees. See Appendix A.1.6 for more details.

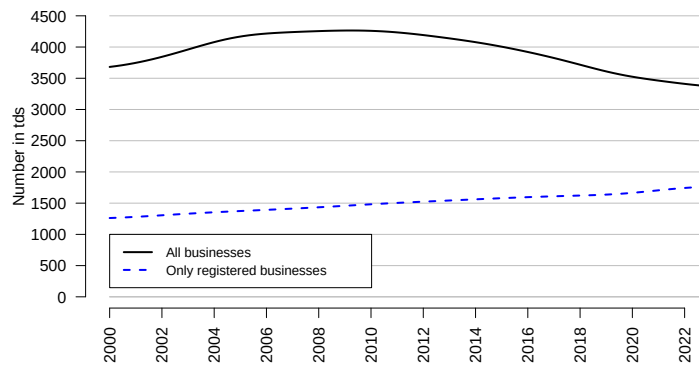


Figure 3: Evolution of the stock of active companies

As formalized in equation (2), the dynamic process of entry and exit drives the stock of active companies over time. To obtain more insights, we compute the aggregate entry and exit rate by $\mathcal{E}_t = E_t/N_t$ and $\mathcal{X}_t = X_t/N_t$, respectively. The statistics are computed, including all businesses and only for those registered at the business register. To compute entry and exit rates for the subgroup of registered companies, that is in line with equation (2), it is necessary to assign companies' year of foundation as being the year of first registering at the business register (which we observe in the data).¹⁵

Figure 4 reports the results, on the left-hand side the entry and exit rates for all businesses, and on the right-hand side the same statistics for only those businesses registered at the business register. Across all businesses, the entry rate exceeds the exit rate until 2009, leading to an increase in the total number of active companies, as shown in Figure 3. Thereafter, the exit rate exceeds the entry rate, which leads to a steady decline in the stock of active companies. The overall picture suggests that the entry rate has declined over time, from almost 7% in 2000 to about 5% in 2023. Instead, the exit rate increases significantly, from 3.2% in 2000 to a peak of about 8% in 2019, then declines to about 6% in 2023. On average over the whole period, the entry and exit rates are 5.7% and 5.9%, respectively.

Considering only registered business units, the entry rate always exceeds the exit rate, which consequently leads to a steady increase in the number of registered businesses throughout the period. The entry rate of registered companies is quite stable, oscillating around 8%. The exit rate, instead, increases from about 5.5% in 2000 to about 7% in 2016 and decreases thereafter. This drives the somewhat more pronounced increase in the total number of registered companies towards the end of the period. As can be seen by comparing the two graphs, the entry rates for the population as a whole are trending down, which is consistent with observations in other countries. However,

¹⁵About 30% of all registered businesses are reported with a year of foundation earlier than the year of first registering at the business register. This happens, for instance, if companies change their legal form so that they are required to register.

entry rates for the population of registered businesses (more likely high-quality businesses) do not exhibit a decline.

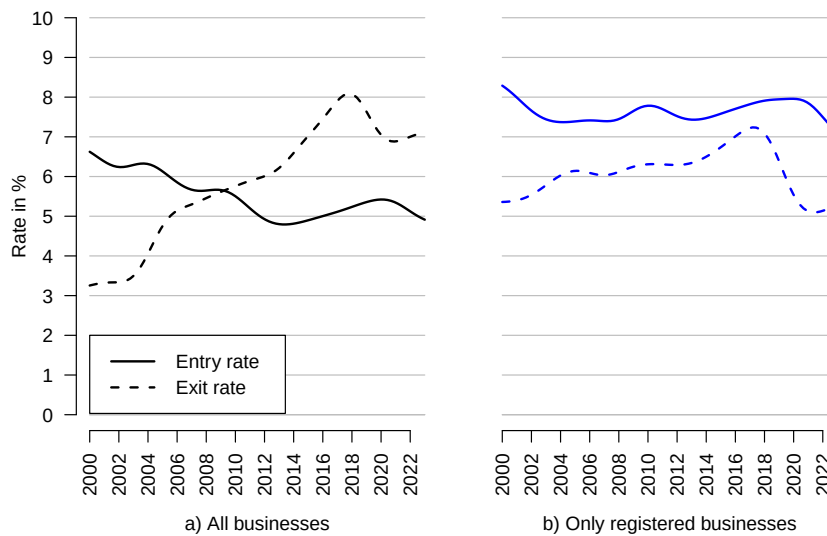


Figure 4: The evolution of the entry and exit rates (all time series are smoothed via a kernel filter)

In Section 3.3 we described that business exit is measured by different types of exit: i) regular cessation of activity, ii) cessation of activity via insolvency proceedings, iii) cessation of activity via an acquisition (M&A), and iv) exit by non-report (i.e. when a business in the LBD shows no relevant activity for more than five consecutive years). Figure 5 shows the distribution of the different types of business exit over time. The share of regular business exit is given on average by about 40%, with a decreasing pattern over time. The average share of business exit by non-report is given by about 53% and increases over time. Business exit by insolvency is given on average by about 5% and remains relatively stable over time. The smallest share of business exit is exit by M&A, with an average share of less than 1.6%.¹⁶ By the small share of business exit by reason of an acquisition, the total exit rate (over all businesses) is only negligibly affected; however, taking these M&A events into account becomes important when conducting further analysis in terms of job creation and destruction. In particular, since the acquisition of a company implies job flows, neither the acquiring company nor the targeted company should be included to the measurement of job creation and job destruction rates.

¹⁶On average, we observe about 228,000 annual business exits, of which on average about 84,000 are regular exits, 129,000 exit by non-report, 10,000 insolvencies, and about 4,000 via M&A. The last few years, however, should still be considered with caution as business exit is typically reported with some lag in the data.

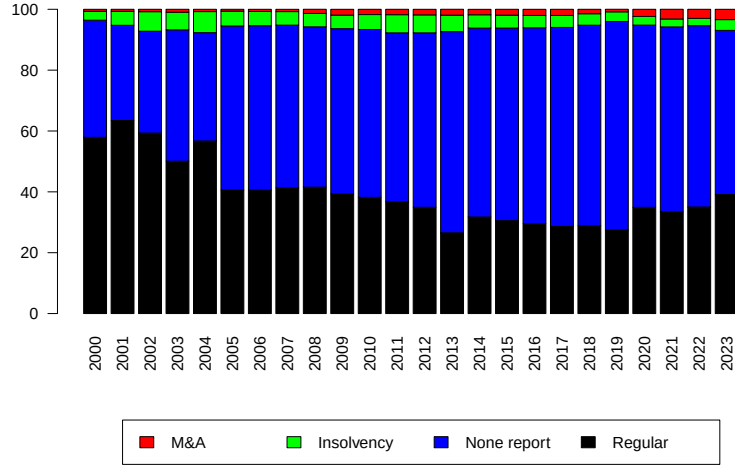


Figure 5: Share of business exit by different categories

3.4.2 Companies' size, age, and entry and exit rate

As described above, the MUP-LBD also includes important variables for measuring business size, such as employment and sales (see Appendix, Section A.1.5 for a detailed description). As the underlying data is not administrative, these variables also contain a non-negligible number of missing values. Table 1 shows average statistics over the whole period 2000–2023 by relating companies' size – here measured by employment size classes – with entry and exit rates as well as average age. The table reveals some regularities often observed in firm-level data:

- (i) The share of businesses is decreasing in size class, i.e., the company-size distribution is right-skewed.
- (ii) The entry and exit rates are almost decreasing over all group sizes.
- (iii) Larger companies are older than smaller ones.

