

Establishment Exits in Germany

The Role of Size and Age

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Motivation

- Entries and exits are important drivers of economic development and structural change
- While there has been a lot of research on entries, exits have received considerably less attention, especially in Germany
- Previous studies on exits for Germany have often focused on single federal states or sectors and covered only short time periods
- Main contributions of our paper:
 - Using comprehensive data for West Germany, we study establishment exits for a period of more than 30 years
 - We investigate whether the determinants of exit differ between young and older establishments

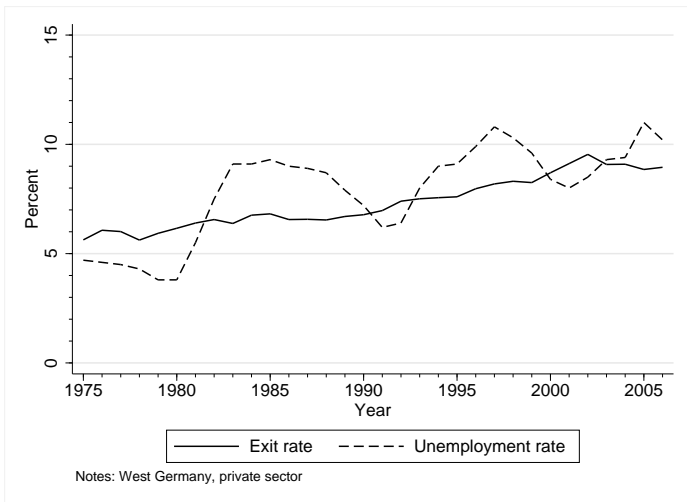
The Establishment History Panel (BHP)

- Random sample of 50 percent of all establishments with at least one employee liable to social security; reference date: June 30th of each year
- Created by aggregating underlying social security data at establishment level
- Information on industry, location, number of employees, structure of the workforce, wage structure
- Our sample: West German private sector (mostly without agriculture and mining)

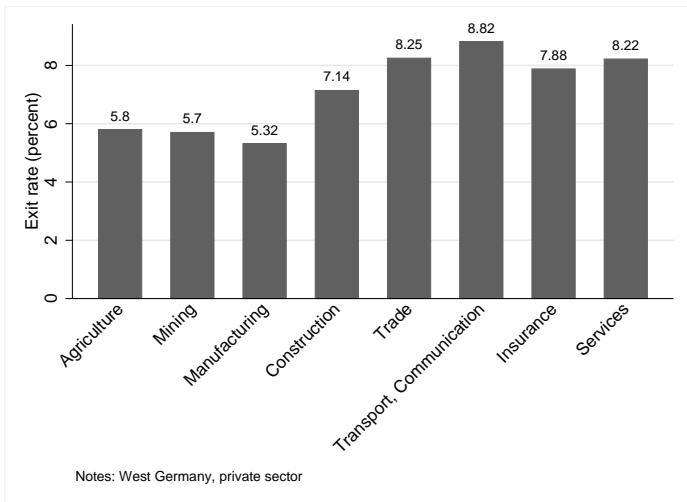
Identification of exits

- Generally, establishments are regarded as exits (entries) when they appear in the data for the last (first) time.
- At the current edge, we count establishments as exits only if they do not reappear in the data in the following two years (i.e. exits are ultimately observed in 2006)
- Shortcoming: events like a change of ownership or legal form, outsourcing or other administrative changes can result in a change of the establishment number while the establishment still exists
- Therefore, extension files on establishment histories based on a worker flow approach by Hethey/Schmieder (2010) are used to identify spurious exits and entries

