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FIRM DYNAMICS AND JOB CREATION IN THE UK

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Firm Dynamics and Job Creation in the UK

Taking Stock and Developing New Perspectives

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Executive Summary

Overview

A consistent theme in the discussion of attempts to stimulate economic recovery in the UK is a recognition of the need to unlock the growth potential of the private sector. We are motivated in this White Paper by a very simple question – *"what types of firms create the most jobs in the UK economy?"* We then ask a further pair of questions – *"to what conclusions does the evidence lead us?"* and *"what are the choices for policy?"* This White Paper is our first step in bringing together the existing evidence on job creation to inform the discussion of these questions. An obvious corollary question is the extent to which those firms creating the most jobs are also the most productive. However, that will be addressed later in the research programme. For now our review of the evidence has identified three perspectives on the job creation process in the UK focusing on employer-only businesses. These perspectives will provide the foundation for our exploration, at a later stage, of the contribution of fast-growing small businesses to UK productivity growth.

A Traditional Story of Job Creation and Destruction

Using a widely accepted methodology we have set out some of the dynamics of that process using some high-level metrics on job gains and losses. In the UK just over a quarter (28.0 per cent) of all jobs in the private sector were either destroyed or created over a typical 12 month period between 1998 and 2010 – a remarkable level of turbulence in the UK economy.

The majority of jobs in the UK were created by small firms (i.e., less than 50 employees and including micro-enterprises); and these firms also recorded the most churn - the sum of job creation and destruction - which has intensified since 2008. Since the late 1990s smaller firms have been increasing their share of total employment year on year and in 2010 their

share was triple that of 1998.

The job creation and destruction metrics are relatively stable over time - even the economic downturn after 2008 did not affect the overall scale of job creation and destruction taking place in the UK economy. Moreover, the metrics on job churn for the US are quite similar to those of the UK over the last decade.

High-Growth Firms and Job Creation – A Closer Look

We have taken a fresh look at the UK data on the number of jobs HGFs create. Situating HGFs within the job creation contributions of ALL job creating firms in the private sector over three years: the question is a simple one - *"What proportion of job creation is contributed by high growth firms?"* Focusing on **all** job creating firms in the 2007-10 period we find that the relative contributions of other groups of firms were as follows in the same period:

- **New firms (born between 2007 and 2010)**: 61% of job creating firms and 36% of job creation
- **Small and Larger firms – non-HGF** (10 or more employees): 6% of job creating firms and 22% of job creation
- **High-Growth Firms**: 1% of job creating firms and 22% of job creation
- **Micro-enterprises – non-HGF** (less than 10 employees): 27% of job creating firms and 15% of job creation
- **Young firms (born in 2007)**: 5% of job creating firms and 5% of job creation

Clearly HGFs are *relatively* the most prolific category of job creating firms. However their closest comparators – the larger non-HGFs – are quite prolific too. The point is, surely, that definitions are important, and that summary statements which gloss over the detail of the definitions may seriously mislead researchers and policymakers alike.

Job Creation Re-Visited - From Growth Rates to Growth Trajectories

Stepping away from growth as the central concern towards 'growth trajectories' allows us to capture the interplay between growth and survival. We have uncovered ***'five brutal facts of UK business demography'***.

1. every year a large number of private sector firms are born in the UK ~ typically between 200,000 and 250,000

2. most new born firms are very small ~ around 90% have less than 5 employees

3. a decade later between 70% and 80% of those new born firms will be dead

4. a cohort is born with about 1 million jobs ~ a decade later the survivors employ just half a million

5. of those which have survived to age 10 ~ around 75% of those born with less than 5 employees will ***still*** have less than five employees

We knew already from the standard accounting by the job creation and destruction components that births and deaths of firms are responsible for a considerable amount of churn, but what the 'brutal facts' remind us is that much of this churn is age-related. It provides a pointer to the dynamic underpinning to the evolution of the stock of firms in the economy over time: as each new 'wave' of firms is born, firms from earlier waves die away.

Policy Discussion

Missing from this set of 'facts' is an understanding of the processes which drive them, which is required if we are to develop a robust set of policy interventions. In the meantime what can we usefully say about the policy implications? There is an obvious tension in existing policy discussions

between the focus on developing the growth potential of existing firms and the promotion of start-ups (particularly by certain under-represented groups e.g., young people). Our evidence suggests that both start-ups and established businesses have rapid growth potential.