It is, however, important to treat the presented figures with caution. First, because the share of missing values in employment with 58% is relatively high (see Table 1), many businesses cannot be assigned to any size group, which makes the computed statistics less reliable. For instance, the exit rate of those companies without reported employment is, on average, very high, with 9.5%. As we have to expect that especially very small companies are most likely not to be reported with information on employment, the entry (exit) rate are likely to be upward (downward) biased, especially that of the smallest size groups. Second, and this also includes the time series of entry and exit rates presented above, because we observe in the data that the entry and exit of large businesses, which can be seen as both the entry and exit rates, are not monotonically decreasing over all firm size groups. The formation and death of large businesses are not usual and, in many cases, are related to the creation of spin-offs or to M&A activity, potentially leading to spurious measures of entry and exit rates. Third, business entry to some extent is not captured in the data towards the end of the sample period, which concerns most of all businesses that are not registered at the business register. That is, *Creditreform* detects some businesses not right at the moment of their creation, but only with some time lag - which ultimately also holds for business exit. Hence, entry and exit rates will likely be changed in retrospect by extending the covered period in the future.

Table 1: Summary statistics w.r.t. firm size based on employment: averages 2000–2023

Size group	# of firms	Share of firms	Entry rate	Exit rate	Average age
1–4	1,117,319	28.48	7.90	1.86	13.67
5–9	225,077	5.74	1.88	1.12	21.44
10–19	140,577	3.58	1.30	0.94	24.50
20–49	93,510	2.38	0.97	0.93	27.82
50–99	32,451	0.83	0.74	0.99	31.55
100–249	20,164	0.51	0.62	1.06	35.78
250–499	6,489	0.17	0.56	1.11	40.20
500–999	2,972	0.08	0.56	1.03	42.27
1000–4999	1,959	0.05	0.87	1.22	43.31
5000–9999	161	0.00	0.77	1.11	47.22
10000+	212	0.01	0.98	1.17	43.59
NA	2,282,482	58.18	5.26	9.54	14.81
Total	3,923,373	100.00	5.50	6.22	15.85

The table above illustrates that even though smaller businesses are younger on average, they do not necessarily need to be very young, which is why these figures are not sufficiently informative in terms of the importance of young businesses in the data. Figure 6 shows, therefore, the share of young businesses (solid line) and their aggregate share of employment (dashed line) by considering all businesses (on the left) and only those registered at the business register (on the right). Consider first the figure on the left. The share of young businesses, here defined with age ≤ 5 years, declines over time from about 30% to less than 25 % in 2016, whereupon a slight increase up to about 26% is reported. Likewise, the aggregate share of employment of young businesses decreases from about 15% in 2000 to about 10% towards the end of the sample period. Considering registered businesses only, the share of young registered businesses (w.r.t. the total number of registered businesses) remains relatively stable at about 25%, and increases towards the end of the period, while the employment share of young businesses experiences a relatively steady decrease from about 15% in 2000 to about 10% in 2023. The reason why both the employment share of young businesses with respect to all businesses and that only with respect to registered businesses looks very similar is that registered businesses account for the largest part of all employment (while only accounting for about 30% of businesses, see Figure 3). The time series on the employment share of young companies, of course, strongly depends on the coverage of employment for that group as well as across all units. The coverage of the employment share of young businesses (both across all businesses and registered businesses) is quite small, at about 10%. However, coverage remains relatively stable over time (see Appendix, Figure A2), which is why the decrease in the employment share at least suggests that the negative trend is not driven by changes in coverage of employment in the data.

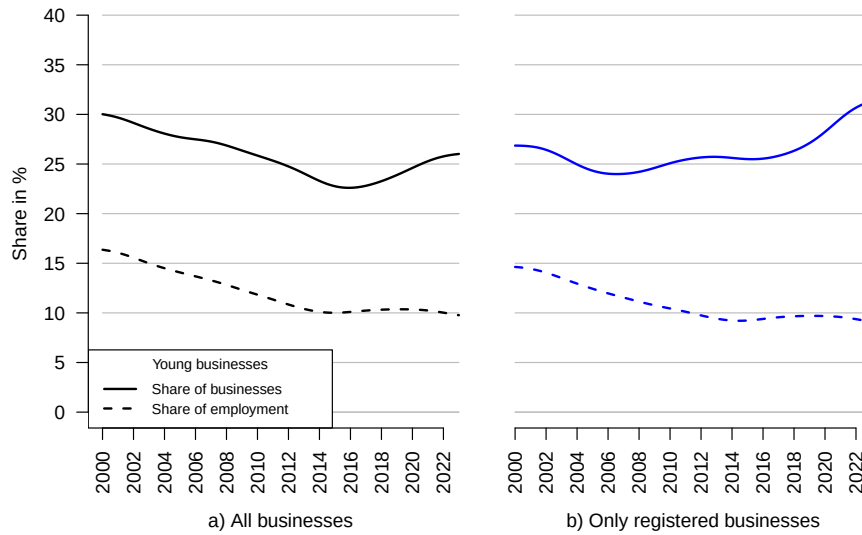


Figure 6: Share of young businesses and their employment share over time (all time series are smoothed via a kernel filter)

3.4.3 Number of observed businesses and aggregate employment across sectors

To illustrate some aggregate statistics across sectors, we show the evolution of the number of active companies and their respective aggregate employment share. Here we use the industrial classification NACE rev 2. (2008) throughout the entire period. This is possible because the data provider *Creditreform* updated the industry classification according to NACE rev. 2 (2008) for all observed business units, even for those that had ceased operations before the reform took effect. For generating the aggregate statistics, we use for each unit its most recent industrial classification (which implies that all considered businesses are classified according to NACE rev. 2) over the whole time horizon. Generally, we observe that some businesses' industrial affiliation changes, which happens, for instance, if a business shifts its activity from one 5-digit industry to another. By assigning the most current industrial affiliation of a given business unit over its entire observed period we eliminate such variation. However, for aggregate sectoral analysis, this should not introduce a bias, since it is very uncommon that a business unit changes from, say the manufacturing sector to the wholesale and trade sector.

Figure 7 shows the distribution of the number of companies (on the left) and the aggregate share of employment (on the right) across sectors for the period 2000–2023. Consider first the distribution of the number of businesses across sectors. Here, the largest sector is given by the wholesale and trade sector, which, however, shows a decreasing pattern: While in 2000 the share of businesses accounts for about 22 %, in 2023 the wholesale and trade sector only accounts for about 16% with regard to the total economy. Instead, the sectors professional/scientific and technical services (including, for instance, legal, accounting, and consulting activities) and the construction sector have kept relatively stable in terms of the share of active business units, given by about 13% and 11%, respectively. The share of companies belonging to the manufacturing industry has decreased from about 8% to 6.5%. In contrast, a notable increase in the share of companies has experienced the sector administrative and support services (such as, for instance, rental and leasing activities as well as cleaning activities), given by a share of about 5% in 2000 and 8.5% in 2023.