Annual exit rates and unemployment rates 1975-2006



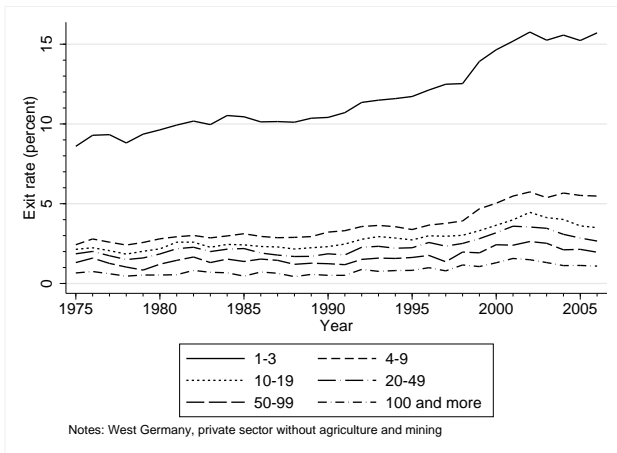
Average exit rates by economic activity 1975-2006



Liability of smallness (Aldrich/Auster 1986)

- Small firms face higher mortality risks than large firms
- Often regarded as a „stylized fact“ in the literature (e.g. Geroski 1995)
- Potential reasons:
 - Financial constraints (e.g. Carreira/Silva 2010)
 - Difficulties in finding qualified workers (Aldrich/Auster 1986)
 - Operating on a smaller scale and therefore facing cost disadvantages (e.g. Audretsch/Mahmood 1994)
 - Fewer options to spread risks across various economic activities (e.g. Geroski et al. 2010)
 - Firm size as a proxy for managerial talent (Lucas 1978, Mata 1996)

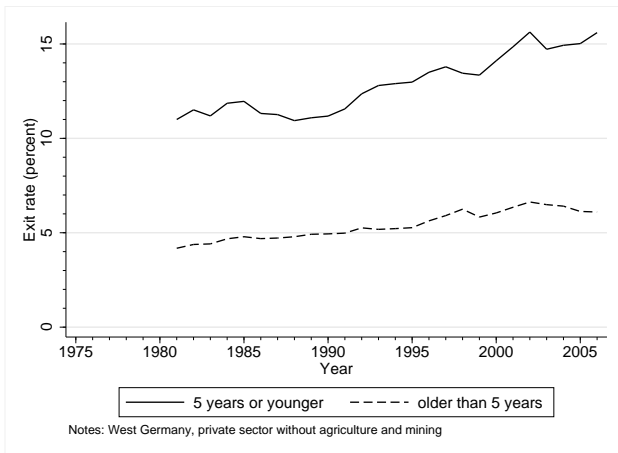
Annual exit rates for different establishment size classes 1975-2006



Liability of newness (Stinchcombe 1965)

- Young firms face higher mortality risks than old firms
- Also usually regarded as „stylized fact“ (e.g. Geroski 1995)
- Potential reasons:
 - New rules, routines and skills have to be evolved, which is costly and can induce efficiency losses
 - Old organizations have advantages in terms of trust and social relations and more stable ties to customers or suppliers
- A higher probability of exit for young firms can also be derived from the Jovanovic (1982) passive learning model

Annual exit rates for young and mature establishments 1981-2006



More on age dependence

- Liability of adolescence (Brüderl/Schüssler 1990):
 - Newly founded organizations start with an initial stock of resources (financial resources, trust, goodwill etc.) which protects them from failure for an initial period
 - Thus the probability of exit is initially low, increases up to a certain point and decreases afterwards
- Liability of aging (Barron et al. 1994)
 - Structural inertia tends to be more pronounced in older organizations
 - This can constrain an organization's ability to respond to environmental changes or reduce its efficiency otherwise
- Empirically, it does not seem to be clear what age dependence exactly looks like (e.g. Cafferata et al. 2009, Hannan et al. 1998)

Differences between young and mature establishments

- Theory on age dependence suggests that the determinants of failure might differ between young and mature firms
- Failures of young firms might be caused by a lack of resources and capabilities, failures of mature firms might occur due to high inertia (Thornhill/Amit 2003)
- Young firms have to struggle more with imperfect competition on product and factor markets and are therefore more vulnerable (e.g. Bellone et al. 2008)

Differences between young and mature establishments

Only few empirical evidence on this issue:

- Thornhill/Amit (2003): failures of young firms are more often attributed to a lack of managerial skills while failures of older firms are more often attributed to environmental changes
- Bellone et al. (2008): effects of firm performance (productivity, profitability) are stronger for mature firms, effects of market structures (concentration, turbulence) are stronger for young firms
- Jensen et al. (2008): young firms are more vulnerable to economic conditions and industry competition

Estimation

- Linear probability models 1985-2006
- Explanatory variables:
 - Age (dummy; 1 if age ≤ 5 years)
 - Size (number of employees; 6 dummies)
 - Sector (5 dummies)
 - Employment structure (percentages of females, low-qualified employees, higher-skilled occupational groups using the Blossfeld (1987) classification)
 - Regional unemployment rate, 21 year dummies
- In a second model all explanatory variables are interacted with the age dummy to take account of differences between young and mature establishments
- To examine age dependence more carefully the model was estimated for the cohorts 2001-2006 with 26 age dummies

Results: Table 1 (1/3)

Determinants of establishment exits (1 = yes), 1985-2006, linear probability models

| | Model 1 | Model 2 | Interaction effect with dummy for young establishment |
|---|----------------------|----------------------|---|
| Young establishment (≤ 5 years; dummy) | 0.05115 (129.80)*** | 0.01769 (8.56)*** | — |
| 1-3 employees (dummy) | 0.09436 (114.16)*** | 0.08246 (115.41)*** | 0.04137 (44.92)*** |
| 4-9 employees (dummy) | 0.02035 (51.17)*** | 0.01733 (50.53)*** | 0.01431 (17.14)*** |
| 10-19 employees (dummy) | 0.00727 (24.25)*** | 0.00530 (20.79)*** | 0.01133 (11.78)*** |
| 20-49 employees (reference) | — | — | — |
| 50-99 employees (dummy) | -0.00701 (-19.65)*** | -0.00531 (-15.98)*** | -0.01953 (-13.62)*** |
| 100-249 employees (dummy) | -0.01068 (-23.59)*** | -0.00984 (-29.78)*** | -0.02768 (-13.70)*** |
| 250 and more employees (dummy) | -0.01244 (-23.37)*** | -0.01439 (-33.28)*** | -0.03031 (-10.78)*** |
| Manufacturing (reference) | — | — | — |
| Construction (dummy) | 0.00999 (17.91)*** | 0.00250 (6.32)*** | 0.03029 (16.64)*** |
| Trade (dummy) | 0.00917 (19.19)*** | 0.00382 (8.52)*** | 0.02036 (27.43)*** |
| Transport, communication (dummy) | 0.00821 (9.74)*** | 0.00259 (3.93)*** | 0.02437 (16.02)*** |
| Insurance (dummy) | -0.00176 (-1.86)* | -0.00578 (-5.94)*** | 0.01477 (9.34)*** |
| Services (dummy) | 0.01789 (37.28)*** | 0.00251 (6.17)*** | 0.04104 (35.81)*** |

Results: Table 1 (2/3)

| | | | |
|---|-----------------------|----------------------|----------------------|
| Percentage of female employees | -0.00021 (-35.65)*** | -0.00006 (-11.44)*** | -0.00030 (-43.43)*** |
| Percentage of low qualified employees | 0.00005 (8.98)*** | 9.37e-06 (1.93)* | 0.00010 (11.64)*** |
| Percentage of skilled manual occupations | -0.00029 (-59.72)*** | -0.00016 (-42.70)*** | -0.00028 (-30.25)*** |
| Percentage of skilled services | -0.00060 (-103.57)*** | -0.00028 (-61.97)*** | -0.00087 (-66.64)*** |
| Percentage of skilled commercial and administrative occupations | -0.00027 (-45.67)*** | -0.00014 (-24.86)*** | -0.00030 (-36.02)*** |
| Percentage of technicians | -0.00039 (-55.67)*** | -0.00014 (-19.77)*** | -0.00057 (-41.80)*** |
| Percentage of semiprofessions | -0.00041 (-36.68)*** | -0.00016 (-14.60)*** | -0.00048 (-24.37)*** |
| Percentage of engineers | -0.00038 (-28.67)*** | -0.00007 (-4.65)*** | -0.00065 (-28.48)*** |
| Percentage of professions | -0.00039 (-25.11)*** | -0.00020 (-12.82)*** | -0.00061 (-18.04)*** |
| Percentage of managers | -0.00026 (-22.39)*** | -0.00011 (-10.36)*** | -0.00033 (-23.31)*** |
| Regional unemployment rate (percent) | 0.00222 (18.66)*** | 0.00175 (18.50)*** | 0.00135 (10.77)*** |

