

Escaping the dead hand of the past: the direct employment effects of new firm formation and the dynamics of job growth in Northern Ireland, 1995-2005*

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version: August 27, 2008

Abstract

Using a newly created firm-level database for Northern Ireland this paper examines the dynamics of employment change over the decade 1995 to 2005. We focus on the anatomy of employment change and present an analysis of the relative contributions of cohorts of the new firms, their survival and growth as well as the contribution of the established (pre-1995) business population. The policy context for this investigation is the ongoing debate on the merits of a high-growth enterprise strategy. Our results will help inform that discussion: we find that pre-1995 cohorts of businesses contributed 60 per cent of total private sector employment in Northern Ireland in 2005, with the post-1995 cohorts contributing between 5 and 10 per cent each. So, for example, a decade after its birth the 1995 cohort accounted for hardly 4 per cent of the total.

*This paper is drawn on unpublished data supplied by Northern Ireland Department of Enterprise Trade and Investment. Special thanks to Sean Donnelly who provided the data and patiently answered our questions.

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1 Introduction

The development of industrial policy in the last 30 years has increasingly incorporated interventions and business support policies designed to stimulate enterprise. The rationale for this has been the assertion that enterprise has been identified as one of the drivers of productivity and economic growth (of Business Enterprise and Reform [2008]). Much of the support for this link stems from the pioneering work of Birch in the 1970s on the job generation propensities of new and small firms. As a result there has been a great deal of interest by policymakers in deriving indicators of enterprise which, in turn, may serve to measure progress against specific policy objectives. The ongoing OECD Enterprise Indicators Project (EIP) illustrates this interest and seeks to establish a suite of metrics related to business stocks and densities, nascent entrepreneurship (i.e., pre-start), entry and exit rates and survival and growth.

In Northern Ireland the Accelerating Entrepreneurship Strategy (AES) has sought to address a long-established entrepreneurial deficit by stimulating higher levels of nascent entrepreneurship and new firm formation. This strategy, formally launched in 2003, followed in a long line of policy initiatives designed to enhance the entrepreneurial processes. Indeed, as we have reported elsewhere, there has been a proliferation of policies aimed at increasing the level of enterprise start-up activity at various spatial scales throughout the UK (Anyadike-Danes et al. [2005], Anyadike-Danes and Hart [2006]). In 2008, prompted by the return of devolved administration to Northern Ireland and alongside the review of the enterprise strategy at national level (of Business Enterprise and Reform [2008]), there is once again a demand for a new enterprise strategy in Northern Ireland. The key question is what form such a strategy should take and, more particularly, what type of individuals and businesses organisation should be offered public sector support.

In parallel to these developments, there has been a re-emergence of the debate in policy circles between the relative merits of pursuing an enterprise strategy which provides support for all small and medium-sized enterprise (SMEs), or one which clearly the intention to focus upon a high-growth enterprises (Autio et al. [2008]; Hoffmann and Junge [2006]). The high-growth emphasis would appear to be a relatively recent phenomenon but it does bear a remarkable similarity to the issues discussed in the 'picking winners' debates of the 1980s (Storey et al. [1987]). Now the debate centres on the ability to promote 'gazelles' (fast growing new starts) but

in essence the priority remains the same. An illustration of this enterprise policy 'choice' would be the contrast between policies which encourage more people to become entrepreneurs as opposed to those which encourage the 'right' people to become entrepreneurs (Autio et al. [2008]). Whilst the definition of the 'right' person remains elusive, the discourse does provide some clues when the high-growth or 'gazelles' policies place an emphasis on technology and related to this academic and university spin-outs. Further, this narrower policy focus would provide support for growth of entrepreneurial firms as opposed to simply increasing the number of entrepreneurial firms.

Where is the evidence that informs such policy choices? Once again we are in danger of allowing the high-growth policy debate to get ahead of the evidence. The aim of this paper is to provide a detailed analysis of the direct employment effects of new business formation compared to the performance of an established business stock. In the first instance we use individual records (firms and plants) from the Census of Employment (CoE) for Northern Ireland which covers all establishments with one or more employees. The CoE is conducted every two years and we have employment numbers (as well as markers for industry and location) on the 5 cohorts born since 1995.¹

What we are interested in here is the extent to which job growth can be understood more clearly by a methodological approach which seeks to examine the differences between various business types, amongst which are high-growth start-ups. The emphasis, therefore, is on understanding the anatomy of employment creation by a business population over time in order to provide policymakers with a more grounded framework within which to develop enterprise strategy. It may turn out to be more effective to develop policies which impact upon specific aspects of this anatomy rather than relying upon the usual default option of increasing the levels of entrepreneurial activity more generally in the hope that, in some unspecified way, sufficiently large numbers of high-growth businesses will emerge. Does it matter if it turns out that 'gazelles' are such a rare event that their overall impact is minimal?

In recent years there has been a growing recognition that the answers

¹The analysis will be repeated for the UK regions using the newly created ONS Business Structures Database (BSD) which is based on the Inter Departmental Business Register (IDBR). The BSD has made practical a study of job generation which is virtually universal in coverage.

to these questions require the construction of longitudinal firm-level and plant-level datasets which incorporate firm demographics entry, exit, survival and growth. Significant methodological developments have been achieved and important studies have begun to emerge which observe the large degree of heterogeneity in business performance even in very similar sectors and markets (e.g. Bartelsman et al. [2003]). The analysis in this paper is developed within that growing body of literature. The paper is structured as follows. Section 2 provides an overview of the key studies on the employment creation effects of new firms. Section 3 describes in more detail the data and definitions used in the analysis. Section 4 examines in detail various dynamics of employment change in the Northern Ireland private sector over the decade 1995 to 2005: characteristics of six cohorts of birth; employment over time; survival and growth by size-band; the 1995 birth cohort and its employment impact 10 years later. We conclude with some discussion of how our results may connect to the ongoing development of an enterprise strategy in Northern Ireland and, in particular, the implications for a selective high-growth strategy.

2 Literature

Post-war reconstruction of western economies was characterised by mass production and the dominance of large companies. Economies of scale were regarded as key to industrial development and as it was thought that only large firms could produce output in sufficient quantities to take advantage of these economies, large firms were regarded as superior in efficiency as well as being the driving force behind technological development (Landstrom [2005]). During the 1970s the impact of the oil crises and other global economic problems led, according to Carlsson [1992], led to a shift in economic activity from large firms to small firms. As a consequence, job creation, entrepreneurship, innovation and industrial dynamics moved to the forefront of the academic and political debate (Acs [1992]).

2.1 The job generation role of small firms

David Birch was one of the first to challenge conventional wisdom about the creation of jobs in society. Before him few economists had studied small business in the economy but his 1979 report *The Job Generation Process* (Birch [1979]) showed that small companies accounted for the majority of new jobs in the US. Birchs interest in this area initially stemmed from

a research project on how US cities had changed. During the project he began to notice that jobs were moving away from city centres and this led him to question where jobs come from, where they are located and which firms grow.

In his report Birch aimed to explain how the behaviour of individual firms caused employment changes in the US, using the Dun & Bradstreet database. The dataset had a number of limitations; it mostly covered manufacturing; it was collected for credit rating purposes, and thus there was potentially a bias in terms of underreporting new firm births; additionally, there were difficulties separating branches. Despite this the dataset was a unique resource, containing a large sample of firms that could be analysed over time on an individual firm basis.

