The economic contribution of a cohort of new firms over time

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Abstract:

What is the economic contribution of a cohort of new entrants? Previous research has investigated this topic but only in passing, and found conflicting results. We analyze a cohort of 6578 firms that entered in 2004, and track them for 10 years with an emphasis on size, which is measured using (deflated) sales data from the entrepreneurs' bank account records. The overall economic contribution of the cohort decreases in the years after entry. Post-entry growth is not sufficient to offset the economic loss from high exit rates. Broadly similar results are found when disaggregating by firm size and industry.

Keywords: cohort | firm size | post-entry growth | survival | entrepreneurship

Article:

> "Theirs not to reason why,
> Theirs but to do and die.
> Into the valley of Death
> Rode the six hundred."
> 'The Charge of the Light Brigade,'
> by Alfred, Lord Tennyson.

Introduction

Economic development owes much to the unrelenting waves of entrepreneurial entrants who perceive business opportunities, and act upon these perceptions to provide novel goods and services. The contribution of entrepreneurship to the economy is not only a topic of considerable economic and political interest but also one of controversy. An area of controversy—albeit one that is not studied in detail—is the economic contribution of new entrants and how their contribution evolves in the years after entry.

The economic contribution of a cohort of new firms is the result of two countervailing forces.[1]

On the negative side, life is short for many entrants (Audretsch et al. 2000): Most new firms die within a few years after entry—about 50% will die within the first 3 years. On the positive side, firms that do survive will grow and make an economic contribution (Fariñas and Moreno 2000; Cabral and Mata 2003; Angelini and Generale 2008; Meisenzahl 2016). New firms have a spurt of relatively rapid post-entry growth, which is particularly pronounced in the years after entry (Haltiwanger et al. 2013; Coad et al. 2018). We therefore investigate the total outcome—at the cohort-level—of these two countervailing forces. We analyze a cohort of over 6000 new ventures in the UK, with the use of rich data that capture their economic contribution (in terms of their total sales) immediately after they start to trade.

Our review of the related literature (which is summarized in Table 1) highlights the prevailing gaps in knowledge about new ventures and our contribution to the literature. While previous studies have measured the economic contribution of a cohort in terms of jobs created—total number of employees—or market share, we are the first to measure the economic contribution of a cohort in terms of total sales. We achieve this by analyzing a novel data source—entrepreneurs' bank account records that were collected by a major bank—in order to complement previous studies by showing an alternative perspective on the evolving economic contribution of entrants. Furthermore, given that previous studies have investigated different countries during different time periods, and have obtained conflicting results, our results can be useful for assembling a more robust body of evidence on the matter.

Table 1. Literature review table

References	Data sample	Lower size threshold for inclusion in the sample	Indicator of size	Post-entry change in the contribution of a cohort
Dunne et al. (1988, Table 8)	US Census of Manufactures for 1963, 1967, 1972, 1977, and 1982	All manufacturing plants that had 1 + employees at any time during the census year. Plants are included in the census when they begin paying Social Security tax on their employees (see footnote 4)	Market share	Decreasing
Boeri and Cramer (1992)	Employment statistics register, Germany	All employees in the private sector, but excluding *inter alia* the self-employed and those in limited employment	Employment	Mixed evidence, varies with the business cycle
Wagner (1994, Table 1)	Entrants in German manufacturing during 1979–1982, tracked until 1990	Entrants are establishments with employees in year t but no employees in $(t - 1)$, according to the Statistical Office	Employment	Mixed evidence
Mata et al. (1995, Fig. 1)	'Quadros de Pessoal' data on Portuguese plants in the manufacturing sector	"A plant was identified as 'born' in a given year if that was the first year it appeared in the database" (p. 463)	Employment	Decreasing

[1] See however Calvino et al. (2015, 2018), who introduce a decomposition of the economic contribution of a cohort of new firms into four elements: the start-up ratio (for the relative weight of new firms in the economy); the survival rates of new firms; the average size of firms at entry; and the average post-entry growth rate of survivors.