Results: Table 1 (3/3)

| | | | |
|------------------------|---------------------|--------------------|---------------------|
| Year 1985 (reference) | — | — | — |
| Year 1986 (dummy) | -0.00112 (-2.25)** | 0.00006 (0.11) | -0.00416 (-3.77)*** |
| Year 1987 (dummy) | -0.00121 (-2.18)** | 0.00013 (0.26) | -0.00468 (-4.11)*** |
| Year 1988 (dummy) | -0.00187 (-3.14)*** | 0.00058 (0.89) | -0.00809 (-6.37)*** |
| Year 1989 (dummy) | 0.00399 (5.78)*** | 0.00540 (7.98)*** | -0.00498 (-4.15)*** |
| Year 1990 (dummy) | 0.00581 (7.61)*** | 0.00677 (9.27)*** | -0.00361 (-2.93)*** |
| Year 1991 (dummy) | 0.00978 (12.69)*** | 0.00914 (11.98)*** | 0.00126 (1.01) |
| Year 1992 (dummy) | 0.01390 (19.32)*** | 0.01162 (16.37)*** | 0.00597 (4.37)*** |
| Year 1993 (dummy) | 0.01147 (22.36)*** | 0.00821 (13.83)*** | 0.00877 (6.29)*** |
| Year 1994 (dummy) | 0.00943 (16.84)*** | 0.00649 (12.24)*** | 0.00781 (5.63)*** |
| Year 1995 (dummy) | 0.00982 (17.32)*** | 0.00684 (11.88)*** | 0.00750 (5.74)*** |
| Year 1996 (dummy) | 0.01172 (21.01)*** | 0.00859 (14.48)*** | 0.00781 (5.69)*** |
| Year 1997 (dummy) | 0.01203 (19.56)*** | 0.00941 (15.56)*** | 0.00616 (4.98)*** |
| Year 1998 (dummy) | 0.01429 (23.70)*** | 0.01361 (22.57)*** | -0.00004 (-0.03) |
| Year 1999 (dummy) | 0.02092 (34.76)*** | 0.01827 (29.46)*** | 0.00659 (4.94)*** |
| Year 2000 (dummy) | 0.02829 (45.48)*** | 0.02319 (36.09)*** | 0.01341 (9.74)*** |
| Year 2001 (dummy) | 0.03371 (59.31)*** | 0.02673 (45.17)*** | 0.01888 (14.71)*** |
| Year 2002 (dummy) | 0.03660 (60.86)*** | 0.02824 (45.22)*** | 0.02292 (16.52)*** |
| Year 2003 (dummy) | 0.03093 (49.92)*** | 0.02562 (44.87)*** | 0.01441 (10.24)*** |
| Year 2004 (dummy) | 0.03209 (51.74)*** | 0.02568 (42.03)*** | 0.01772 (11.59)*** |
| Year 2005 (dummy) | 0.02629 (41.59)*** | 0.01963 (33.04)*** | 0.01895 (14.18)*** |
| Year 2006 (dummy) | 0.03004 (48.58)*** | 0.02099 (34.97)*** | 0.02655 (19.29)*** |
| Intercept | -0.00330 (-2.32)** | -0.00098 (-0.84) | |
| R-squared | 0.0433 | 0.0466 | |
| Number of observations | 13,088,949 | 13,088,949 | |

Notes: West Germany, private sector without agriculture and mining; t-values in brackets, standard errors adjusted for cluster on district level, ***/**/* indicates statistical significance at 1/5/10% level.