Immediate Next Steps

Our research programme over the next three years is designed to build a more robust set of job creation metrics on which we can build a better understanding of the drivers of both employment and productivity growth at the level of the firm. An important dimension of this will be a closer look at churn rates and the extent to which they might help us understand the growth trajectories of what is always a heterogeneous small business sector.

The research will be connected to the themes on innovation and exporting as well as finance, through a range of firm-level data-linking work, which will assist us to develop a profile of the most prolific job creators in the UK economy. We will also seek to extend our analysis beyond employer-only businesses and incorporate datasets which include the self-employed – to examine their contribution to the job creation story in the UK.

1. Introduction

A consistent theme of the discussion of attempts to stimulate economic recovery in the UK is the need to unlock the potential for growth in the private sector. Since May 2010 this has been a particular focus of the Coalition Government, whose ambitious fiscal plans rely on a strong private sector recovery and a rebound in investment and export performance.

The development of industrial policy in the last 30 years has increasingly incorporated interventions and business support polices designed to stimulate enterprise. The rationale for this has been the assertion that enterprise is one the drivers of productivity and economic growth. 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[1]. 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.

Economies thrive when their most ambitious, innovative and productive small businesses are able to thrive. As well as being the major source of job creation in developed economies, a vibrant small business sector is seen as critical to driving economic growth through innovation and market expansion.[2] However, we may be getting ahead of ourselves here and the intention of this White Paper is to review *only* the evidence on the job creation part of that assertion. We are motivated by a very simple question in this paper – *"what types of firms create the most jobs in the UK economy?"*

In answering this question we adopt a very simple typology in the first instance and focus on firm size (i.e., micro-enterprises; small firms and large firms) although we do introduce a growth definition into the analysis and discussion. More importantly, our developing research agenda on firm dynamics over the next three years will seek to broaden this simple typology to include, for example, those firms engaged in innovation and/or

exporting as well as those seeking and attracting differing forms of finance. This will be done by undertaking extensive data-linking between the UK business demography dataset and a wide range of firm-level data held by the ONS.

Getting a clear understanding of the evidence on job creation is crucial in being able to develop more robust models of productivity growth. Current productivity models depend on, for example, entry and exit rates and the contribution of entry and exit (i.e., churn) to employment growth as well as survival rates, but the extent to which they fully capture the growth trajectories of individual firms perhaps needs to be reviewed[3].

This White Paper will provide a review of our existing knowledge on job creation, reviewing the UK and international evidence on what types of firms are responsible for job creation[4]. We will present in summary form the most recent comparative UK and US evidence on the processes of job creation and destruction in the private sector which extends our previous work for the Department for Business, Innovation and Skills (BIS) which was published in 2011[5].

We also draw on recent work on the private sector in the UK by two of the authors of this paper which has been recently published by NESTA in an online Working Paper[6]. In particular, we will summarise the new evidence on the contribution of High-Growth Firms (HGFs) to job generation in the UK which for the first time takes stock of the range of other job creating firms in the economy which do not fall within this rather arbitrarily OECD-defined concept. We focus on the evidence about employer-only businesses which does include micro-enterprises with only one employee but are mindful that the contribution of the self-employed (without employees) to job creation is not yet included.

Our concern in assembling the evidence is that the focus on traditional methods of analysing job creation are in themselves fraught with problems and do not actually provide us with answers to the key questions on what

drives employment growth. Indeed, we are mindful that some of these traditional methods and associated metrics are used by economists in their models of productivity growth. Getting them wrong, or at best specifying them incorrectly, runs the risk of misunderstanding the drivers of productivity growth[7].

We conclude the White Paper by presenting a range of stylised facts about business demography and job creation in the UK and discuss their policy implications.

2. Job Creation Debate

2.1 Background

In 1979 the Birch report[8] (albeit unintentionally) initiated what has turned out to be a long-lasting and at times acrimonious debate, a debate which continues to this day. Birch sought to answer the question: *what size firms create the most jobs?* His answer has been in the background to all analysis and discussion by academics, policymakers and practitioners working in the area of industrial and economic development in the last 35 years.

"On the average about 60 per cent of all jobs are generated by firms with 20 or fewer employees, about 50 per cent of all jobs are created by independent, small entrepreneurs. Large firms (those with over 500 employees) generate less than 15 per cent of all net new jobs."