References	Data sample	Lower size threshold for inclusion in the sample	Indicator of size	Post-entry change in the contribution of a cohort
Baldwin and Rafiquzzaman (1995)	Greenfield entry: when a new firm enters an industry via the creation of a new plant. Plant-level data from the Canadian Census of Manufactures	Birth corresponds to the first appearance of the plant's identifier in the dataset	Share of production	Increasing
Caves (1998)	Literature review	–	–	Decreasing
Strotmann (2007, Fig. 3)	Manufacturing sector of Baden-Wuerttemberg (Germany), 1981–1994	Data on "manufacturing establishments with at least 20 employees and for establishments which are part of an enterprise with at least 20 employees" merged with "data from an annual report of small manufacturing establishments covering all establishments in the manufacturing sector with less than twenty employees." Although "a 'true' identification of actual entries is impossible, some corrections are made to reduce this ambiguity as far as possible." (pp. 90–91)	Employment	Slightly increasing
Shane (2009)	Literature review	–	Employment	Decreasing
Decker et al. (2014)	Longitudinal Business Database, US Census Bureau	All firms in the private, nonagricultural sector with at least one employee	Employment	Decreasing
Calvino et al. (2015)	OECD DynEmp v.2 database, for 15 countries	Not so clear. Each country's data comes from its own national statistical office	Employment	Increasing
Geurts and van Biesebroeck (2016)	Belgian social security office register data, 2003–2012	P. 66: "all private firms with at least one employee"	Employment	Decreasing
Anyadike-Danes and Hart (2018, Fig. 1)	239,000 UK private sector firms born in 1998, and tracked for 15 years	'Employer enterprises' with at least 1 employee	Employment	Decreasing
This paper	Cohort of UK small businesses starting in 2004	None. Even firms below the VAT reporting threshold are included	Sales	Decreasing

In Sect. 2, we present the previous literature on the economic contribution of a cohort of new firms, and we describe the contribution of this paper. In Sect. 3, we discuss the dataset, and in Sect. 4 we present the descriptive empirical analysis. Section 5 concludes the paper with summary remarks and offers a roadmap for future research.

Previous Literature

The topic of the economic contribution of a cohort has been addressed in passing in previous research. Furthermore, the results from previous research are not in agreement. This lack of agreement could be because previous research used different samples of data with varying degrees of inclusion of the youngest and smallest firms (which face the highest death rates). It

could also be because when a topic is addressed in passing; the underlying empirical structure needs for internal consistency could be overlooked. Table 1 summarizes the previous research.

An early contribution by Dunne et al. (1988) analyzed census data that are observed at a quinquennial frequency, and found that the contribution of an entering cohort declines in the years after entry. They summarized (p. 510) as follows: "The market share of each cohort declines, on average, in each census year following entry…. Equivalently, each group of entrants is on average responsible for its largest share of industry output in the census year in which it is first observed."

Some early authors found mixed evidence for the contribution of a cohort, with the total employment of the cohort usually increasing in the year after entry, before decreasing in the following years (see Wagner 1994, Table 1, and Boeri and Cramer 1992, Fig. 2). Wagner (1994, p. 144) writes: "The decline of employment in a cohort due to exiting firms, therefore, is more or less compensated by the growth of survivors of the same cohort." Boeri and Cramer (1992, p. 552) write: "establishments born in 'good times' experience faster growth immediately after entry than establishments born during cyclical downturns. However, in the following years employment declines at the same pace in all cohorts."

The classic study by Mata et al. (1995) focuses on survival, start-up size, and post-entry evolution. These authors show (p. 464) that "the share of employment in each cohort declines steadily over time (Fig. 1)."

The influential literature review by Caves (1998) draws on Mata et al. (1995) and the work of other scholars, to reach the 'substantive conclusion' that: "Gross entry is substantial in most industries. It is much larger than net entry, due to high rates of infant mortality. Successful entrants grow rapidly, so that an entrant cohort's initial market share falls slowly." (p. 1976; see also p. 1955). Similarly, Shane's (2009) review of the literature concludes that entering cohorts have a disappointing job creation performance in the years after entry: "43 people have to try to start companies so that we can have 9 jobs a decade from now. That's not the spectacular yield you might think we'd get if you read the press reports about the job creation of start-ups" (p. 144). Decker et al. (2014) also observe that entering cohorts have a decreasing contribution in the years after entry, although the attrition is not as severe as that observed by Shane. Decker et al. (2014, p. 8) write: "Five years after the entry of a typical cohort, total employment is about 80 percent of the original employment contribution of the cohort—in spite of losing about 50% of the original employment to business exits."

Not all scholars agree with these conclusions, though. Baldwin and Rafiquzzaman (1995) present evidence that the net economic contribution of a cohort actually increases in the years after entry. They write (p. 505): "the surviving firms grow sufficiently to offset the output loss due to the high infant mortality rates. The average share of production accounted for by an entry cohort increases from 1.75 to 1.97% over the same period as the average size of the surviving firms increases." Strotmann (2007, p. 92) reports similar results: "The substantial reduction of the number of plants in a cohort however does not coincide with a corresponding reduction of employment." Figure 3 in Strotmann shows that the employment contribution of a cohort seems to increase slightly in the years after entry, for most cohorts.

Calvino et al. (2015) also suggest that the net total employment of a cohort increases in the years after entry: "young firms aged five or less are on average always—and by a fair amount—net job creators…. net job creation by surviving micro start-ups is large enough to more than compensate for the job destruction of those micro start-ups that exit" (p. 10). Calvino et al. (2018) confirm their earlier findings on a slightly larger dataset of 19 (instead of 15) countries.