Despite the limitations the dataset revealed a number of interesting findings; it indicated that migration of establishments from one state to another played a virtually negligible role in terms of employment creation. In addition, the death and contraction rates varied little from one region to another, despite the rather large range of net change rates between regions. Thus the variation in net change was found to be mainly due to the rate of replacement rather than the rate of loss. This finding led to the question of which firms were the major generators of these jobs and what type of firms were they. The subsequent results showed that,

- the majority of expansion growth consisted of independent firms and these played a more important role in industries like farming, trade and service sectors i.e. those sectors of the economy that were growing in the 1970s;
- around 60% of all jobs in the US were created by firms with 20 or less employees and around half of all jobs created by independent small entrepreneurs. Firms with over 500 employees created less than 15% of net new jobs;
- not all small firms were job providers; it was the smaller, younger firms that generated jobs. These firms were termed by Birch as 'gazelles'. Once the firms were over four years old their job generation powers declined substantially.

These results were consistent across industries and regions.

Job Creation in America (Birch [1987]) represented a further attempt to look at individual units that make up an aggregate economy. The book sug-

gested that underneath the balanced surface of the economy there is a turbulent collection of companies all constantly undergoing change; a large number of new firms appear each year, some of which grow rapidly, many mature firms decline and a large number go out of business each year. In this context the small firms appeared to be the engine in the economy creating more jobs than the giant companies, growing more rapidly, running greater risks of failure and showing more adaptability. In fact he found that firms with less than 20 employees accounted for 88% of all net new jobs between 1981-85.

Birch's reports had a huge influence on policymakers and politicians around the world whilst it also provided the foundation for researchers to incorporate smaller firms into the analysis of economic development. However his seminal work *The Job Generation Process* (Birch [1987]) was not without its criticism particularly within the academic community. In fact Birch's results proved impossible to replicate, using the same database (Armington and Odle [1988]) whilst studies in the UK (Gallagher et al. [1990]; Daly et al. [1991]) found that although small firms made a disproportionately large contribution to net job creation, it was not as large a contribution as Birch had found for the US.

David Storey was inspired by Birch's work to undertake a similar analysis for Teeside in England. The results were published in the book *Entrepreneurship and the New Firm* (Storey [1987]) which concluded that small firms' role in economic development was more complex than previously thought. Storey argued that large firms were still responsible for the majority of new jobs, as well as job losses. He further suggested that the majority of new firms disappear within a few years of being established, with young firms more likely to fail than older firms and small firms more likely to fail than their larger counterparts, whilst he further suggested that most small firms exhibit a low level of growth. Similar to Birch, however, he did find evidence of a small group of fast growing firms. In a later book *Job Generation and Labour Market Change* (Storey et al. [1987]), he critically reviewed the data and analyses used in other studies on small firms and job creation. Again, he concluded that Birch had overestimated the contribution of small firms to job creation and found that it was a small number of new and expanding small firms that created a substantial share of the new jobs. Later, he would state that around one-third of jobs were found in less than 4 per cent of business that start to trade (Storey et al. [1987]).

In 1996, there was a further critique of the notion that small business creates the majority of jobs and suggested that the conventional wisdom, initiated by the work of Birch, was based on statistical fallacies and misleading interpretations of the data (Davis et al. [1996]). Their empirical work showed that small firms, although creating jobs at a higher rate than large firms, were also destroying them at a higher rate. The net effect, they found, was that job creation in US manufacturing exhibited no strong or simple relationship to firm size. They further highlighted the methodological problems in previous studies. They showed that size distribution data cannot be relied upon to explain whether small firms grow faster than large ones, due to the migration of firms across sizeband categories over time. In particular, they found that firms migrating from the 'large' to the 'small' category was a frequent occurrence and was most likely during periods of slow employment growth, creating the appearance of a fast growing small firm sector.

In order to truly estimate the contribution of small firms to job creation they suggested the need for longitudinal data on individual firms, although again they pointed to how the results of this can be misleading. The authors suggest that a distinction needs to be drawn between the small business share of gross job creation and that of net job creation, and singling out the work of the SBA ([SBA]) and Birch (Birch [1979] Birch [1987]), they argue that the share of net job growth accounted for by small businesses in such studies "grossly misrepresent the actual distribution of newly created jobs by size of employer". In addition they suggest that measurement error is a serious problem in the datasets used in those studies making it susceptible to regression fallacy. The use of the Dun & Bradstreet database in particular was seen as a major weakness due to the discrepancy between US employment as given by the dataset and the corresponding figures given by the Bureau of Labor Statistics and the Bureau of the Census (D&B exceeded the others by around 9 million), with the most serious data problems involving younger and smaller firms. The database was also found to have mistakenly identified 81 per cent of the mass layoffs or plant closures, which were actually events such as changes in ownership. Furthermore, the database was thought to have missed between 95-97% of new businesses when compared to alternative datasources.

Using the Longitudinal Research Database Davis, Haltiwanger and Schuh perform their own estimates of job creation and destruction by firm size (Davis et al. [1996]). They find that over the 1973-88 period large employers in the US created and destroyed most manufacturing jobs with small

firms accounting for just 40 per cent of job creation, although the authors do suggest that the definition of a small firm, defined here as firms with up to 500 employees, is perhaps not what springs to mind when the term 'small' is used. Looking at a tighter definition, they find that just 16 per cent of gross job creation is accounted for by firms with less than fifty employees. The authors do suggest however that this is likely to be higher in the non-manufacturing sector, but they did not have the available data to prove so.

2.2 New firm formation and economic development

Given the increasing availability of longitudinal datasets and modern computational methods and the more widespread acknowledgment of the role of small firms, the debate about job creation has moved on and rather than being concerned with methodological and measurement issues, key themes emerging now include the innovative role of small firms and the related issue of how new firm formation relates to economic development. However much of this literature deals issues beyond the scope of this paper²

Even in this wider context, though, survival is still an important issue since one of the key characteristics of start-ups is also their inability to survive. Empirical evidence has shown that new firms are characterised by a high risk of failure during their first years of existence (Fritsch et al. [2006]; Weyh [2006]). The main reasons for this 'liability of newness' are the problems of setting up an organisational structure and getting the new unit to work efficiently enough to keep up pace with their competitors. Often the firms have to survive a certain period of time before their first profit is attained, adding to their vulnerability. A linked concept is the 'liability of smallness' which concerns firm size at the time of establishment and their probability of survival. The hypothesis suggests that small firms have a lower probability of survival than larger firms of the same age.

According to Fritsch only 80 per cent of private sector start-ups in 1984-2000 in Germany continued to exist after year 1 (Fritsch et al. [2006]). Survival rates were considerably lower in services than in manufacturing; only 25.9 per cent of new service firms set up in 1984 survived until 2000,

²A useful starting point is the book *Innovation and Small Firms* (Acs and Audrestsch [1988]) which was one of the earliest to examine the contribution of small businesses to technological change. Acs, Audrestsch, and more recently Michael Fritsch, together with many co-authors have produced a substantial literature in this area.

in manufacturing the share was 33.4 per cent. Larger cities seemed to have low survival rates, possibly due to the relatively high share of start-ups in services which tends to have a higher hazard rate. Survival rates were highest in the moderately congested regions. In terms of the determinants, spatial autocorrelation was found to be important in explaining new firm survival. A high minimum efficient establishment size in the industry has a negative impact on new firm survival in services whilst the number of start-ups in an industry or region also has a negative impact, reflecting the strong competition between a large number of entries and confirming the market density-hypothesis. Weyh confirms these findings; arguing that there are pronounced differences in the development of start-up cohorts across industries and regions and revealing that regional characteristics are of importance for the success of start-ups (Weyh [2006]).

Despite this risk of failure, new firm formation is linked to economic development; the innovative activities performed by such firms typically result in new or better products, processes and services which increase the technological competitiveness of an economy, and therefore its economic growth. It is this reasoning that has led to the belief that a high level of new business formation in a region stimulates its economic development however Fritsch et al. have suggested that there is no clear empirical proof for this link (Fritsch et al. [2004]). Instead they suggest that a relatively long time period is needed for the main effects of new business formation to become evident.