In other words – a relatively small proportion of firms – disproportionately small firms – account for a relatively large proportion of job creation. David Birch is generally credited with having first formulated this conjecture[9]. This appears a simple enough empirical proposition, so it seems difficult to imagine how his claim about the extent of the small firm contribution could have become, and remained, so controversial[10]. In the 35 years since Birch's publication there have been a number of further studies of the US (by Birch amongst others) and other countries looking at different dimensions of job creation, but as yet no consensus has emerged on the answer to Birch's question[11].

As time passes the heat generated by the 'debate' about the relative importance of the small firm contribution to job creation becomes more difficult to understand. Birch's 1979 study of job generation which initiated it, was part of a project on regional industrial policy. It was conducted using 'components of change analysis', what was then a conventional framework

much used by industrial geographers. Birch's principal innovation was to have compiled a much more extensive database (both in time and space) of firm-level employment data than had previously been assembled which was drawn from the files of Dun and Bradstreet.

The finding which attracted widespread attention, and drew the ire of (mainly) mainstream economists was that relatively small number of firms accounted for a disproportionately large share of job creation. The critics were explicitly concerned with the use that was being made of this conclusion to lobby for programmes to support small business (though Birch himself had never made this case, quite the contrary) but their criticisms focused on the quality of his data and the calculations he had made. Indeed, 15 years after Birch's original report, criticisms were still being made. Some insight can be gained from the July 1994 Special Issue of *Business Economics* (the journal of the North American Society of Business Economists). The title of the 'economists' contribution, by Davis, Haltiwanger and Schuh is itself indicative *"Small Business and Job Creation: Dissecting the Myth and Reassessing the Facts"*, and the abstract too is quite blunt: "The conventional wisdom [meaning Birch] about the job-creating process of small business rests on a misleading interpretation of the data and the use of unsuitable data." (p.13) A rejoinder by Dennis, Phillips and Starr followed: *"Small Business Job Creation: The Findings and their Critics"* (two of the authors were senior officials from the Office of Advocacy of the US Small Business Administration). The first sentence of their conclusion reads: *"The data clearly show that small businesses have been the primary source of net new employment in the United States over the past twenty to twenty five years."* (p.28)

Evidently neither side was prepared to concede. The controversy continues, though contributions are now rather more intermittent[12]. The 'economists' position has become increasingly nuanced and it now relies on separating the effect of size from age. In most, earlier, studies of US data size and age were confounded because the bulk of young firms are small, the latest finding is that controlling for age, size effects become

rather small[13]. Of course, it is rather too early to tell whether this result will be regarded as decisive. As we shall see below UK data suggests that even though age might be critical, size still plays an important role in accounting for job creation.

Yet, despite the controversy, the conjecture itself became widely accepted quite quickly[14] and interest in it continues[15]. One of the factors that has played an important role in sustaining this debate was (according to a recent contributor[16]), that *"Birch's argument about the role of small business in job creation fit perfectly with the US government's long tradition of supporting small businesses".* This sentiment has had a great deal of resonance in the public policy debates in the UK since the 1980s and increasingly since the economic downturn in 2008 with the focus on stimulating growth.

2.2 An Accounting Framework in Search of a Theory?

Throughout the long history of work on job creation and the on-going debates about how the metrics should be defined and used there is a nagging question which does need to be addressed. Namely, what does this methodology actually contribute to our understanding of how a private sector evolves over time, over and above the allocation of jobs to particular types of firms? It is an accounting framework pure and simple and so does not itself provide an explanation of the phenomena it measures. Indeed, that was the view first put forward by Birch 35 years ago. However, where we need to take the 'outputs' from these seemingly simplistic metrics on job creation is to connect them to a theoretical framework which enables us to understand the dynamic processes as the private sector evolves and generates growth over time. Of particular interest is to use the data on job creation (or job flows) and harness theoretical frameworks from labour market economics, macroeconomics and industrial organisation to this end: this appears most readily achievable through the body of literature on employer life cycle dynamics[17].

2.3 The Data Challenge

The empirical observation that there is typically a small group of firms that are responsible for a large share of new jobs created motivated the OECD to initiate a programme of work which aimed both to measure the contribution to job creation of these 'rapidly expanding firms' – christened High-Growth Firms (HGFs) – and to investigate their differentiating characteristics[18]. One of the by-products of this work was an internationally agreed definition of an HGF (set out in section 4) and a chapter dedicated to HGFs in the Manual of Business Demography[19].