In terms of employment share, the manufacturing sector is by far the largest. However, the industry's employment weight is, as is well known, decreasing: while the manufacturing sector accounted for about 25% of the economy's total employment in 2000, in 2023 it accounts for only about 19%. The wholesale and trade sector represents the second-largest sector in terms of employment share, at 20% in 2000 and 16% in 2023. Also, the construction sector has experienced a decrease in the employment share from about 14% (2000) to 10% (2023). Other sectors, instead, showed a relative growth, most importantly given by the sector for health and social work,

from about 4% (2000) to 10% (2023), and by the sector for administrative and support services from about 6% (2000) to 8% (2023).

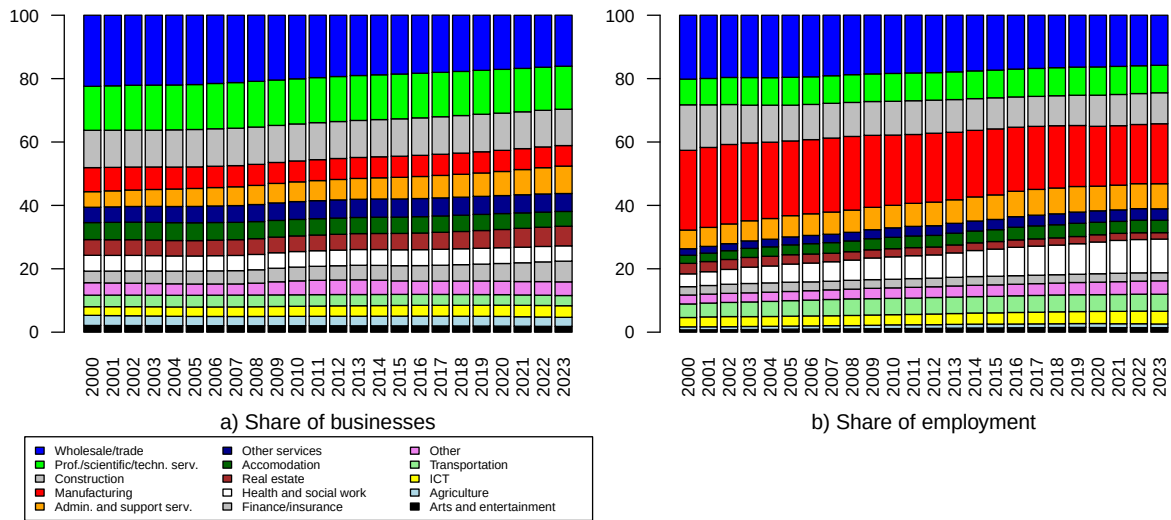


Figure 7: Distribution of number of active businesses (in %) across sectors

3.4.4 Geographic identifiers along with business entry and exit

Creditreform's internal data collection process provides businesses' addresses. In the MUP-LBD, these are mapped to the county (in German called *Kreis*, given by the variable `kreisnr`, containing county-specific identifiers) identified by the reported address.¹⁷ Figure 8 shows the entry and exit rates in 2020 for all German counties. Considering the entry rates on the left, the map illustrates that entry rates tend to be higher in the south of the country, with a particularly high entry rate in Munich, which is known for its vital startup environment. Generally, the western part of Germany has higher entry rates compared to the eastern counties. Berlin is an exception, which lies among Germany's most remarkable startup regions. Considering the exit rates on the right, differences between east and west are not as pronounced as compared to the entry rates, and appear to be somewhat more homogeneous.

¹⁷See Appendix A.1.4 for more details. Note that a business's county code might change over time, occurring when a company moves to another location. The MUP-LBD contains across all years the latest county identifiers, published by the German postal authorities.

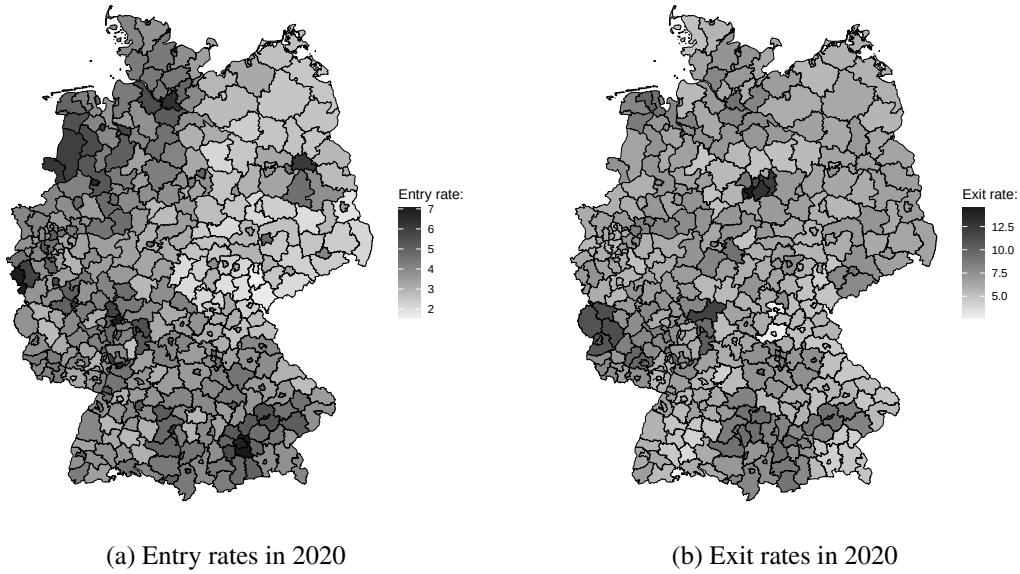


Figure 8: Business entry and exit rates in 2020 across counties

3.5 Comparison of the MUP-LBD with official German business statistics

The German Statistical Office (Statistisches Bundesamt, Destatis) publishes aggregate statistics of the number of registered Legal Units with taxable turnover and/or with employees. Until 2018, the threshold of taxable turnover was at 17,500€, thereafter the threshold was increased to 22,000€. Figure 9 shows the aggregate evolution of active businesses from Destatis with those contained in the MUP-LBD. According to the official statistics, the number of active and taxable legal units varied between 2.9 million. (2002) and 3.1 million (2023), with its highest level of almost 3.3 million legal units in 2019. The results suggest that both datasets converge over time in the aggregate number of active companies.¹⁸ The level of active legal units derived from the MUP-LBD differs for three potential reasons: First, in the source data, especially at the beginning of the covered period, there is potentially a higher number of undetected identifiers that refer to the same business unit. Second, our database does not distinguish between taxable and non-taxable units but includes all types of business activity - even those below the above-described turnover thresholds. Third, our statistics also include businesses such as medical offices, which are not part of the official statistics of business activity with taxable turnover. Also, see Bersch, Gottschalk, et al. (2014) for an earlier study comparing data from German Statistical Office with the business-level data provided by *Creditreform*, which showed that in the latter the smallest business size classes are slightly underrepresented, resulting in a smaller share of non-incorporated businesses.

¹⁸The figures are taken from the online data platform Statista, which refers to Destatis: <https://de.statista.com/statistik/daten/studie/246358/umfrage/anzahl-der-unternehmen-in-deutschland/> (accessed September, 2026).