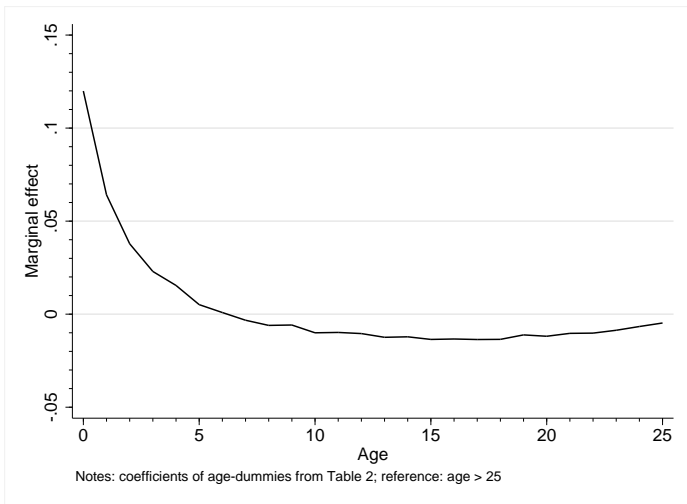
Results: Table 2

Determinants of establishment exits (1 = yes) when specifically controlling for age, 2001-2006, linear probability model

| | | | |
|----------------|----------------------|---------------------------|----------------------|
| Age 0 (dummy) | 0.11993 (109.60)*** | Age 14 (dummy) | -0.01216 (-13.10)*** |
| Age 1 (dummy) | 0.06414 (64.39)*** | Age 15 (dummy) | -0.01357 (-15.24)*** |
| Age 2 (dummy) | 0.03782 (41.59)*** | Age 16 (dummy) | -0.01335 (-14.30)*** |
| Age 3 (dummy) | 0.02295 (25.68)*** | Age 17 (dummy) | -0.01362 (-15.34)*** |
| Age 4 (dummy) | 0.01544 (16.69)*** | Age 18 (dummy) | -0.01353 (-12.58)*** |
| Age 5 (dummy) | 0.00513 (6.28)** | Age 19 (dummy) | -0.01114 (-11.05)*** |
| Age 6 (dummy) | 0.00088 (1.19) | Age 20 (dummy) | -0.01186 (-11.66)*** |
| Age 7 (dummy) | -0.00325 (-3.96)*** | Age 21 (dummy) | -0.01031 (-9.82)*** |
| Age 8 (dummy) | -0.00603 (-7.92)*** | Age 22 (dummy) | -0.01019 (-9.50)*** |
| Age 9 (dummy) | -0.00583 (-6.68)*** | Age 23 (dummy) | -0.00865 (-7.58)*** |
| Age 10 (dummy) | -0.01001 (-11.11)*** | Age 24 (dummy) | -0.00664 (-5.71)*** |
| Age 11 (dummy) | -0.00981 (-10.97)*** | Age 25 (dummy) | -0.00474 (-4.21)*** |
| Age 12 (dummy) | -0.01043 (-11.30)*** | Age \geq 25 (reference) | — |
| Age 13 (dummy) | -0.01243 (-14.19)*** | | |

Notes: West Germany, private sector without agriculture and mining; further controls as in table 1; t-values in brackets, standard errors adjusted for cluster on district level, ***/**/* indicates statistical significance at 1/5/10% level.

Results: age dependence of establishment exits 2001-2006



Robustness

- Alternative estimation methods
 - Different classifications of exits and entries
 - Inflow sample, i.e. only establishments whose exact age is known
 - Restricting the survivor group to establishments which continue to exist for the following 3 or 5 years
 - Including agriculture and mining sector
- ⇒ Our insights still hold!