Geurts and Van Biesebroeck (2016) use a comprehensive dataset on Belgian firms to investigate the post-entry dynamics of entering cohorts. They write on page 93 that "Only half of all entrants are still around at age 6, at which time the average firm size in the surviving group has almost doubled." The total employment contribution of the cohort is always slightly below what it was in the year of entry, however.

Finally, Anyadike-Danes and Hart (2018) present a detailed analysis of a single cohort of UK businesses: All of them start in 1998 and are tracked for 15 years. Their Fig. 1 shows that many firms exit, that survivors increase in size, and that overall the total number of jobs of the cohort decreases over time, because the job creation by surviving firms is too small in magnitude to compensate for the loss of jobs from exiting firms.

As is shown in Table 1, previous studies use different datasets, which vary in terms of their ability to include small and short-lived micro enterprises. We address this shortcoming with our rich data. Indeed, there could be an important source of bias if short-lived firms are not included, or if firms below a certain size threshold are not included, or if firms are only observed a few years after startup. We argue that to assess a cohort's contribution accurately, we need representative data for all of the cohort in each of the years after entry.

Previous studies usually measure a cohort's overall net economic contribution in terms of employment, whereas we contribute by providing evidence for sales. We consider sales to be an important measure because it is denominated in GBP and thus it overcomes the productivity-related heterogeneity of employment measures.[2] Previous studies have also given disproportionate emphasis to analysis of the manufacturing sector. Table 1 shows that the results are mixed, perhaps because previous research has applied different approaches on different datasets.

Data

Dataset Description

Our dataset is drawn from the records of new firms that entered the business customer base at Barclays Bank, UK. The sample is not restricted to new firms that obtained a bank service—such as a loan or an overdraft—but it corresponds to firms that opened a new business account at the bank.

[2] Value added could be a better indicator than sales, but this must be left for future research because unfortunately value added does not appear in our dataset.

Our dataset tracks a cohort of 6578 firms for up to 10 years. All the firms in our sample started trading between May and June of 2004, and we verified that these observations correspond to genuine firm births by including only firms that showed activity in the month that followed entry into the customer base. At the time of data collection, about one in four UK start-ups banked with Barclays. The firms in our sample come from all sectors of the economy (except for financial services), and all regions of England and Wales.

Measuring Total Sales

The total sales of a firm are measured using 'credit turnover,' which corresponds to the value of payments entering into a current account over a 12-month period. This metric captures real sales and not financial account transfers, because it excludes payments from related accounts, such as deposit accounts held by the business.[3,4] Our measure of sales serves as a very close approximation to sales revenue inclusive of taxes. The greater granularity of sales as a size measure compared with using measures of employee numbers (which are commonly used in such studies—see Table 1—but which suffer from integer restrictions) is a particular strength of our data. Our sales measure is reliable and comprehensive; and, since every financial transaction is documented, the total sales can be reliably quantified. Values are expressed in 2004 GBP by applying the World Bank's Consumer Price Index deflator for the UK, taking 2004 as the benchmark.[5] Our indicator of total sales has been used in previous research (e.g. Coad et al. 2013; Lundmark et al. 2020).

Table 2 presents summary statistics on the size and growth rates of sales of the firms in our dataset.

Table 2. Summary statistics for sales and sales growth rates for the cohort's first 10 years. There are 6578 firms at the start of year 1 (May–June 2004), although only 5524 survive until the end of year 1

	Mean	Std Dev	10% Quartile	25% Quartile	Median	75% Quartile	90% Quartile	N
Sales								
Year 1	114,095	508,678	5475	14,687	38,712	103,658	260,652	5524
Year 2	141,440	535,248	5436	16,199	43,636	121,932	316,730	4162
Year 3	161,209	618,023	5000	16,521	45,824	132,477	357,417	3211
Year 4	172,150	507,279	5089	17,344	48,634	147,898	401,036	2593
Year 5	171,844	499,442	5371	16,258	46,225	137,557	407,841	2152
Year 6	169,887	624,700	4632	15,487	42,370	130,730	401,144	1823
Year 7	182,339	803,414	4878	15,812	45,376	138,598	438,725	1604
Year 8	207,484	1,092,547	5463	15,989	47,628	145,105	472,873	1424

[3] The UK, unlike many countries in continental Europe, is not characterized by multiple banking relationships (Ongena and Smith 2000). Furthermore, multiple banking relationships are unusual among firms that are young and small (Ongena and Smith 2000), such as those in our sample. The business account at a single bank is therefore likely to capture the full trading activities of the firm.

[4] Note that it is not possible to verify the origins of possible payments by the entrepreneur into the business account in the form of cash or cheque deposits. However, we consider that there is very limited scope for non-sales income to distort significantly the measures that we have selected in a sample of more than 6000 firms.