3 Data

The data used here derives from Northern Ireland's Census of Employment (CoE) which collects data on the number of employees from all non-agricultural employers (by definition it does include numbers for the self-employed). It is a statutory enquiry, which means that employers are legally obliged to respond, and can be prosecuted if they do not; the response rate is about 95%. The CoE has been undertaken every two (odd-numbered) years since 1987 but we have access to just seven datasets: 1993 to 2005. The responses recorded refer to September of the enquiry year and we have data on employee numbers classified by industry according to SIC92 (the UK version of the EU NACE rev.1).

Census returns are filled out for all "local units" (LUs) – establishments (premises where there are employees) – and each establishment has a unique

reference code (LU number). All employers also have a "reporting unit" (RU) code and so, for a multi-establishment employer, LUs are nested within its RU. We were supplied with establishment level data but since our study of job generation is being undertaken for firms (RUs), the first step was to merge LUs into RUs. In the case of multi-establishment employers we assigned the RU an industry by using the industrial code for the largest proportion of employment in the LUs.

Demographic events – the birth and death of firms – are critical to our analysis but, unfortunately, we are not able to date them as directly, or precisely, as we might wish. The birth of a firm is defined here as the appearance of a new RU reporting at least one employee. Evidently, the firm might have been born (eg have paid its first employees) as much as 23 months earlier ie just after the last CoE, or as little as one month before the next CoE, both firms are treated here as 'born' in the same period. Equally, for deaths: the date of death is defined here as the year for which a firm fails to supply a census return with at least one employee. Evidently we have a fairly coarsely scaled ruler when it comes to the *timing* of events. There is a further difficulty, we are unable to distinguish firms which close from those which are absorbed through merger or acquisition. Equally we are not able to distinguish *de novo* births from those which result from the dissolution of a pre-existing firm. However, anecdotal evidence suggests that neither of these processes – lumping and splitting – are sufficiently important to distort our conclusions significantly.

Firms are classified as either 'private' or 'public' sectors and we made this split using the classification by industrial activity. All employees in – public administration and defence; Education; and health and social work – as public sector (SIC92 sections L, M, N) – were classified as public sector. Of course, some RUs in these sectors (in health and/or education for example) are private firms, and some RUs in our private sector are public sector RUs, but ours is a reasonable approximation and ensures that most typically longer lived public entities (schools and hospitals) do not distort our calculations of survival rates and employment growth.

4 The anatomy of employment change in Northern Ireland, 1995-2005

4.1 Basic statistics at birth

Table 1 sets out some basic descriptive statistics for our six birth cohorts. The number of firms in each cohort – births – has varied between 3 and 6.5 thousand: averaging about 5 thousand over each two year period, so about 2.5 thousand a year. The number of employees per cohort varied quite widely too, between 20 and 35 thousand: averaging 30 thousand over the cohorts, 15 thousand a year. The distribution of firm sizes is so skewed that the average size at birth is not a very meaningful measure of the centre of the distribution, for example one employee is the modal size at birth for every cohort, and two employees is the median.

Here instead we classify firms into seven size-bands. There are so many very small firms that one, two, three and four employee firms are separate categories; then we have three larger size-bands, five to nine; 10 to 19; and 20+. The distribution of firms at birth across these size-bands for the six birth cohorts is displayed in Figure 1. Whilst with just six observations we need to be especially cautious about identifying 'trends', it does appear that from 1995 to 1999 the share at the 'large' end contracted whilst the share at the 'small' end expanded (the divide between shrinking and expanding is between the 3 and the 4 – 5 employee size-bands). More recently, the proportion in each of the size-bands seems virtually stationary.

The differences in the size distribution between cohorts are relatively minor compared to the differences between the shares of the sizebands. Almost one third of the firms in every birth cohort has had only one employee; another third have either two or three. So about two thirds of all firm births in Northern Ireland between 1995 and 2005 have no more than three employees. In stark contrast, at the large end of the distribution, the 20+ size-band has typically accounted for just 3% to 4% of firm births in recent years.

The proportion of employees in each size-band at birth, displayed in Figure 2, are rather more evenly distributed than were those of firms, and since 1999 the proportions have been broadly similar across cohorts. Around 40% of employees are in the largest (20+) size-band, so at birth 4% of firms account for 40% of the employees. At the other end of the size scale, the

three smallest size-bands (one, two and three employees) account for two thirds of firms but just 20% of employment.

4.2 Employment over time

4.2.1 Birth cohorts, 1995-2005

Table 1 recorded employees by cohort in each birth year, whereas Figure 3 follows employee numbers forward through time, with bars for each year from 1995 to 2005. Employee numbers from each cohort are stacked, so that each stacked bar represents the total for that year summed over birth cohorts. The white-coloured slice at the top of each bar up to 2005 is labeled 'dead' because it represents the number of employees in firms which, although alive in that year, were dead by 2005. The grey slices represent the employees of firms which were still alive in 2005: the 2005 'survivors'. For the survivors' slices, the darkest section of the bar – at the bottom of the stack – is the 1995 birth cohort, the one above it is 1997, and so on.

Figure 3 is, then, a slightly unusual construct. It combines employment numbers from the historical record with a retrospective categorisation (here from the perspective of 2005) of the employing firms. So, for example, in 1995 the employee total (by definition all of them working for firms born in 1995) of around 20 thousand is divided between 9 thousand employees of 2005 survivors, and 11 thousand employees of firms who were dead by 2005. The 1995-born firms which died before 2005 contribute to the 'dead' slice of the employment total in each subsequent year in which they were alive: 8 thousand in 1997; 6 thousand in 1999; and so on. Of course, the 1997-born firms will contribute to the dead in 1997, 1999, 2001 etc. The 'dark' slice for 1995 expands as we move across the years: total employment in 1995-born 2005 survivors doubled over the decade to 17 thousand, an implied annual average growth of 6.7%. Indeed, we can see that the numbers of employees in 2005 survivors from each of the birth cohorts – each a slightly different grey-shaded slice – expand from period to period and at broadly similar annual average rates.

4.2.2 Total employees, 1995-2005

If we wish to 'account' for the overall number of employees in Northern Ireland's private sector, not just those employed by the cohorts born since 1995, we have to include the employees of the pre-1995 cohorts too. How-

ever, since we cannot reliably distinguish their birth year, employees in all these pre-1995 cohorts are treated as a single group. Total private sector employee numbers, including the single pre-1995 'cohort', are displayed in Figure 4. This barplot has been constructed in the same way as Figure 3, so the top, white, slice of each bar represents the numbers employed in each period by firms which were dead in 2005. So we have 'triangle' of data from Figure 2 resting on top of the shrinking numbers 'inherited' from earlier years.

The pre-1995 cohort has added a large dark slice at the bottom of the plot as well as considerably enlarging the size of the dead white slice at the top of each bar. In 1995, for example, pre-1995 firms which did not survive to 2005 had 101 thousand employees. Notice, though, the 2003 dead slice represents only a marginally larger figure than the dead slice in Figure 3 – non-survivors of the pre-1995 cohort only had 6 thousand employees in 2003. Just as noteworthy as the declining number of dead, is the pattern of employment growth recorded by the 2005 survivors of the pre-1995 cohort. Whilst some jobs were added between 1995 and 2001, and by 2005 the number of employees was only 20 thousand larger than in 1995. Taking the decade beginning-to-end, this represents an annual average growth rate of less than 1%.