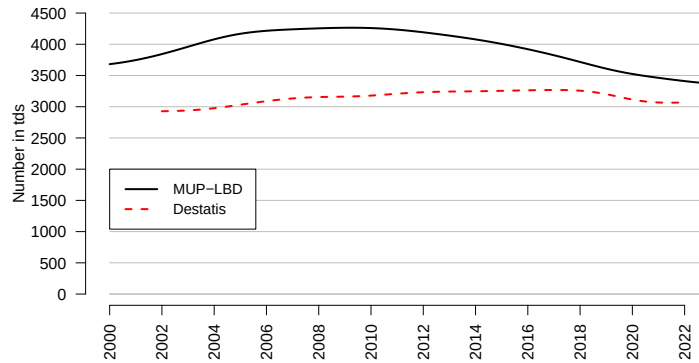


Figure 9: Comparison with official aggregate business statistics

4 Linking the MUP-LBD to other data sources

The MUP-LBD is invaluable for researchers studying the dynamic process of business activity in Germany. Beyond that, the data set's value substantially increases by its connectivity to further data sources. We distinguish here between linking the data with internal and external data. Internal data includes additional elements provided by *Creditreform* that share the same company identifiers. In contrast, external data are data sources from outside the *Creditreform* universe, which usually have to be linked using appropriate data-matching methods. In the following, we briefly present linkable data to the MUP-LBD. The descriptions, however, should not be considered as complete representations of the respective data and its characteristics.

4.1 Linkage to internal data

4.1.1 MUP-ownership data

A subset of businesses observed in the MUP-LBD are related to their owners (or shareholders), who are assigned an owner-specific identification number by *Creditreform*, the so-called *b_crefo* id. The by far largest part of the ownership data is extracted by *Creditreform* from the official business register, where registered companies disclose, to some extent, their ownership structure.¹⁹ An owner can either be a natural person or a legal business unit, and, consequently, a business can be owned by one or more natural persons, by both natural persons and one or more companies, or by only one or more companies. Given that an owner is also assigned an amount of EURO investment in the company, we compute their shares at a given year. Both the set of owners and the corresponding shares define the ownership structure of a company or business unit (*crefo* id) for a given year. We then create the MUP-ownership panel data in which legal business units are observed over time in terms of their ownership structure. The overlap between the MUP-LBD and the MUP-ownership data is not perfect. About 35 % of all businesses (i.e., about 3.2 million businesses over the period 2000–2023) observed in the MUP-LBD are provided with information on their ownership structure. About 11% of all businesses (i.e. somewhat more than 1 million businesses) are related to at least one other shareholding company. These businesses are almost all registered at the business register.

The observation of companies' ownership structure is fundamental to study business dynamism. This is because changes over time in a company's ownership structure informs about M&A activity and, therefore, help to

¹⁹Depending on the legal business form, companies are required to disclose their ownership and shareholder structure. Corporations such as limited liability companies (GmbH) have to disclose all of their shareholders and shares. Public limited companies (AG) only have to disclose their founding shareholder and majority shareholder, as they are publicly traded companies. Business partnerships usually register their shareholders; however, these companies are not obliged to provide the exact shares.

distinguish true economic business failures from closures induced by a takeover. Similarly, the formation of a new business that is entirely owned by a larger holding company, might not be treated as a usual business entry as, for instance, a regular startup owned by a single owner or by a group of founders.

4.1.2 MUP–contract data

The MUP–contract change data, as part of the source data, is extracted by *Creditreform* from the commercial business register and contains information on specific contractual agreements concluded between two companies. Such agreements include, among others, controlling, profit transfer/takeover, and merger agreements. Specifically, observations are at the contract-level, where a contractual agreement relates a specific `crefo id`, with a `contract_partner id` and a `contract_type` at a given year of the signed contract. Companies’ contract data, thus, informs in terms of the relocation of the decision-making business unit. This data is particularly valuable for the analysis of M&A activity, where acquisition events that lead to the closure of a corresponding target company might not be reflected in the above-described ownership data. That is, as the target company fully merges into the acquiring company, no effective change in its ownership structure can be observed, and it simply disappears from the ownership data. Instead, under specific conditions, such a transaction must be formalized in a contract and disclosed in the business register. Hence, information from business contracts augments information for specific transactions, which are usually difficult to observe. In this regard, also see Section A.1.2 for an application of identifying business exit by an acquisition in the context of the here presented MUP–LBD.

4.1.3 The Mannheim Innovation Panel

Since 1993, ZEW has been surveying businesses in Germany about their innovation activity, which results in the Mannheim Innovation Panel (MIP), see Peters and Rammer (2023). The survey is conducted on behalf of the Federal Ministry of Research, Technology and Space (BMFTR) and is realized in cooperation with infas (Institute of Applied Social Science) and Fraunhofer ISI (Institute for Systems and Innovation Research). The MIP is the German contribution to the European Commission’s Community Innovation Surveys (CIS) and covers businesses from various industries, including mining, manufacturing, energy and water supply, waste disposal, construction, business-related services, and distributive services. For the construction of the survey, businesses are sampled from the MUP (see Section 2.2), which represents the full population and are contacted thereafter with a detailed questionnaire on their R&D and innovation activity. The survey is representative of Germany and, hence, allows projections for the German business population as well as for specific industries and business size classes.

4.2 Linkage to external data

4.2.1 The MUP–BhP linkage

The MUP–BhP linkage represents a unique linkage between companies observed in the MUP–LBD and establishments observed by the national employment agency (BA), which hosts its data at its affiliated research institute “Institute for Employment Research (IAB)”. More precisely, individuals subject to social insurance contributions have to be registered at the BA via the establishments at which individuals work. By that, the BA registers not only individuals but also establishments, i.e., physical production units at which individuals realize their work. Similar to the units observed in the MUP–LBD, establishments observed by the BA are provided with names and addresses. Based on names and addresses from both data sources, companies and establishments are matched with the MUP–LBD. See a detailed description of the matching procedure and its results in Doherr (2023, Section 3.2, pp. 25) and Diegmann et al. (2024).²⁰

²⁰In a collaborative project between the Halle Institute of Economics (IWH) and ZEW, funded by the Leibniz Association (Leibniz Collaborative Excellence K525/2023), the MUP–BhP linkage is currently further developed and investigated. The project not only intends to increase the match quality but also conducts comprehensive research on German business dynamism.

4.2.2 IAB/ZEW Start-up Panel

The IAB/ZEW Start-up Panel is a representative survey of start-ups and young businesses and is conducted by ZEW in cooperation with the Verband der Vereine Creditreform and the Institute for Employment Research (IAB), Nuremberg, see Rodepeter, Gottschalk, and Hottenrott (2026).²¹ For the construction of the survey, young businesses are sampled from the MUP and linked to the establishments observed at IAB. The aim of the data is to enable high-level research on business startups, which are tracked up to 7 years after founding (conditional on survival). Hereby, by means of a computer-assisted telephone survey, 5,000-6,000 startups are interviewed annually. The sample of the IAB/ZEW Start-up Panel includes startups from all industries except agriculture, mining, and the public sector. About 50% of the included businesses are represented by high-tech companies (i.e., cutting-edge technology, high-value technology, technology-oriented services, and software). The remaining 50% are sampled from other sectors of manufacturing, services, and construction.