[5] The adjustment for inflation is undertaken using World Bank data for the consumer price index for the United Kingdom (GBR), as in Lundmark et al. (2020):
see https://data.worldbank.org/indicator/FP.CPI.TOTL?locations=GB (last accessed 23rd June 2019).

	Mean	Std Dev	10% Quartile	25% Quartile	Median	75% Quartile	90% Quartile	N
Year 9	221,271	1,307,656	5207	15,361	45,633	143,764	474,669	1311
Year 10	233,645	1,589,967	5330	17,617	50,497	152,931	460,672	1208
Sales growth								
Year 1	–	–	–	–	–	–	–	–
Year 2	− 0.075	0.940	− 0.984	− 0.290	0.033	0.336	0.733	4162
Year 3	− 0.156	0.946	− 1.024	− 0.326	− 0.001	0.217	0.543	3211
Year 4	− 0.133	0.864	− 0.896	− 0.302	− 0.010	0.203	0.480	2593
Year 5	− 0.225	0.907	− 1.026	− 0.414	− 0.102	0.100	0.392	2152
Year 6	− 0.243	0.833	− 0.885	− 0.390	− 0.102	0.064	0.337	1823
Year 7	− 0.121	0.772	− 0.729	− 0.239	− 0.027	0.153	0.442	1604
Year 8	− 0.099	0.698	− 0.637	− 0.241	− 0.044	0.141	0.414	1424
Year 9	− 0.106	0.731	− 0.619	− 0.250	− 0.049	0.119	0.409	1311
Year 10	− 0.062	0.678	− 0.543	− 0.201	− 0.005	0.177	0.458	1208

Measuring Business Death

The accurate measurement of a firm's death is a challenging task for the analysis of firm survival and performance. One possible complication in our case is that firms may close their bank accounts and transfer their business activity to a rival bank, which should not be recorded as a business death. Our data allow us to distinguish between those businesses that have closed, and those that have switched to another bank. We use Barclays closure-reason-codes that record why any given account has been closed. 1.38% of our initial sample switched over the 10 years covered by the dataset: They had closed their account with Barclays, but continued to trade.[6] These firms were dropped from our sample at the start.

Another aspect that relates to the measurement of business exit is judging when a given business has actually closed: Although most Barclays customers that cease to trade clearly close at a specific time—when no more transactions take place—an important minority of firms become dormant: Their account remains open, but without showing any activity.[7] In our sample, we followed the rule that if the business had shown no sales in two consecutive 6-month periods, then it was deemed to have closed in the first of these periods.[8] It is important to note that this process identifies closures, as opposed to business 'failures', because many business closures are voluntary and some closing businesses may still be successful in terms of being able to continue to cover their costs (Headd 2003; Harada 2007). Finally, cases of entrepreneurial exit (but business continuation) such as an initial public offering (IPO), merger or acquisition (M&A) or trade sale will not have a confounding effect on our measurement of business exit (Wennberg et al. 2010), because if the firm continues operations with the same bank account, it will be treated in our dataset as a continuing firm, whereas if it switches its bank account to a different bank, it will be treated in our dataset as a 'switcher' and dropped prior to analysis. However, cases of IPOs, M&As, and even trade sales are negligible in our data, because our firms are young, small,

[6] This could be an understatement of the true number if there were imperfections in the reporting process such that some switchers were not recorded. However, our rates are broadly in line with Fraser (2005, p. 90) for all types of UK (SME) businesses.

[7] It is possible that some of these firms may have switched activity to a rival bank, rather than closed.

[8] Some Barclays customers show little or no activity for several months before their turnover returns to non-negligible levels. This reflects the heterogeneous and idiosyncratic nature of many 'micro' businesses.

and generally representative of all sectors. The technology-based services in which these outcomes are particularly characteristic constitute only a tiny proportion of the sample. "Appendix 1" provides a more detailed discussion on how the various potential exit routes (survival, M&A, voluntary liquidation, and failure) correspond to the observed bank account activity states (continuation, switching, and account closure) in our data.

Our dataset has several strengths: First, we can track the sales of firms from the very start of operations, which allows us to capture the performance of firms immediately after birth, since we observe when the business bank account was opened. Relatedly, our dataset also includes firms that die before the end of their first year, which might not be detected by administrative datasets that are collected at an annual frequency.

Second, our dataset includes firms that would be small enough to fly under the radar of administrative datasets. Government datasets, such as employment censuses, and administrative or tax-related records, often have poor coverage of new businesses because they seek to trade-off the need for detailed information against the desire to minimize the bureaucratic burden that is faced by small firms. For example, British firms whose annual sales is below the Value Added Tax (VAT) threshold are not required to register in some government datasets, and so no information is available about such enterprises. In our dataset, many firms are below the VAT threshold and would not be detected in official government records.[9]

Third, our dataset allows for accurate measurement of a firm's total sales, because information on credit turnover is collected automatically by the bank. This is a strength when compared with government datasets, which are linked to issues of tax and regulation, and therefore may be prone to inaccuracies through either accidental misreporting and/or deliberate tax evasion.