By 2005 60% of the 400 thousand private sector employees were employed by the pre-1995 cohort, i.e. firms more than 10 years old. The remaining 40% is divided fairly equally between the six birth cohorts, with 6% or 7% each (indeed, only the 1995 cohort had a distinctly smaller share, about 4%).

4.3 Survival & growth by size-band

4.3.1 Survival

Clearly understanding survival is critical for understanding the growth of employment. The survival rates presented below have been calculated using the non-parametric Kaplan-Meier (K-M) estimator which allows for censoring: firms whose records are incomplete (that is, they have survived to 2005 at when the last data is available) are treated as having survived to the last period for which there is an observation, and then deleted from the number who are at risk for the next period. In our case, where we have pooled over birth cohorts, the two year survival rate calculations use data from the 1995 to 2003 cohorts, whilst the 10 year survival rate calculations

use just the 1995 cohort.

Figure 5 displays K-M survival rates by size-band, and the differences between them are striking. For example, 2 years after birth 87% of the largest firms are still alive, but just 70% of those with one employee; 10 years after birth, the difference is slightly wider, in the 20+ size-band 62% survive, but only 39% of the single employee firms. The difference in survival rates has widened from 17 to 23 percentage points over the decade after birth.

The other size-bands are quite close together, roughly in the middle of the range. Indeed three of them: 4, 5-9 and 10-20; are quite hard to distinguish on the plot. In fact, the standard errors attached to all five suggest none of them are statistically distinct.³ In other words, there are distinguishable survival rates for only three size-bands: single employee; 2-20 employees; 20+ employees.

4.3.2 Growth

We have just seen how strongly firm survival rates are differentiated by size-band: from Figure 6 we can see that employment growth – in those firms which survived to 2005 – is very strongly differentiated by size-band too. However, whilst survival varies positively with size-band – larger firms have a better chance of surviving, employment growth varies inversely with size – larger firms have a lower rate of employment growth. The relationship between size and growth is a little more disordered than that between size and survival. To be sure, survivors born with one employees grew the most, by a factor of almost 5 (equivalent to annual average rate of 17%), whilst survivors born in the 20+ band were only 60% larger (equivalent annual average rate of 4.6%). Between these two extremes though, the growth rates are not strictly in size-band order. The growth rate for size 3 is a little larger than size 2, although both are larger than size 4. It is also important to bear in mind the absolute numbers involved in these rates of growth. The size 1 growth rate, though spectacular, implies that on average size 1 survivors had about 5 employees after 10 years; at the other end of the scale for example, size 20 survivors from the 20+ size band on average would have added 10 employees.

³The pattern revealed by the Kaplan-Meier estimates is confirmed by the coefficients of a Cox proportional hazard model estimated on the same data.

4.4 The 1995 cohort under the microscope

We have a decade's worth of data on the 1995 cohort and we can use it to illustrate the inter-relationship between size, survival and growth in more detail, examining the transition from birth to the state of the cohort in the year of our last observation, 2005. The big picture is summarised by Figure 7. The first pair of bars record the distribution of firms across size bands: on the left (familiar from Figure 1) is the distribution at birth, whilst the bar on the right reveals how the distribution had changed after a decade. By 2005 only 37% of the cohort are left (from Table 1, 1137 of the 3082 with which we started) and we can see immediately the combined impact of size-band differences in survival and growth. In 1995 one third of the cohort had a single employee, by 2005 the proportion was just one fifth; at the other end of the scale, the proportion of the cohort in the 20+ category has just about doubled.

The second pair of bars (the first of which appeared on Figure 2) record shares of total employment by size-band. Again the effects of survival and growth are clearly evident. In 1995, when there were almost one thousand single employee firms, they accounted for about 5% of employment, the 150 or so single employee 2005 survivors accounted for less than 1%. In strong contrast the employment share of the 20+ category (which hardly changed in number, 145 in 1995, 156 in 2005), less than half in 1995, contributed 70% of the total in 2005.

The rest of this section focuses on how each of these pairs of bars is connected: first we present a 'big picture' overview of the size distributions in 1995 and 2005; then we use a transition matrix to connect the distribution of firms across size-bands at birth to their distribution in 2005; and then looks in more detail at the changing fortunes over the decade of the largest firms.

4.4.1 The size distributions of firms and employees on a continuous scale

One simple approach to characterising the distribution of employees across firms is to construct a 'Lorenz' curve (more commonly used to display the extent of inequality in the distribution of income): we plot firms in decreasing size order ⁴ along the x-axis against their contribution to (cu-

⁴A conventional Lorenz curve would order the firms from smallest to largest, ours ordering is largest to smallest.

mulated) share of total employment on the y-axis. So, for example, if the largest member of the 1995 birth cohort had 500 employees, equivalent to 2.5% of employment: then the first point on the Lorenz curve for 1995 would have the coordinates (1,2.5); if the next largest firm had 400, equivalent to 2% of employment, which means the first two together account for 4.5%, then the next point on the curve would be (2,4.5); and so on. By definition the last point would be (3082, 100): there are 3082 firms altogether accounting for 100% of employees.

Figure 8 displays two 'Lorenz' curves, one for 1995 – the dashed line – and the other for 2005 – the solid line. The markers on the horizontal axis "1", "2", and so on refer to the deciles of the distribution: where '1', for example, refers to the top decile of the distribution. Now since there are different numbers of firms in 1995 and 2005 the decile markers will in turn refer to different numbers of firms: in 1995 a decile covers 308 firms; in 2005, just 114. Obviously, if each firm had the same number of employees then the 'Lorenz' curve would be a 45° line through the origin, the extent of the area above the curve is a measure of the inequality of the distribution of employees across firms. For most of its length the 2005 curve is systematically above the 1995 (albeit not by very much), and this 'outward' movement of the curve suggests that there has been an increase in inequality: a larger percentage of employment has become concentrated in a small percentage of large firms. Notice, because the overall number of firms contracted so much (from 3083 to 1137), and overall employment shrank rather less (from 19914 to 16900), in 1995 the 308 firms in the top decile accounted for 12 thousand jobs, whilst by 2005 the 114 firms accounted for almost as many, about 10.5 thousand [check these numbers].

4.4.2 firms by size-band: the transition matrix

Table 2 takes us into the detail by size-band, the first three columns supplies some basic information on the fate of firms, dividing each size-band into three categories: dead; zero; or alive. Since almost no zero employee firms ever records any employment subsequently, the analysis of transition is simplified at virtually no cost, if zero employee firms are treated as more dead than alive.

The pattern of variation across size-bands in the proportion dead resembles the 10 year survival rate from the Kaplan-Meier curves (of course, dead rate is (roughly) 100 less the survival rate). The difference between the dead rate for 1-4 employee size-band of 59%, and the 20+ employee

size-band of 44%, is 15 percentage points, the dead rate for the other two other size-bands are in the middle, and quite close together. From the third column we can see that, taking the 1995 cohort as a whole, over one-third cohort were still alive; and the pattern across the size-bands largely reflects the pattern in dead rates (the proportion near-dead, in the zero category, has had no systematic effect): 34% of 1-4 employee births were still alive in 2005 and 53% of the 20+ category.

The rest of the table refers only to firms still alive in 2005, the 2005 survivors of the 1995 birth cohort. It is a four-by-four origin to destination – or transition – matrix. An origin (row) refers to a firm's size-band at birth in 1995, whilst a destination (column) refers to a firm's size-band in 2005. The proportions across each row sum to 100%, since each firm originating in a given row must be in a destination column in that row.

Starting with the first row, 1-4 employee firms, we find that after a decade two thirds remained in the same size band. Now if we add the 22% of 1-4 employee firms who made the transition to 5-9 employees, we see that about 85% of all 1-4 employee firms have no more than 9 employees after a decade. So just 15% grew to more than 9 employees, and only a tiny proportion, about 4%, made the transition to 20+.