4.2.3 MUP-EPO linkage

The MUP-EPO linkage connects companies observed in the MUP-LBD with companies that have submitted patent applications to the European Patent Office (EPO). To match companies observed in the MUP-LBD with those companies indicated in patent applications submitted to the EPO, we apply a matching procedure based on companies' names and addresses, which are both included in the *Creditreform* source data and appear on the patent applications. For that purpose, we use the Search Engine presented in Doherr (2023, Section 3.1, pp. 21). In total, about 33,000 (0.38%) of all businesses in the MUP-LBD are related to patenting activity.

5 Summary

The MUP-LBD represents the most comprehensive German business-level data outside of national statistical offices, covering the period 2000–2023 with detailed information on new business formation and business exit. The source data is provided by *Verband der Vereine Creditreform e.V.*, Germany's largest credit rating agency, which collects exhaustive information on individual businesses' activity. The data is further processed at ZEW to provide a high-quality research dataset that enables researchers to study business dynamism in Germany. Moreover, the data contains information on companies' geographic location, industry affiliation, as well as employment and sales. Based on the data, we show patterns of entry and exit rates, the evolution of the employment share of young companies over time, as well as the evolution of the aggregate number of companies and the aggregate employment share across sectors and over time. Among other results, the data reveals a decline in business entry over time, while business exit rates are increasing. Also, the share of young businesses and that group's employment share in terms of total employment is shown to be decreasing over time. Moreover, as a well-known fact, our data likewise illustrates that the share of manufacturing is decreasing, both in terms of the number of active businesses and in terms of its employment share with respect to the total economy. For such types of analysis, the value of the MUP-LBD is invaluable as a standalone data set. It is, however, intended to be used in conjunction with other data, expanding the scope of the information and creating new opportunities for researchers.

²¹Until 2013, the project was also in cooperation with Kreditanstalt für Wiederaufbau (KfW).

A Appendix

A.1 Variable register

A.1.1 Date of foundation

Companies observed in the data are provided with a date of foundation, from which we extract the year. The corresponding variable is given by `gr_jahr`. As already mentioned, if the year of foundation falls within the period covered by the MUP-LBD, the company's first observation is set to the year of foundation. Hereby, *Creditreform* might capture the formation of a new business with some lag compared to its actual foundation, which is why, in the source data, newly formed companies in some cases might show up for the first time some periods after their creation. We account for that and align its first appearance in the MUP-LBD with the company's date of foundation. As a consequence, however, when the MUP-LBD dataset is updated, the number of entering companies of a given year might change retrospectively.

A.1.2 Status of activity

In the source data, there are three types of indicators, which we label indicator A, B, and C, and which are relevant for inference on a company's current state of activity. Ultimately, the combination of all three indicators yields a concise variable, called the `crefo_status` variable, informing about the status of activity and exit, and the reason for exit.

- **Indicator A** represents a basic indicator on a specific company's (`crefo id`) state of activity, which is constructed by the source data provided by *Creditreform*. This indicator includes a set of information, such as,
 - the cessation of activity or deregistration of a company,
 - the occurrence of an M&A event (merger/acquisition), without further information on the specific event (i.e., whether a company acts as target or acquirer, nor is there information on the transaction partner),
 - a flag indicating that a `crefo id` is a duplicate, and should therefore be discarded.

As mentioned earlier, this information can either be collected by *Creditreform* via their own research on a company's activity or via information from official registers.

- **Indicator B** contains information on companies' activity originating from the official commercial business register. More precisely, *Creditreform* provides a variable that carries information on the reason for the last entry at the commercial business register. That is, the commercial business register continuously updates information on registered companies, where the reason for a recent update is usually very specific. We cluster this indicator into different categories:
 - signal of activity, which occurs if the latest entry at the business register allows conjecture that a company is actually active, such as the registering of a new business contract with another company (profit/control agreements), a reported change in the ownership structure, or a reported increase of capital;
 - deregistration,
 - cessation of activity by insolvency or
 - cessation of activity by an M&A event,
 - the occurrence of M&A event, i.e., merger/takeover with unspecified consequences;

By that, some of the information carried by indicator B carries similar information compared to indicator A, some are additive. This indicator, however, only provides detailed information from 2019 on.

- **Indicator C** contains specific information on companies' stages of insolvency proceedings. This kind of information is reported at the official website for business insolvencies in Germany,²² and collected by *Creditreform*. Typically, any step of an insolvency proceeding belongs to a certain type (for instance, corporate or consumer insolvency proceedings) and the stage of the ongoing proceeding (for instance, opening, denial, or completion). In the raw data, we count about 280 combinations of types and stages, which we cluster into three categories:

- unclear information (in some cases did either hint to an opening/completion of a proceeding)
- ongoing proceedings, and
- completion of proceedings.

Many of the reported insolvency proceedings lead to the cessation of activity, which, hence should also be reported by indicator A and B.

Table A1 summarizes the information carried by each indicator.

Table A1: Indicators reporting on crefo status

Value	Indicator A	Indicator B	Indicator C
0	no information	no information	-
1	active signal	active signal	Ongoing insolvency proc.
2	dissolved/deregistered	dissolved/deregistered	Completed insolvency proc.
3	M&A, unclear	cessation by insolvency	Reorganisation by insolvency
4	Duplicate	cessation by M&A	
5		M&A unclear consequences	
6		Ongoing insolvency proc.	

Note that we observe changes in `indicator_a` for a given business unit only by comparing the reported values over time (time-varying variable of type II). In contrast, `indicator_b` and `indicator_c` are reported with a specific year of reference to which the observation belongs (time-varying variable of type I). We make use of these properties to establish the longitudinal panel structure of each indicator. Finally, to construct the new variable `crefo_status`, we concisely bundle the information of the three indicators. More precisely, from table A1 it can be seen that between the indicators there is some overlapping information (for instance value 2, shared by `indicator_a` and `indicator_b` (dissolved/deregistered), or value 3 of `indicator_b` (cessation by insolvency) and value 2 of `indicator_c` (completed insolvency proceedings), while other information is indicator-specific (for instance value 4 of `indicator_a` (duplicate business unit). Between the three indicators, many different combinations are possible. In fact, in the data, we observe 78 unique combinations. To each of these unique combinations we assign by hand a corresponding value that summarizes the information of all three indicators, which we then use to merge with the longitudinal business database. By that, each business unit becomes assigned its activity status, summarized by the variable `crefo_status` according to the three indicators a,b, and c. Table A2 describes the values that `crefo_status` can represent:

²²See <https://neu.insolvenzbekanntmachungen.de/ap/> (accessed in September 2026).

Table A2: Description of the crefo_status variable

value	description
0	no information available
1	activity signal
2	cessation of activity
3	ongoing insolvency proceedings
4	cessation of activity by insolvency
5	cessation of activity by M&A
6	M&A event, unknown consequences
7	duplicate business unit

For the sake of illustration, Table A3 shows only the most common combinations between the three indicators and the corresponding values of the crefo_status variable. Here the most frequent combination (78%) is given by “no available information“ in all variables (all indicators take the value of zero), which is assigned the value zero in terms of the crefo_status variable. The second most frequent information is given by indicator_a taking the value of 2 while both indicator_b and indicator_c take the values of 0. In this case, the crefo_status variable is assigned the value of 2.