A drawback of our dataset is that, given its focus on the 2004 cohort, we are not able to examine how the business cycle may affect the economic contribution of cohorts at different points of the business cycle. To investigate this latter research question, we would need to compare a number of cohorts that start in different years.

Calculating the Evolving Contribution of a Cohort

The total economic contribution of a cohort in year *t* is the sum of the sales revenues of all *N* firms in that cohort in year *t*:

$$\sum_{i=1}^{N} sales_{i,t} \tag{1}$$

The change in the total economic contribution of the cohort, from one year to the next, depends on the death rates of firms, and also the growth of the surviving firms (Wagner 1994). If there are *M* firms that survive, we have the following expression:

[9] For example, in the UK, the threshold for Value-Added Tax (VAT) registration was set at a turnover of £58,000 for the 12 months from 1 April 2004. From 1 April 2011 it has been £73,000 per annum. Our Table 2 shows that the median firm in our dataset is below the VAT threshold in year 1.

$$\sum_{i=1}^{M} sales_{i,t+1} - \sum_{i=1}^{N} sales_{i,t} = \sum_{i=1}^{M} (sales_{i,t+1} - sales_{i,t}) - \sum_{i=M+1}^{N} (sales_{i,t}) \quad (1)$$

The first term on the right-hand-side of (2) corresponds to the growth of the M survivors, while the second term on the right-hand-side of (2) corresponds to the loss due to exit.[10]

Analysis

We present our main results with the use of descriptive statistics and line charts,[11] rather than regressions. We begin with an aggregate analysis, before distinguishing between the components of changes in the cohort's total sales, and also before disaggregating by sector and by initial firm size.

Aggregate Analysis

Figure 1 shows our baseline results for the post-entry contribution of the cohort. The economic contribution of a cohort, in terms of its total cohort-level sales, decreases over time. This is especially true for the first 6 years, after which the total cohort-level sales hits a plateau (and perhaps even increases slightly).

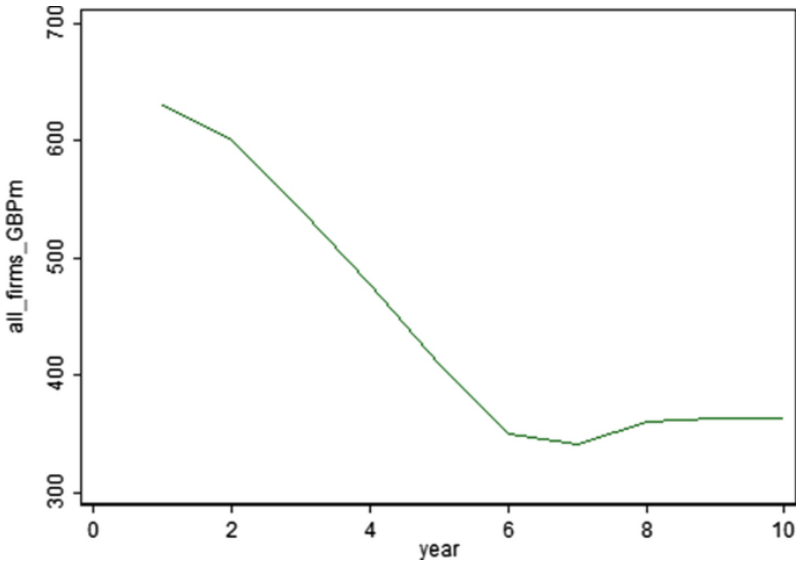


Fig. 1. Sum of the sales of all surviving firms, in the years after entry. *Notes*: Units are GBP millions. Linear vertical axis

[10] Future work could include exit via mergers and acquisitions (M&A) in Eq. (2), in addition to the exit term (the second term on the right-hand-side). This is not done in the present paper, because our data do not allow us to cleanly identify M&A events. Note however that there is no need to distinguish between bankruptcy and voluntary liquidation for the purposes of Eq. (2).

[11] This is in keeping with the previous literature that investigates (in passing) the economic contribution of a cohort: e.g., Boeri and Cramer (1992), Mata et al. (1995), and Strotmann (2007). See also Decker et al. (2016) for an example of industrial organization research that presents its main results using line charts. Future work could potentially apply more advanced techniques such as regressions and Blinder-Oaxaca decompositions.

Table 3 and Fig. 2 provide an explanation for this decline in total cohort-level sales, by distinguishing between gross sales growth for positive-growth firms, gross sales loss for declining firms, and the loss of sales due to exit. Three interesting findings stand out.