Looking at the transition matrix as a whole, a pattern is fairly easy to discern. The largest proportion of each category is in its 'own' size-band i.e. more firms 'stay' in their size-band of origin than 'move' to any other destination size-band. In matrix terms, the largest proportions are on the leading diagonal. Secondly, the next largest destinations are typically those closest to the leading diagonal: those who move do not move very far. So, for example, 31% of firms born with 5-9 employees remain in the two employee size-band and looking either side we see that 30% contract to 1-4 employees, whilst another 22% expand to 10-19 employees. So after a decade we find that 83% of 5-9 employee firms have between one and 19 employees. Evidently there is a degree of immobility in the size distribution. And, in this respect, the 20+ size-band stands out: three quarters of those born with 20+ employee, and who survive, have 20+ employees in 2005. Finally, it is worth noticing that for all size-bands death is *more likely* than remaining in the same size-band (even for the 20+ category), and death is *very much more likely* than moving up a size-band.

4.4.3 Jobs by size-band

Table 3 helps us to pin down more precisely the pattern of employment in 2005 survivors: the rows of the table are size-band at birth; the columns size-band in 2005; each cell records the proportion of 2005 employment accounted for by the birth/2005 size-band combination. We know that overall, the 2005 survivors more or less doubled employment over the decade, from 8785 to 16900 and so the table shows how the different combinations of size-band at birth and size-band in 2005 contributed to that outcome.

From the first row we see that firms which were born in the 1-4 size-band *and stayed there* accounted for under 7% of 2005 jobs; but firms which were born in the 1-4 size-band *and did not stay there* accounted for 20% of 2005 jobs. What we are observing here then are the simply the consequences of growth: we know from Table 2 that almost two thirds of firms born 1-4 stayed 1-4; what we now see is that the one third that moved accounted for a considerable number of jobs. At the other end of the size scale, the firms which were born in the 20+ category, and remained there in 2005, accounted for 41.7% of 2005 employment; further, firms which grew into the 20+ size-band over the decade accounted for another 27 percentage points of total employment. In total, then, firms in the 20+ size-band by 2005 together accounted for almost 70% of 2005 employment.

It is very important, though, that this very successful group be seen in context. Just 72 firms made the transition from 1 to 9 to 20+ over the decade. This represents just 7% of the 1 to 9 firms which survived the decade, and just 2.5% of the 1 to 9 firms born into the cohort in 1995. Perhaps a more 'interesting' group are the 27 firms born in the 10 to 19 category who made the transition to 20+ and accounted for 8% of the job growth. These represented a third of the 10 to 19 survivors, and 12% of those born in the 10 to 19 size-band.

4.4.4 The 20+ size-band

The importance of the 20+ group suggests it is worth a more detailed look. Now we know from Table 2 that half the firms born into the 20+ size-band at birth died over the decade, and we know from Figure 7 that, nonetheless, 70% of employees in the survivors of the 1995 birth cohort were in the 20+ size-band. Evidently, understanding the dynamics of this category could contribute importantly to the understanding of employment growth dynamics. Some data are recorded in Table 4.

Starting with the basics. At birth the 1995 cohort had 145 firms in the 20+ size-band, just under 5% of all the firms in the cohort. These firms had, between them, 9239 employees, 46% of the cohort total. The 2005 survivors of the 1995 birth cohort had 156 firms in the 20+ size-band. However, because about two third of cohort members had died (or were near dead), they comprised 14% of all the survivors. In 2005 these birth cohort survivors had about 11600 employees, 69% of all 1995 cohort survivor employees. So over the decade the 20+ category – *although it barely changed in number* – became, both relatively and absolutely, more important: it became a larger proportion of the birth cohort and accounted for a larger proportion of its employees; and by 2005 the survivors in this size-band had a third more employees than the size-band did at birth

However, there is only a limited overlap between the firms which were members of the 20+ group in 1995 and its membership in 2005 and the 'demographic accounts' are summarised in Table 3. Of the 145 firms born in 20+,

- 69 (about half) died, across the size range and broadly in proportion to the distribution across the size range at birth (for example, about half the 200+ firms died, as did half the firms in the 100-199 range). Taken together these firms employed half the 20+ size-band at birth.
- 19 of the 76 survivors contracted to below 20 employees (nearly all of them from the sub-50 part of the distribution), this group had 762 employees at birth (by 2005 just 229).
- so we have just 57 of the 20+ at birth in the 20+ survivors category, at birth this group had 3866, (42%) of the employees

These survivors were joined by 99 firms which had less than 20 employees in 1995. So almost two thirds of the 20+ size-band in 2005 had joined it within the decade. The bulk of these 'newcomers' were from the more heavily populated bottom end of the of the birth size distribution: more than two thirds of them had less than 10 employees in 1995, one third had less than 5 employees. Unsurprisingly the newcomers were smaller (average size 46) than those who remained (average size 124). However, the newcomers did include eight in the 100+ category and one 200+. More noteworthy, but no more surprising, the newcomers recorded strikingly higher rates of growth of employment: the newcomers averaged 20.4% annually over the decade, whereas those who remained managed only 6.2%.

5 Summing up

5.1 Escaping the dead hand of the past

We have focused here on the dynamics of employment change in the Northern Ireland private sector over the decade 1995 to 2005. Our concern has been to establish orders of magnitude of various stocks, flows and proportions and the relationship between them. We have, therefore, made no mention of background economic conditions which might have shaped them, amongst which would be,

- global economic conditions (eg the hi-tech downturn of 2001)
- the "Celtic Tiger" across the border in the south of Ireland (1995-2001)
- the 'long boom' (nice) in the UK (1995 to 2008)
- the political settlement in Northern Ireland and the return of devolved government

Clearly any attempt to provide an explanation for the size and evolution of our key constructs – birth, survival and growth – would have to test for the effects of these (amongst factors).

In brief, we have data on six birth cohorts at two year intervals between 1995 and 2005. At birth each cohort had around 5000 firms (1995 rather smaller, closer to 3000) and at birth each cohort had 25000 to 30000 employees (1995 smaller, about 20000). We analysed, in some detail, a decade's worth of data on the 1995 birth cohort and found that,

- after a decade, around two thirds of the firms in the birth cohort are dead (or near dead, ie no employees)
- the 'dead' firms accounted for just over half the employees of the cohort at birth
- the surviving one third of firms have twice as many employees as they did at birth
- overall, the 2005 survivors of the 1995 cohort contributed 85% of the overall cohort's size at birth to total employment in 2005

The pre-1995 cohorts contributed 60% of the employment total in 2005, 272 thousand employees, which represented 85% of its 1995 level. So, taken together, our six birth cohorts (1995 to 2005) accounted for 40% of jobs in 2005 – the 1995 cohort accounted for about 4%. The 2005 survivors from the 1997 to 2003 cohorts, and the 2005 birth cohort itself, shared the rest of the jobs roughly equally with employee numbers in the 25000 to 30000 range, not hugely different from their size at birth (depending on the cohort, 85% to 95%). Between 1995 and 2005 private sector employment in Northern Ireland grew by about 25%, the increase of 90 thousand employees is of the same order of magnitude as the numbers employed by the 2005 survivors of firms born since 1995.

In a sentence: firms are born, many die, however, in Northern Ireland over the decade 1995 to 2005 relatively strong employment growth amongst survivors seems to have balanced (approximately) the jobs lost by the firms that did not survive.