Table A3: Combine indicator A, B and C into the crefo_status variable

Indicator A	Indicator B	indicator C	crefo.status	Frequencies	Share	Cum.
0	0	0	0	76958323	78.00	78.00
2	0	0	2	12416736	12.59	90.59
4	0	0	7	2446120	2.48	93.07
0	0	1	3	2210895	2.24	95.31
0	1	0	1	2053601	2.08	97.39
2	0	1	4	1331143	1.35	98.74
2	2	0	2	424401	0.43	99.17
3	0	0	6	215742	0.22	99.39
2	0	2	4	177471	0.18	99.57
4	0	1	7	95820	0.10	99.67

Especially indicator_b, i.e., the reason for the last change at the business register, does only provide from 2019 on more detailed information. Therefore, to capture information for cessation of activity via M&A activity, we enrich the data based on observed transactions in the MUP-contract data. In particular, the data contains information on contracts of merger/takeover events, that are mandatory to be disclosed at the business register.

We observe a total of 109,562 businesses associated with a merger contract as being the acquired company for the period 2000–2023. Figure A1 presents the evolution over time, where at the beginning of the period, only about 1000 businesses were associated with a merger contract. After a slight increase until 2007, up to about 2000 M&A cases, the number increases drastically in 2008 to about 5000 observed cases. This is because from 2008 on *Creditreform* electronically scrapes the business register, which systematically leads to a higher coverage of registered merger contracts. From 2008 on, the increase in the number of observed merger contracts increases steadily, which goes in line with the increase in the stock of registered companies.

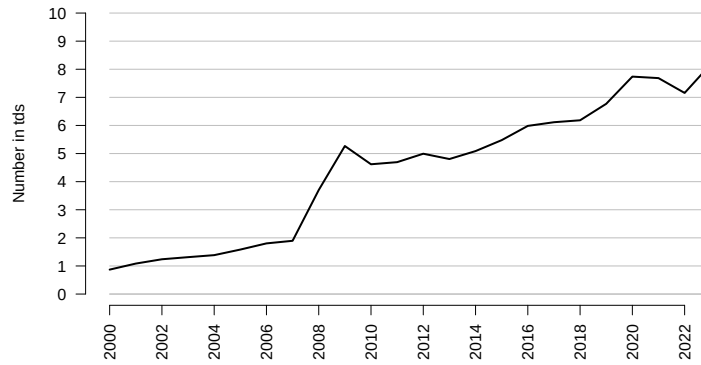


Figure A1: The number of takeover contracts over time

Table A4 shows the distribution of the crefo status variable at the year at which a merger contract was registered (over the whole period). About 13.5% were not associated with an exit, 13.9% were measured as associated with a regular exit, 22% with cessation by M&A event, 14% with an M&A event but unclear consequences, and 36% were indicated to be a duplicate business unit. The reason why so many businesses were indicated as being a duplicate (or multiple) observed given a merger event, is that when a target becomes acquired by a business that is registered at another local court (Amtsgericht), the target company becomes shortly registered at the court where the acquiring party is registered. Hence, *Creditreform* indicates that both registrations are duplicates.

Table A4: Summary crefo status and contract data for 2000–2023

crefo_status	Frequency	Share	Cumulative share
0	13795	12.61	12.61
1	1101	1.01	13.62
2	15303	13.99	27.61
3	14	0.01	27.62
4	14	0.01	27.63
5	23941	21.89	49.52
6	15293	13.98	63.50
7	39899	36.48	99.98

For those businesses associated with a merger contract, we recode the crefo status variable. In particular, given the status variable indicated cessation of activity (value 2 for regular cessation, 4 for cessation by insolvency, 5 for cessation via M&A) or M&A event with unclear consequences (value 6), or duplicate business unit (value 7), the status variable is recoded to take the value of 5, i.e., cessation by M&A. Further, given the status variable did not indicate cessation of activity (value 0 or 1) but associated with a merger contract, we assign cessation by M&A activity given the last observation of either employment or sales was reported to be close to the merger event (+/- two years). By that, the recoded status variable for the 109,562 businesses associated with a merger contract takes the following distribution: about 7.7% of all businesses related to a merger contract can not be related to cessation of activity by an acquisition. Instead, 92% of all cases can clearly be associated with cessation of activity via an acquisition.

A.1.3 Industry affiliation

The provided data allows researchers to track companies' statistical classification of economic activities over time and comprises all sectors, except those affiliated to the sectors agriculture, forestry, fishing, health and social

Table A5: Summary crefo status variable adjusted by contract data

crefo_status	Frequency	Share	Cumulative share
0	7301	6.65	6.65
1	715	0.65	7.30
5	101780	92.70	100.00

services, the public sector, and private households.

The respective variable is given by *wzdig* (*numeric*) and contains the statistical classification according to NACE (Nomenclature générale des Activités économiques dans les Communautés Européennes) of both revision 1 (2003) and revision 2 (2008). For basically all units observed in the data, a change from revision 1 to revision 2 is reported, even if a given entity was reported to have exited the market before the reform in the industrial classification in 2008. As a result, the data allows for retrospective assignment of the current industrial NACE 2 classification exclusively.

A.1.4 Geographic location

To relate business units observed in the MUP–LBD with the primary administrative subdivision in which they are located, i.e., the county (Kreis), we proceed by the following: In the source data provided by *Creditreform*, by far the most observed businesses are also provided with information on their geographic location in terms of the place (Ort) and postal code, but not with the specific county id. To link businesses with their county-specific location, we use geographic information provided by the German Postal Service (Deutsche Post), in which all locations are related to specific postal codes and counties.²³ Most postal codes correspond to a unique county id, which provides a direct linkage. However, disambiguities occur if some postal codes share two or more county ids. In this case, we apply a name-matching approach, described in Doherr (2023), where we match businesses' locations observed in our data with the location provided by the German Postal Service. We assign those counties to the observed businesses that have the highest matching score between the location provided in our data and the location provided by the German Postal Office (related to a specific county). Finally, each *crefo* id is assigned its specific county, which is specified by the variable *kreisnr*.

A.1.5 Employment and turnover

The MUP–LBD contains information on companies' number of employees and turnover, provided by the variables *anzma* and *umsatz*, respectively. Companies registered at the commercial business register are free to choose to deliver information on both quantities. For those units that do not deliver the relevant information and/or those that are not officially registered, *Creditreform* does conduct its own research to collect the data. In the data, however, it is not possible to distinguish between such information collected by *Creditreform* itself and such scraped from the official business register. Importantly, in the source data, both variables are accompanied by the date of collection of the most recent information, which we make use of to construct the MUP–LBD panel. That is, if there is no update at a given year, the entries of the variables *anzma* (*numeric*) and *umsatz* (*numeric*) are assigned missing values. Researchers using the MUP–LBD might then develop appropriate techniques to treat the missing values.

Figure A2 shows the coverage of employment information over time, for all (black solid line) and all young businesses, with age ≤ 5 (black dashed line), and the same only for registered companies (respective gray lines). The employment coverage across all businesses (registered businesses) increases from about 30% (45%) in 2000 to about 55% in 2020 (68%) and decreases thereafter as the data is not yet fully up-to-date. The employment coverage of young businesses (both across all as well as registered businesses only) is much lower, at about 10%.