Table 3. Decomposing the total sales at the cohort level into changes due to gross sales growth, gross sales decline, and changes due to exiting firms

Year	(1) Cohort sum of sales	(2) Gross change in sales for positive growth firms	(3) Gross change in sales for declining firms	(4) Sales change due to exit	=(2) + (3) + (4) Net change
1	630.26	0	0	0	0
2	588.67	160.29	− 79.17	− 122.71	− 41.59
3	517.64	113.78	− 69.52	− 115.29	− 71.03
4	446.38	74.58	− 87.76	− 58.08	− 71.26
5	369.81	41.80	− 82.79	− 35.59	− 76.58
6	309.70	37.29	− 65.66	− 31.74	− 60.10
7	292.47	42.37	− 43.55	− 16.06	− 17.23
8	295.46	45.40	− 30.84	− 11.58	2.98
9	290.09	31.93	− 28.47	− 8.83	− 5.37
10	282.24	34.00	− 37.91	− 3.93	− 7.84

Units are GBP millions

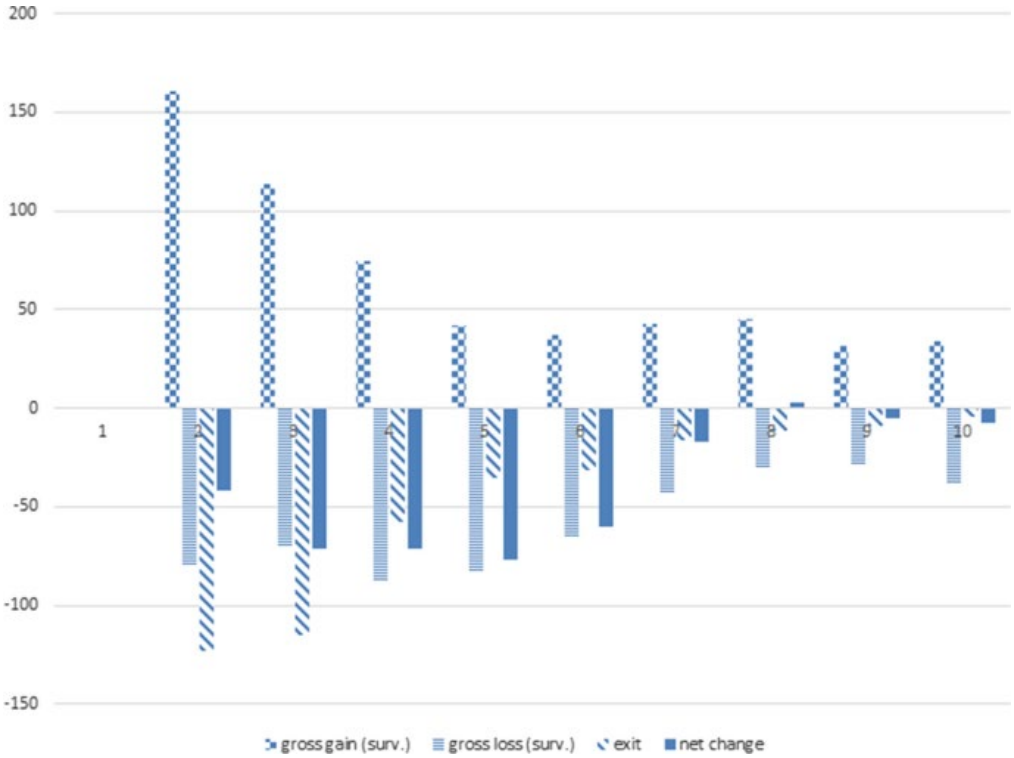


Fig. 2. Decomposing the net change in the cohort-level total sales. *Notes*: See Table 3 for the primary data