5.2 Concluding remarks

Overall, therefore, the analysis has demonstrated the heterogeneity of business performance which lies behind the growth in private sector employment in the decade 1995 to 2005. So where does that leave the discussion on the necessary elements of an enterprise strategy? The major conclusion to emerge from this analysis is that the development of an enterprise strategy for Northern Ireland which would seek to increase the level of overall new business formation may not be straightforward. The discussion about the balance within that strategy between initiatives to increase the absolute numbers of start-ups or increase the proportion of new high-growth start-ups would not appear to be critical to this assessment. For example, we observe that just under two-thirds of private sector employment in 2005 was in businesses who were aged ten years or over. The surviving cohort of pre-1995 births exhibited a very modest growth rate over the decade - an annual average growth rate of less than 1 per cent. In other words, the long-term economic impact (in this case measured by jobs after 10 years) of new firms is considerably less than that of the performance of an established business stock, whose survivors taken as a group have not been growing rapidly.

Perhaps more importantly, in the context of any discussion of the merits of a selective new high-growth strategy, the analysis shows that very few firms in the 1995 birth cohort undergo significant growth over time and,

therefore, we draw the conclusion that this 'rare' event does not readily lend itself to policy intervention on the grounds that the significant effort needed to identify such businesses *ex ante* would appear unjustified even if it were possible. Of course, we need to undertake more detailed analysis of this 1995 birth cohort (e.g., by sector, ownership and whether they were supported by public sector business support interventions) before we are in a position to be at all certain about the policy implications. However, it does appear that there might be some merit in examining the potential for re-balancing policy to focus attention on long-established businesses with a view to enhancing their growth rates. This might be a better use of public sector business support than the stimulation of new firm formation, irrespective of the selection criteria used for that policy. Clearly, a better understanding of the dynamics of the business stock and how that is connected with the anatomy of employment change is vital.

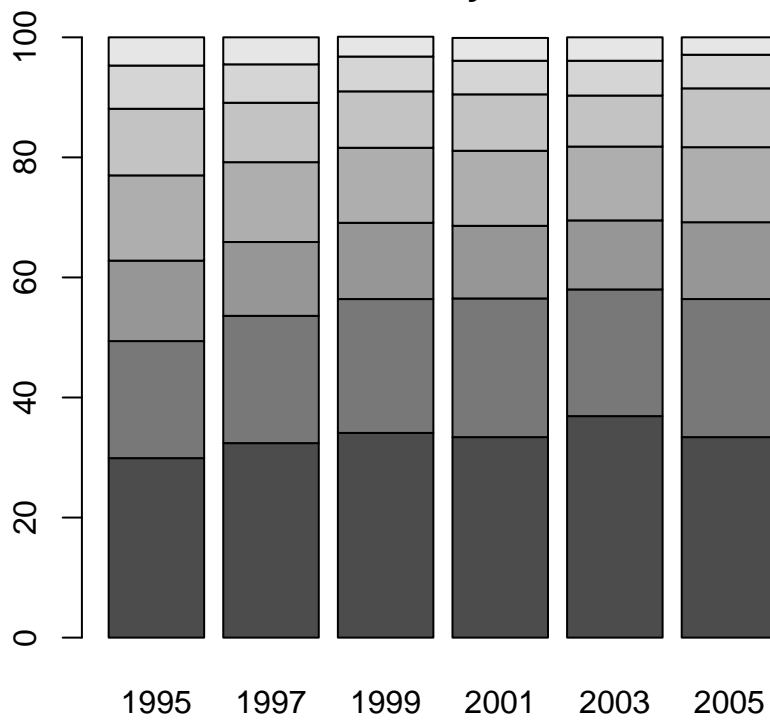
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Figure 1:

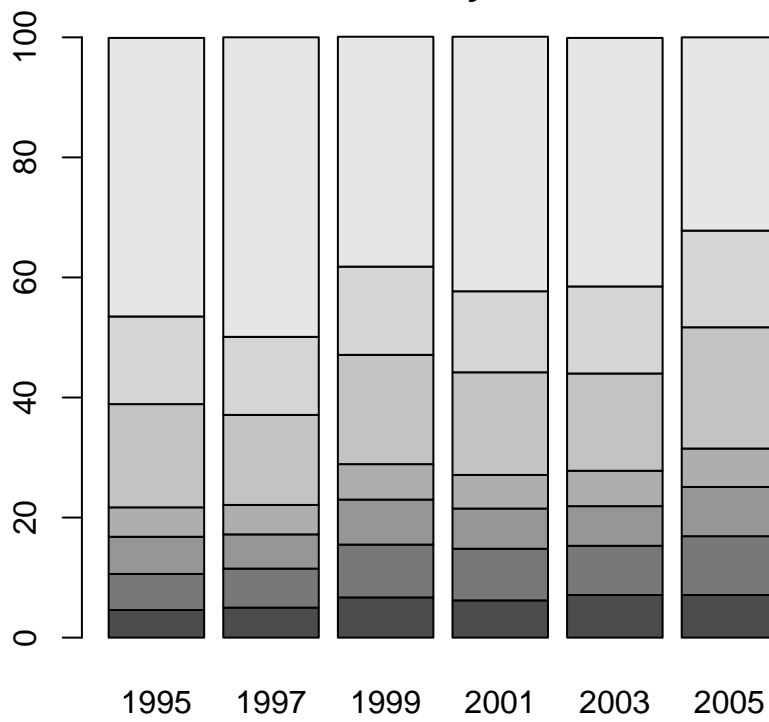
**Birth Cohorts, 1995–2005, firms,
share of cohort by size–band %**



size–bands in ascending order: 1, 2, 3, 4, 5–9, 10–19, 20+

Figure 2:

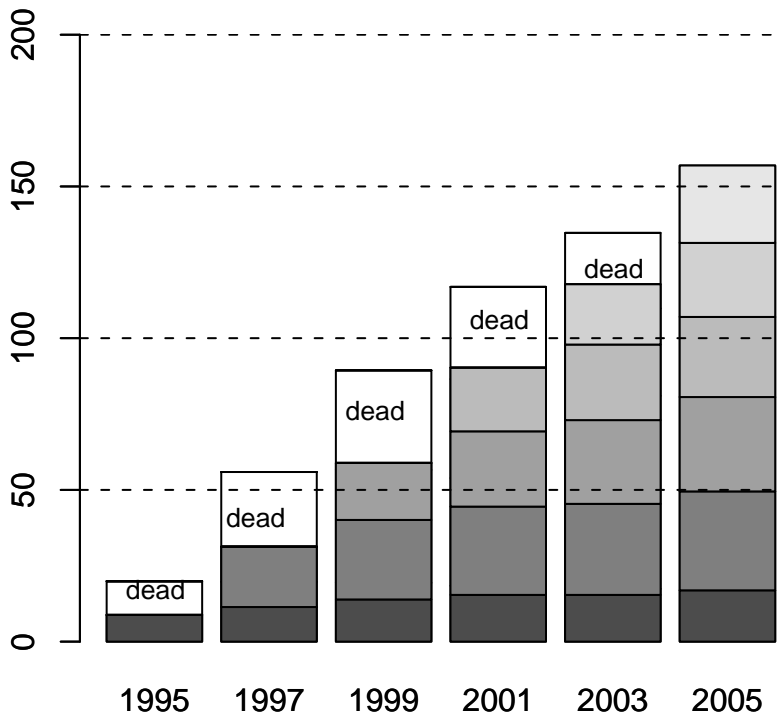
**Birth Cohorts, 1995–2005, employees,
share of cohort by size–band %**



size–bands in ascending order: 1, 2, 3, 4, 5–9, 10–19, 20+

Figure 3:

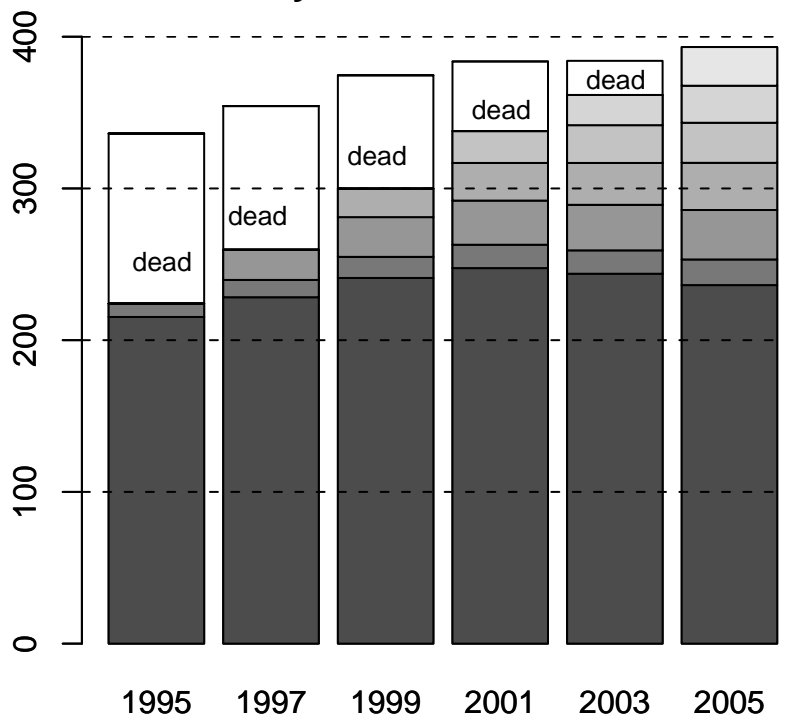
**Employees, 1995–2005, coh95 to coh05,
by birth cohort '000**



each slice is a cohort, in ascending order:
95, 97, 99, 01, 03, 05

Figure 4:

**Total Employees, 1995–2005,
by birth cohort '000**



each slice is a cohort, in ascending order:
pre-95, 95, 97, 99, 01, 03, 05

Figure 5:

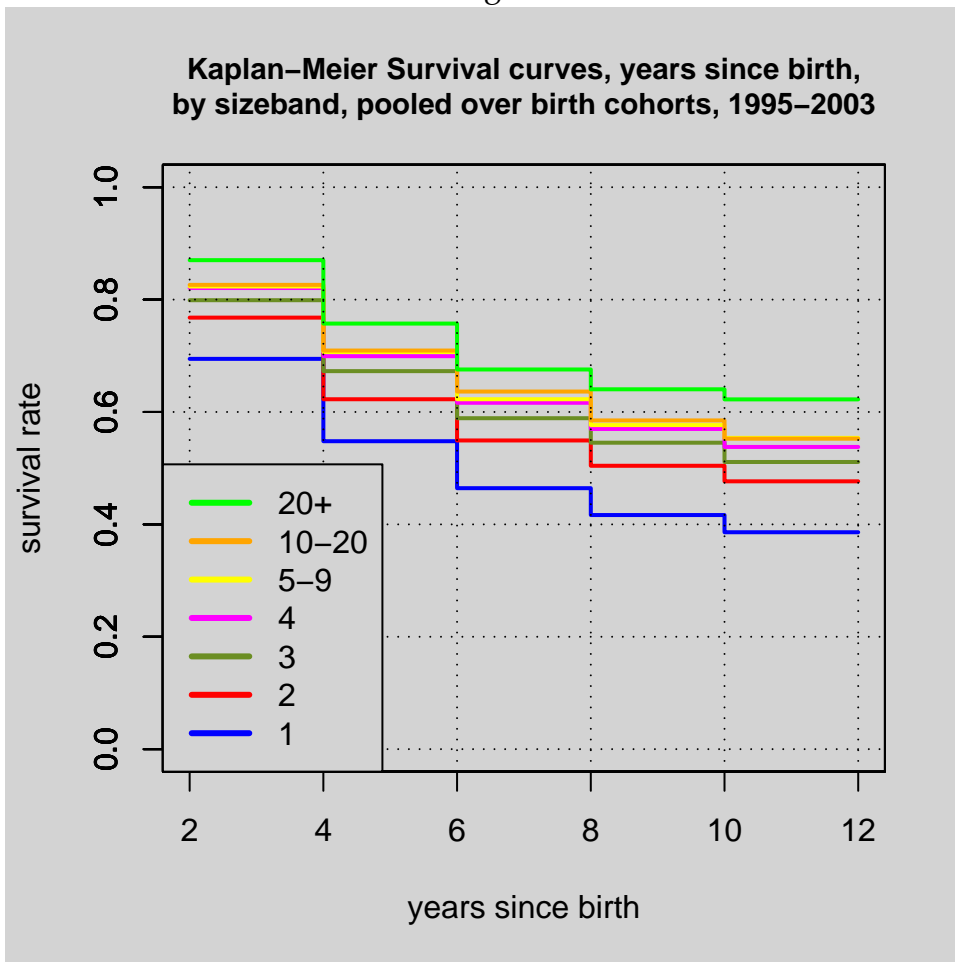


Figure 6:

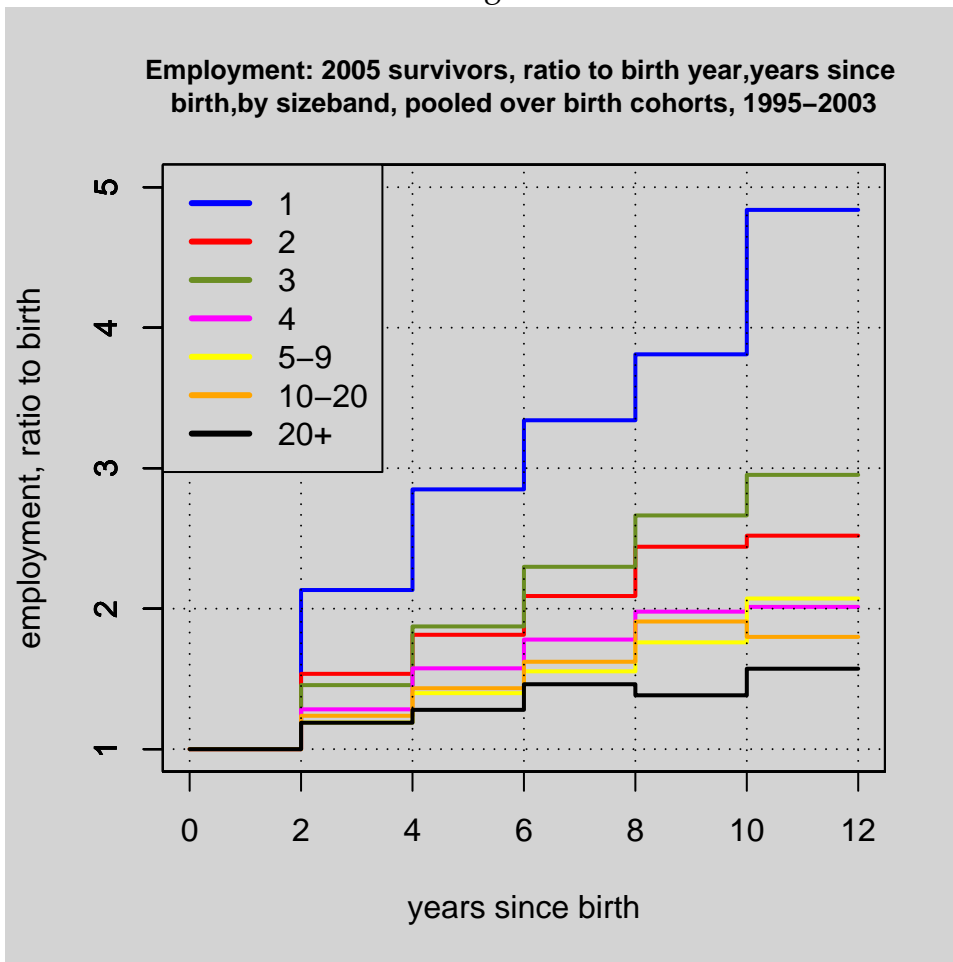
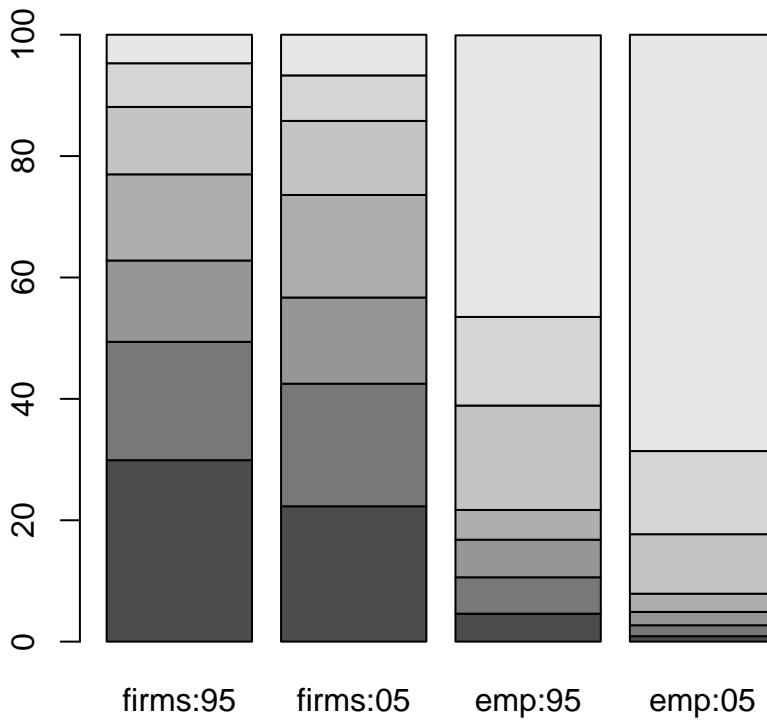