²³See the Data Factory of Deutsche Post: <https://www.deutschepost.de/de/d/deutsche-post-direkt/datafactory.html> (accessed on September 2026).

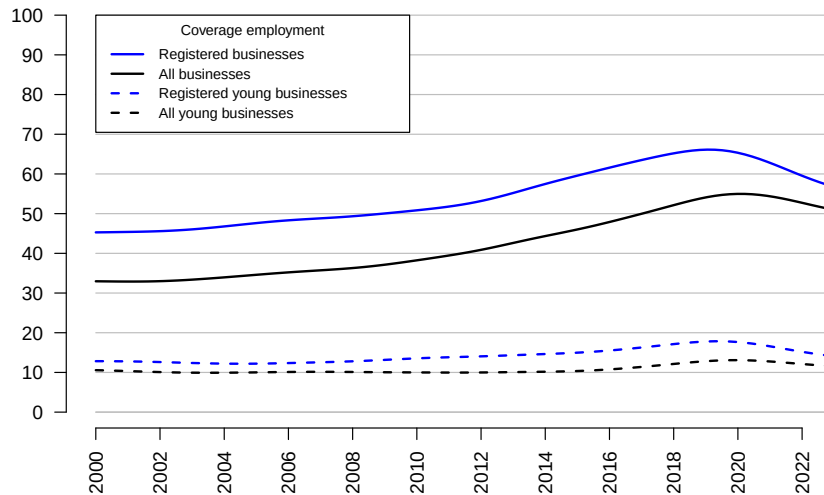


Figure A2: Coverage of employment across all businesses, young, and registered businesses

A.1.6 Legal business form

As an important piece of information, the MUP-LBD contains a variable indicating the legal form of a company. The numeric variable is given by `refo` (*numeric*) and takes a set of values, each referring to a specific legal form. The exhaustive list of legal forms appearing in the data is given in Table A6, which is classified into five broader categories: Associations (A), Sole Proprietorship (SP), Liberal Profession (LP), Corporation (C), Partnership (P), else (E), Foundations (F). Figure A3 shows the share of businesses contained in the MUP-LBD according to the class of legal form they belong to. It can be seen that the share of businesses in the form of partnerships (green) represents the largest class, representing, on average, about 42% of all businesses. The share of businesses in the legal form of corporations increases over time from about 22% in 2000 to 41% in 2023. Instead, the share of businesses belonging to other legal forms (else) (containing missing values in legal form, agriculture, and foundations and other forms, see Table A6) decreases considerably over time. As important drivers of this evolution are the fact that the coverage of legal form information increases over time, as well as the creation of a new legal form in 2008, namely *Unternehmergesellschaft* (UG), belonging to the class of corporations, with the purpose of facilitating the foundation of a limited liability company. The share of businesses belonging to the class of sole proprietorship and liberal professions increases from about 8% in 2000 to its maximum of almost 13% in 2013 and decreases thereafter to 9% in 2023. Finally, associations represent the smallest class of businesses in the data, with their share increasing from less than 1% in 2000 to about 2.5% in 2023.

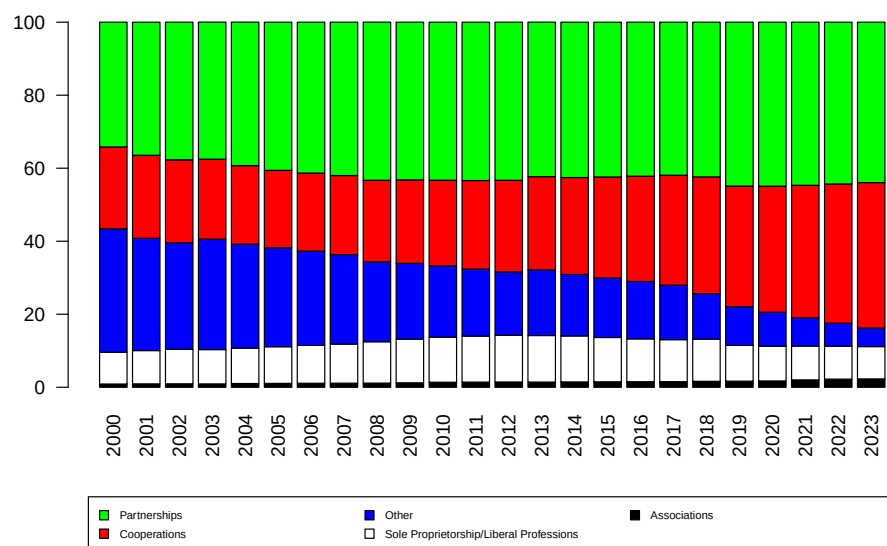


Figure A3: Share of businesses and classes of legal forms.

Table A6: Exhaustive list of legal forms

Value	Rechtsform (DE)	Legal form (EN)	Class*
1	AG	Public Limited Company (PLC)	C
2	AG & Co. KG	PLC & Limited Partnership	P
3	AG & Co. KGaA	PLC & Partnership Limited by Shares	P
4	Anstalt	Institution	E
5	Anstalt öffentlichen Rechts	Public Law Institution	E
6	BGB-Gesellschaft	Civil Law Partnership	P
7	BGB-Gesellschaft - Arbeitsgemeinschaft	Civil Law Partnership - Working Group	P
8	eG	Registered Cooperative	C
9	eG & Co. KG	Cooperative & Limited Partnership	P
10	Einzelfirma	Sole Proprietorship	SP
11	Einzelperson	Individual	SP
12	eU	Sole Proprietor (Austria)	SP
13	eV	Registered Association	A
14	EWIV	European Economic Interest Grouping (EEIG)	E
15	Firma (Ausland)	Foreign Company	E
16	FlexKapG	Flexible Capital Company	C
17	Freie Berufe	Liberal Professions	LP
18	GbR	Civil Law Partnership (Germany)	P
19	GbR / ARGE	Civil Law Partnership / Joint Venture	P
20	GbR & Co. KG	Civil Law Partnership & Limited Partnership	P
21	Gesellschaft & Co. KG	Company & Limited Partnership	P
22	Gesellschaft & Co. KGaA	Company & Partnership Limited by Shares	P
23	Ges.m.b.H.	Private Limited Company (Austria)	C
24	Ges.m.b.H. & Co. KG	Private Limited & Limited Partnership (Austria)	P
25	Ges.n.b.R.	Civil Law Association	P
26	Ges.n.b.R./ ARGE	Civil Law Association / Joint Venture	P
27	Gewerbebetrieb	Commercial Enterprise	P
28	GmbH	Limited Liability Company (LLC)	C
29	GmbH & Co. KG	LLC & Limited Partnership	P
30	GmbH & Co. KG & Co. KG	LLC & Limited Partnership & Co. KG	P
31	GmbH & Co. KGaA	LLC & Partnership Limited by Shares	P
32	KG	Limited Partnership	P
33	KG & Co. KG	Limited Partnership & Co. KG	P
34	KG & Co. KGaA	Limited Partnership & Partnership Limited by Shares	P
35	KGaA	Partnership Limited by Shares	P
36	Körperschaft öffentlichen Rechts	Public Corporation	E
37	Landwirtschaftlicher Betrieb	Agricultural Enterprise	E
38	Limited	Limited Company (UK)	C
39	Limited & Co. KG	Limited Company & Limited Partnership	P
40	Limited & Co. KGaA	Limited Company & Partnership Limited by Shares	P
41	nicht protokollierte Einzelfirma	Unregistered Sole Proprietorship	SP
42	Öffentliches Unternehmen	Public Enterprise	E
43	OG	General Partnership (Austria)	P
44	OG & Co. KG	General Partnership & Limited Partnership	P
45	OHG	General Partnership	P
46	OHG & Co. KG	General Partnership & Limited Partnership	P
47	PartG mbB	Professional Partnership with Limited Liability	P
48	Partnerschaftsgesellschaft	Professional Partnership	P
49	Privatstiftung	Private Foundation	E
50	reg.Gen.m.b.H.	Registered Cooperative with Limited Liability	E
51	reg.Gen.m.b.H. & Co. KG	Registered Cooperative with Limited Liability & Limited Partnership	E
52	Sarl	Limited Liability Company (France/Luxembourg)	C
53	Sarl & Co. KG	LLC (France/Luxembourg) & Limited Partnership	P
54	Sarl & Co. KGaA	LLC (France/Luxembourg) & Partnership Limited by Shares	P
55	SCE	European Cooperative Society	E
56	SE	European Company (Societas Europaea)	C
57	SE & Co. KG	European Company & Limited Partnership	P
58	SE & Co. KGaA	European Company & Partnership Limited by Shares	P
59	Sonstige ausländische Rechtsform	Other Foreign Legal Form	E
60	Sonstige Rechtsform	Other Legal Form	E
61	Sparkasse	Savings Bank	E
62	Stiftung	Foundation	F
63	Stiftung & Co. KG	Foundation & Limited Partnership	E
64	Stiftung & Co. KGaA	Foundation & Partnership Limited by Shares	E
65	UG & Co. KG	Entrepreneurial Company (limited) & Limited Partnership	P
66	UG & Co. KGaA	Entrepreneurial Company (limited) & Partnership Limited by Shares	P
67	UG (haftungsbeschränkt)	Entrepreneurial Company (limited liability)	C
68	Verein	Association	A
69	Verein & Co. KG	Association & Limited Partnership	E
70	VVaG	Mutual Insurance Association	E
71	Wirtschaftliche Zweckgemeinschaft	Economic Purpose Association	E