Conclusion

- The average exit rate has risen considerably between 1975 and 2006 in West Germany
- The liabilities of smallness and newness are confirmed
- A more detailed analysis of age dependence shows that exit rates are initially very high, reaching a minimum at ages 15 to 18, and then rise again \Rightarrow liability of aging
- The effects of all explanatory variables on the probability of exit are stronger for young establishments, suggesting that young establishments are more vulnerable in several ways

Appendix: Descriptive statistics (1/2)

| | All observations | | Exits | | Survivors | |
|---|------------------|-----------|---------|-----------|-----------|-----------|
| | Mean | Std. Dev. | Mean | Std. Dev. | Mean | Std. Dev. |
| Young establishment (≤ 5 years; dummy) | 0.32990 | 0.47018 | 0.53865 | 0.49850 | 0.31147 | 0.46309 |
| 1-3 employees (dummy) | 0.51383 | 0.49981 | 0.78553 | 0.41046 | 0.48984 | 0.49990 |
| 4-9 employees (dummy) | 0.28939 | 0.45348 | 0.15044 | 0.35750 | 0.30165 | 0.45898 |
| 10-19 employees (dummy) | 0.10288 | 0.30380 | 0.04018 | 0.19637 | 0.10842 | 0.31091 |
| 20-49 employees (dummy) | 0.05827 | 0.23425 | 0.01802 | 0.13302 | 0.06182 | 0.24083 |
| 50-99 employees (dummy) | 0.01922 | 0.13730 | 0.00404 | 0.06346 | 0.02056 | 0.14191 |
| 100-249 employees (dummy) | 0.01111 | 0.10480 | 0.00150 | 0.03864 | 0.01196 | 0.10869 |
| 250 and more employees (dummy) | 0.00530 | 0.07264 | 0.00030 | 0.01728 | 0.00575 | 0.07558 |
| Manufacturing (dummy) | 0.20300 | 0.40224 | 0.14681 | 0.35392 | 0.20797 | 0.40585 |
| Construction (dummy) | 0.10349 | 0.30460 | 0.10259 | 0.30343 | 0.10357 | 0.30470 |
| Trade (dummy) | 0.25908 | 0.43813 | 0.28336 | 0.45063 | 0.25694 | 0.43694 |
| Transport, communication (dummy) | 0.03845 | 0.19228 | 0.04648 | 0.21052 | 0.03774 | 0.19057 |
| Insurance (dummy) | 0.01635 | 0.12681 | 0.01734 | 0.13052 | 0.01626 | 0.12648 |
| Services (dummy) | 0.37963 | 0.48529 | 0.40342 | 0.49058 | 0.37753 | 0.48477 |

Appendix: Descriptive statistics (2/2)

| | All observations | | Exits | | Survivors | |
|---|------------------|-----------|-----------|-----------|------------|-----------|
| | Mean | Std. Dev. | Mean | Std. Dev. | Mean | Std. Dev. |
| Percentage of female employees | 54.32365 | 40.09834 | 52.14148 | 44.58777 | 54.51621 | 39.67180 |
| Percentage of low qualified employees | 16.70421 | 27.23143 | 15.72105 | 32.09646 | 16.79102 | 26.75769 |
| Percentage of skilled manual occupations | 20.02414 | 33.68714 | 17.77467 | 34.66400 | 20.22275 | 33.59230 |
| Percentage of skilled services | 12.14216 | 30.18379 | 7.83313 | 25.57566 | 12.52261 | 30.52807 |
| Percentage of skilled commercial and administrative occupations | 21.04388 | 32.78958 | 21.92915 | 37.61616 | 20.96572 | 32.32767 |
| Percentage of technicians | 3.43263 | 14.49039 | 2.83921 | 14.82376 | 3.48503 | 14.45942 |
| Percentage of semiprofessions | 1.11437 | 8.95492 | 1.01896 | 9.26784 | 1.12280 | 8.92672 |
| Percentage of engineers | 1.13789 | 8.09207 | 1.08706 | 9.20157 | 1.14238 | 7.98670 |
| Percentage of professions | 0.75358 | 5.77471 | 0.53072 | 6.00331 | 0.77326 | 5.75368 |
| Percentage of managers | 3.30646 | 14.27636 | 3.57858 | 16.60682 | 3.28243 | 14.05179 |
| Regional unemployment rate (percent) | 8.52385 | 3.27247 | 8.82692 | 3.30963 | 8.49709 | 3.26782 |
| Number of observations | 13,088,949 | | 1,061,889 | | 12,027,060 | |

Notes: West Germany, private sector without agriculture and mining, regression sample 1985-2006