Figure 7:

**coh95 at birth & 2005:
size distribution of firms & employees**



size-bands in ascending order: 1, 2, 3, 4, 5-9, 10-19, 20+

Figure 8:

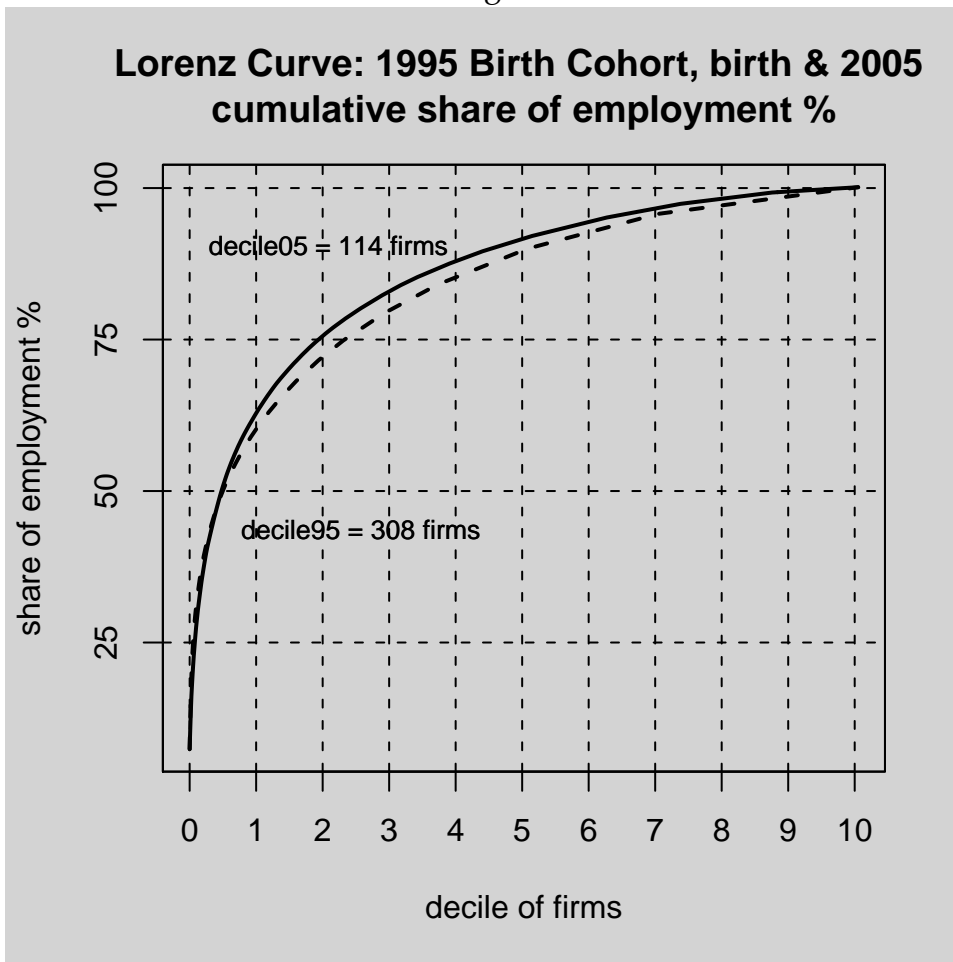


Table 1: Birth Cohorts, 1995 to 2005, basic statistics

birth year	births		survivors	
	firms	employees	firms	employees
1995	3083	19914	1137	16900
1997	5565	36221	2223	32572
1999	6450	32752	3035	31055
2001	5633	30406	3100	26377
2003	4815	24934	3340	24362
2005	5431	25510	5431	25510
mean	5163	28290	3044	26129
memo: pre-1995	21436	319484	9879	271943

Table 2: 1995 Birth Cohorts, birth to 2005, size-band transition matrix

1995 size-band	2005 share			2005 size-band (share of alive)			
	dead	zero	alive	1-4	5-9	10-19	20+
1-4	59.0	6.8	34.1	63.6	22.0	10.1	4.3
5-9	52.1	4.7	43.3	29.9	30.7	22.1	17.3
10-19	54.8	6.8	38.5	9.4	21.2	37.6	31.8
20+	44.1	3.4	52.4	3.9	2.6	18.4	75.0
all	56.8	6.3	36.9	48.7	22.4	15.1	13.7

Table 3: 1995 birth cohort 2005 survivors, share of 2005 employment by size-band

1995 size-band	2005 size-band				all
	1-4	5-9	10-19	20+	
1-4	6.6	6.0	5.8	8.9	27.3
5-9	1.2	2.8	3.9	9.9	17.8
10-19	0.1	0.8	2.7	8.1	11.8
20+	0.1	0.1	1.2	41.7	43.1
all	7.9	9.8	13.7	68.6	100.0

Table 4: 1995 birth cohort, 20+ size-band, 1995 and 2005

status	firms		employees	
	no	coh%	no	coh%
(a) 1995				
all	145	100	9239	100
died	69	48	4611	50
contracted	19	8	762	8
remained	57	39	3866	42
(b) 2005				
all	156	100	11598	100
remained	57	37	7049	61
new	99	63	4549	39
of which,				
1-4	32	21	1508	13
5-9	40	26	1675	14
10-19	27	17	1366	12
memo:				
av growth	remained	new		
95 to 05 % pa	6.2	20.4		