* Classes of legal forms: A - Associations, SP - Sole Proprietorship, LP - Liberal Profession, C - Corporation, P - Partnership, E - Else, F - Foundations.

A.1.7 Further variables

- **HR (numeric):** binary variable (0/1) taking the value of one, if a company is registered at the business register and zero else.
- **entry (numeric):** binary variable (0/1) taking the value of one if a business is founded at a given year t and zero otherwise.
- **exit (numeric):** binary variable (0/1) taking the value of one, if a company is measured to exit at a given year t and zero else.

A.2 Construction of the MUP-LBD and the data cleaning procedure

As described in Section 2.2, the raw data received from *Creditreform* comprises more than 16.7 million crefo id's (i.e., individual business units). As illustrated in Table A7, about 39% of these are indicated to be (at some point in time) registered at the commercial business register, while about 61% are non-registered businesses. Substantial cleaning of this data is necessary to construct a database, the MUP-LBD, that comprises only businesses active within the covered period, 2000–2023, businesses based in Germany, and excluding all those businesses indicated to be duplicates. Table A7 shows that after cleaning the raw data the MUP-LBD comprises somewhat more than 8.7 million crefo ids, from which about 47% are registered businesses and about 53 % are non-registered businesses. By that, the table also displays that the cleaning procedure excludes substantially more crefo ids related to non-registered business units compared to those related to registered ids.

Table A7: Data cleaning procedure

	Raw data		MUP-LBD	
	# crefo ids	Share	# crefo ids	Share
Total	16,700,503	100.00	8,730,583	100.00
... thereof registered businesses	6,548,150	39.21	4,073,097	46.65
... thereof non-registered businesses	10,152,353	60.79	4,657,486	53.35

Figure A4 shows the distribution of excluded crefo ids with respect to the reason leading to an exclusion. Considering first registered businesses: Here, 15% of all non-registered crefo ids are excluded because they are indicated as duplicate ids. 41% are excluded since originating from a foreign *Creditreform* office, which implies being a foreign business.²⁴ The largest share of excluded ids are given by the reason of an exit identified before 2000, and is given by 43%. Considering now non-registered businesses, duplicates here account for about 13% of all excluded ids. Further, excluded ids from foreign offices account for about 12% and business exit before 2000 for about 2%. The largest share of excluded crefo id's, however, is given by the reason "no update at all/only before 2000", which means that these crefo ids' were either only be registered once (with no further update in any variable) or provided with the last update before 2000. Relevant economic activity within the covered period of such crefo id's is highly uncertain, which is why we exclude them from the MUP-LBD. The reason only non-registered businesses are excluded by this criterion is that registered businesses' economic activity is much more trackable through information provided by the business register, where inactivity is detected by deregistration.

²⁴As described in the main text, *Creditreform* is structured in a decentralized manner, with many local branches that collect data on business activity for specific regions. These local branches not only exist in Germany but also in some foreign neighboring countries, such as Austria and Liechtenstein. Businesses (i.e., crefo ids) from foreign *Creditreform* offices can be identified in the data, which, thus, can be excluded easily.

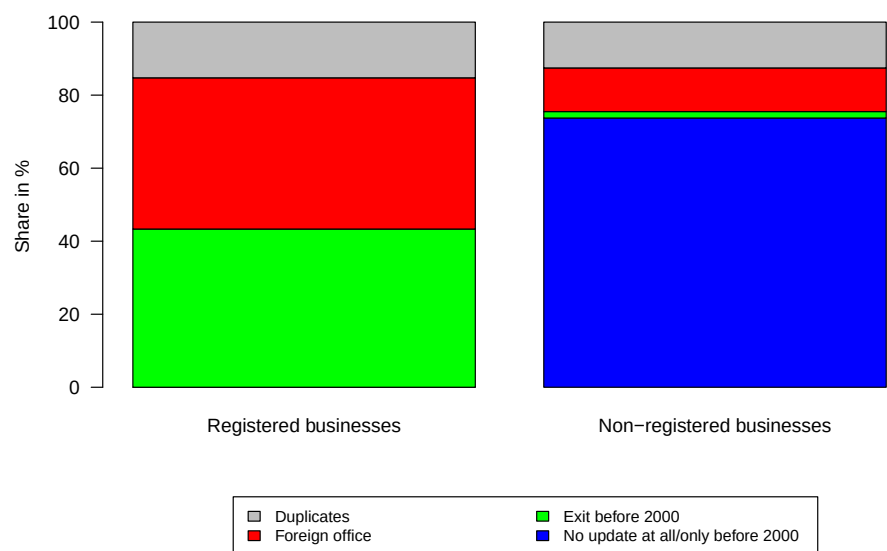


Figure A4: Data cleaning procedure for registered and non-registered businesses

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**ZEW – Leibniz-Zentrum für Europäische
Wirtschaftsforschung GmbH Mannheim**

ZEW – Leibniz Centre for European
Economic Research

L 7,1 · 68161 Mannheim · Germany

Phone +49 621 1235-01

info@zew.de · zew.de

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