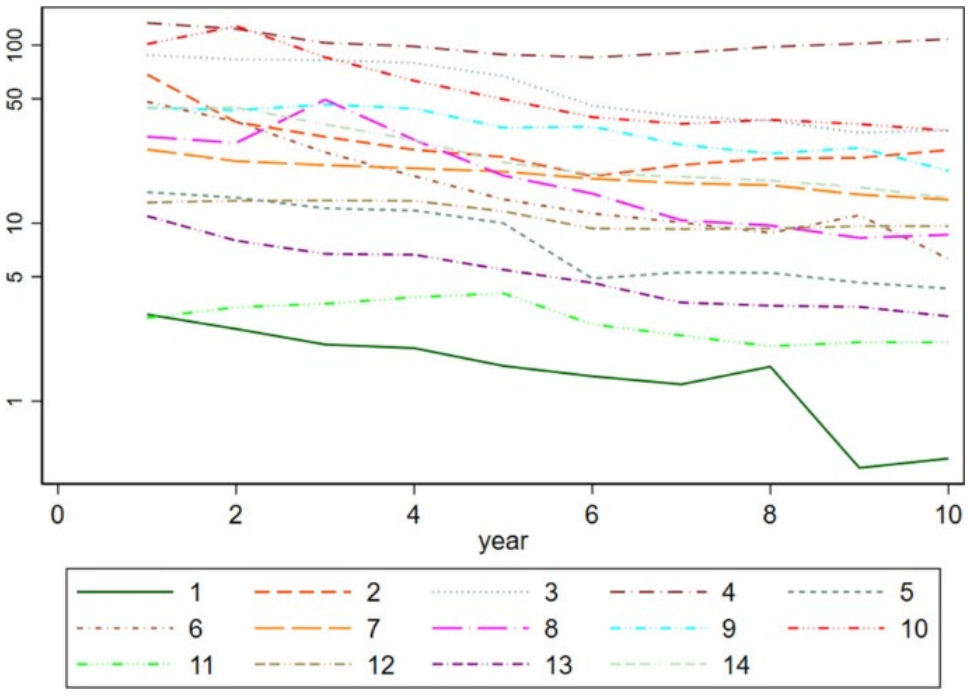
First, the net change in the cohort's sum of sales is much smaller than the magnitude of gross gain on the part of the firms with positive sales growth. Beneath the relatively gentle changes in total cohort-level sales there is significant variation.

Second, the role of exit is larger than the role of gross loss of surviving firms, but only in the first 2 years.[12] After that, the decline of the cohort's total economic contribution is driven by many firms having a negative sales growth.[13]

Third, the gross change in sales for positive growth firms decreases rapidly in magnitude in the first 4 years. However, gross losses due to declining sales in shrinking firms remain at roughly the same magnitude for the first 5 years.

Disaggregating by Sector

This subsection investigates whether the decline in the cohort-level total sales is common across sectors, or whether it is being driven by particular sectors. Indeed, sectors may differ in terms of survival rates (Audretsch et al. 2000; Helmers and Rogers 2010) and also in terms of post-entry growth. Figure 3 presents the evidence, with the use of logarithmic vertical axes. Sectors differ considerably in sizes.[14] While there are some exceptions, nevertheless the general trend is that each sector seems to experience a decrease in the cohort-level total sales in the years after entry.



[12] Note that while firm growth is overall positively related to survival, nevertheless some growing firms will exit in each year, and fast-growth firms have higher death rates than do moderate-growth firms.
[13] One possible explanation for this could be that their market share is under attack from an even younger cohort of entrants.
[14] Number of observations in each sector in year 1: Agriculture: 67 obs; Manufacturing: 320 obs; Construction: 967 obs; Retail: 1169 obs; Transport: 176 obs; Accommodation: 619 obs; Information: 393 obs; Real Estate: 227 obs; Professional: 473 obs; Administrative: 985 obs, Education: 54 obs; Health: 104 obs; Arts: 225 obs; Other: 800 obs.

Fig. 3. Sum of the sales of all surviving firms in the years after entry, disaggregated by sector. *Notes*: Logarithmic vertical axis. Units are GBP millions. Key to sectors: 1 = Agriculture, 2 = Manufacturing, 3 = Construction, 4 = Retail, 5 = Transport, 6 = Accommodation, 7 = Information, 8 = Real Estate, 9 = Professional, 10 = Administrative, 11 = Education, 12 = Health, 13 = Arts, 14 = Other

Disaggregating by Firm Sales

To further investigate what might be driving the decrease in cohort-level total sales, we disaggregate by firm sales, where large (small) firms have above (below) median sales in their first year.[15] Figure 4 shows that the total sales for large and small firm groups decreases over time. However, the two lines are not parallel. It appears that large start-up size firms have a sharper decrease in their total sales in the first 6 years after entry, after which they reach a plateau. On the other hand, small start-up size firms experience no change in the first 4 years, but afterwards the total cohort-level sales decrease steadily until year 10 and perhaps beyond.

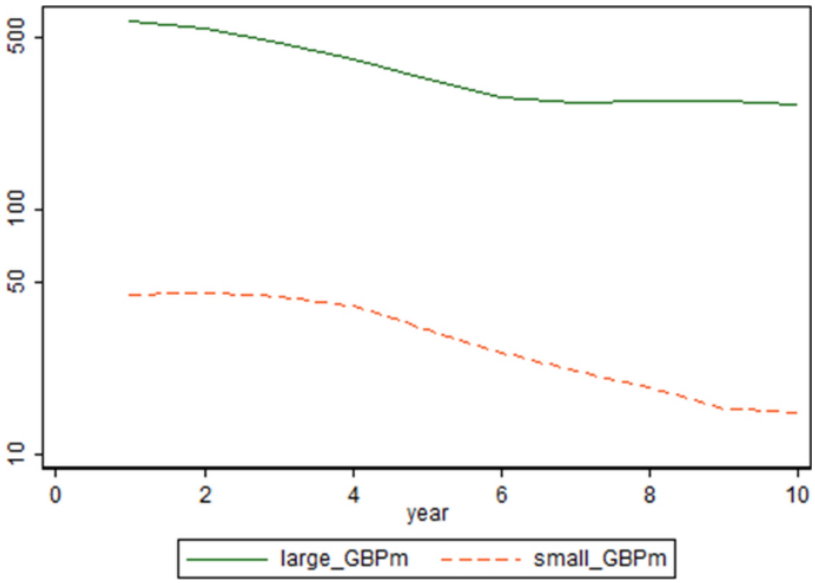


Fig. 4. Sum of the sales of all surviving firms in the years after entry, disaggregated according to small or large startup size. *Notes*: Units are GBP millions

Conclusion

Amid conflicting evidence about the economic contribution of cohorts of new firms, when economic contribution is proxied by an employment measure, we investigate whether the economic contribution of a cohort of new firms, proxied by a sales measure, increases or decreases in the years after entry. Overall, we observe that the cohort's economic contribution—in terms of its total sales—unequivocally decreases in the years after entry. The growth of surviving firms is not sufficiently large to offset the losses that occur because of relatively high exit rates for new ventures, and because of sales decreases by some surviving firms.

[15] To be precise, the cut-off point, which corresponds to the median sales in the first year, is £38'712.

In the first 2 years, the cohort's combined sales are particularly vulnerable to losses due to the exit of firms. After the first 2 years, however, the decline of the cohort's total economic contribution is driven by many surviving firms that have a negative sales growth.

We also observe that the gross gains in sales for positive growth firms decrease rapidly in magnitude in the first 4 years. However, gross losses that are due to declining sales in shrinking firms remain at roughly the same magnitude for the first 5 years.

We recommend that future work could build on our analysis with the use of other datasets, such as the well-known PSED II dataset: the Panel Survey of Entrepreneurial Dynamics (see Yang and Aldrich 2017).

Future work could also investigate the role of business cycle effects on the economic performance at the cohort level. Previous studies in this area have suggested that the business cycle has an effect on the economic contribution of a cohort (Boeri and Cramer 1992; Strotmann 2007; Sedlacek and Sterk 2017). Unfortunately, we were unable to investigate business cycle effects, because our data focus on just one cohort of firms that all started in May or June of 2004.

Future work might also investigate how the total contribution of entrants—the contribution of age-zero firms in each year—varies over time. For example, Haltiwanger et al. (2013, Table 1) observe that firms that were aged zero created 3518,419 jobs in the U.S. in 2005. How does this number vary over the years, and how does this relate to GDP growth rates and unemployment rates over the business cycle?

Future work could also investigate the varying contribution of different types of entrants, which include imitative entrants as well as Schumpeterian-type innovative entrants (Mueller 2003; Eklund and Lappi 2018). Imitative entrants would be more likely to grow by stealing business from incumbents (e.g., by undercutting on price), whereas innovative entrants would be more likely to grow by creating new markets in which they are monopolists of their innovative new products and services.[16] Hence, entrants might be heterogeneous and have different patterns of interacting with incumbents.

Another potentially interesting avenue for research—that we could call the 'fine young cannibals'[17] conjecture—could be to investigate whether an entering cohort is more likely to engage in fierce competition and business-stealing with those cohorts of young firms that entered in the prior years—the cohort of firms that are now aged 1 and aged 2—while having less influence on more established firms. In this scenario, much of the decline in the economic contribution of a cohort in the years after entry (e.g., in years 2–6) could come from competition from younger entrants rather than from competition with established firms. This conjecture remains to be investigated.

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[16] Other types of entrants can also be envisaged, for example innovators who develop significant cost-cutting process innovations. These entrants do not easily fit into the categories of imitators or Schumpeterian market creators. We are grateful to the Editor for this suggestion.

[17] "Fine Young Cannibals" is the name of a British rock music band formed in Birmingham, England, in 1984, who took their name from a 1960 film "All the Fine Young Cannibals" that starred Robert Wagner and Natalie Wood.

Our analysis and results lead to consideration of how policy makers might be able to improve the contribution of a cohort. On the one hand, this could be done by enhancing survival rates of new ventures; and on the other hand, it could be achieved by boosting the growth rates of survivors. However, we caution that it may be counterproductive to enhance the survival rates for firms, if this corresponds to putting poor-quality 'zombie' firms on artificial life support, at the taxpayers' expense. Also, we are aware that the literature has found that it is difficult to predict which firms will grow, and how growth can be stimulated (e.g., Coad 2009). Instead, we argue that policy could have a role in boosting the quality of firms—e.g., in terms of capabilities and the quality of management—in the hope that higher-quality firms are more likely to survive and thrive.

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