For decades systematic work on the job creation propensities of various types of firms was long hindered (and debate much stimulated) by a paucity of appropriate firm-level data but, particularly since the mid-1990s, as the data deficiency was made good, researchers began to take an increasingly active interest in this research question[20]. Criticism of the early work on firm-level analysis on job creation pointed to the need to use longitudinal data[21].

That particular challenge has now been resolved in the UK with the recently released UK Business Structure Database (compiled by the Office for National Statistics) which records annual data on employees for the entire population of firms in the UK[22]. We have linked together the annual 'snapshots' from the BSD using firm-level identifiers to form a longitudinal firm-level database for the UK and have devised algorithms to produce firm-level demographic markers for 'birth' and 'death'[23].

2.4 Summary

We now have access to longitudinal firm-level data for the UK over the last 13 years and the remainder of this report presents a summary of three distinct aspects of the job creation narrative derived from this dataset. We commence with a summary of the evidence from the application of the widely accepted job creation and destruction metrics. This is followed by a

more thorough look at the contribution of HGFs to job creation in the UK and we take the opportunity to present some new evidence whose production was stimulated by our dissatisfaction with the OECD HGF metric. We conclude by setting out an agenda which seeks to take forward our evidence base on job creation in the UK by focusing on the individual growth trajectories of firms rather than relying on current approaches. This follows naturally from recognising the critical significance of age, whilst still allowing for the importance of size.

3. Job Creation in the UK Economy

3.1 Introduction

Since the publication of the Birch report in 1979 there has been an on-going controversy over what would appear to be a very simple question, "what size of firm creates the most jobs?" There have been a number of UK studies which sought to address this question using a variety of datasets and their findings all point in a broadly similar direction.

For example, studies for the UK in late 1980s showed that smaller firms (i.e., those employing less than 10 employees), across all sectors, have accounted for a disproportionately large share of total job creation in relation to their overall share of employment[24]. In the United Kingdom, for example, a study claimed that firms employing fewer than 10 people were responsible for about half of all net job creation in the late 1980s, despite employing only about 20% of the workforce[25].

However, what is important to disentangle from such an observation is the relative importance of the role of increasing business birth rates, the decline of larger firms and the survival and growth of existing small firms. The most useful summary of the findings from this era is provided by Storey, who observed: "out of every 100 small firms, the fastest growing four firms will create half the jobs in the group over the decade"[26] (and see section 5 for our recent work on this subject). More importantly, the task is to translate these findings into a conceptual framework which is sufficiently robust to be used in a policy context.

It is clear that small firms account for a substantial proportion of the business stock in the UK and their share of total employment has been increasing[27]. A useful original contribution to the job creation debate in the UK using the Annual Respondents Database (ARD) for the manufacturing sector concluded that small establishments (i.e., less than 100 employees) account for between half and two-thirds of jobs created.[28] Small

establishments also have higher job creation and job destruction rates than larger establishments.

A study of job creation over the period 1995 to 1999 using Dun and Bradstreet data for the UK found that there were 2.3 million extra jobs in new businesses, of which 85% were in small businesses[29]. Expanding businesses provided 3.5 million new jobs between 1995 and 1999. Although small businesses were less likely to expand than large businesses, because there are so many of them, they accounted for more than 50% of new jobs in existing businesses. Overall, new and existing small businesses accounted for 66% of all new jobs created in this period, contributing more to job creation than their share in employment (56%) might have indicated. However, small businesses were also responsible for around 66% of job losses in this period. There was a net gain of 800 thousand jobs in the period, and small businesses accounted for around 70% of this.

More recent research[30] analysed ONS UK firm-level data[31] from 1997-2005 and found that 'small' firms (those with fewer than 100 employees) account for a disproportionately large fraction of job creation (between 50% and 70%) and destruction (between 50% and 60%) relative to their share of employment. They found the entry of new firms accounted for about 40% per cent of job creation and the exit of firms accounted for about 50%.

Although these contributions have been valuable, here (as elsewhere) research has been constrained by the limited availability of suitably comprehensive data at the level of small, medium and large firms. This has now changed. As mentioned earlier, in 2008 the Office of National Statistics (ONS) launched a new firm-level database, the Business Structure Database (BSD) for the UK, with records of (amongst other things) employment from 1997 onwards for virtually all businesses with employees[32].

Early analysis of the BSD was undertaken for all sectors for the period

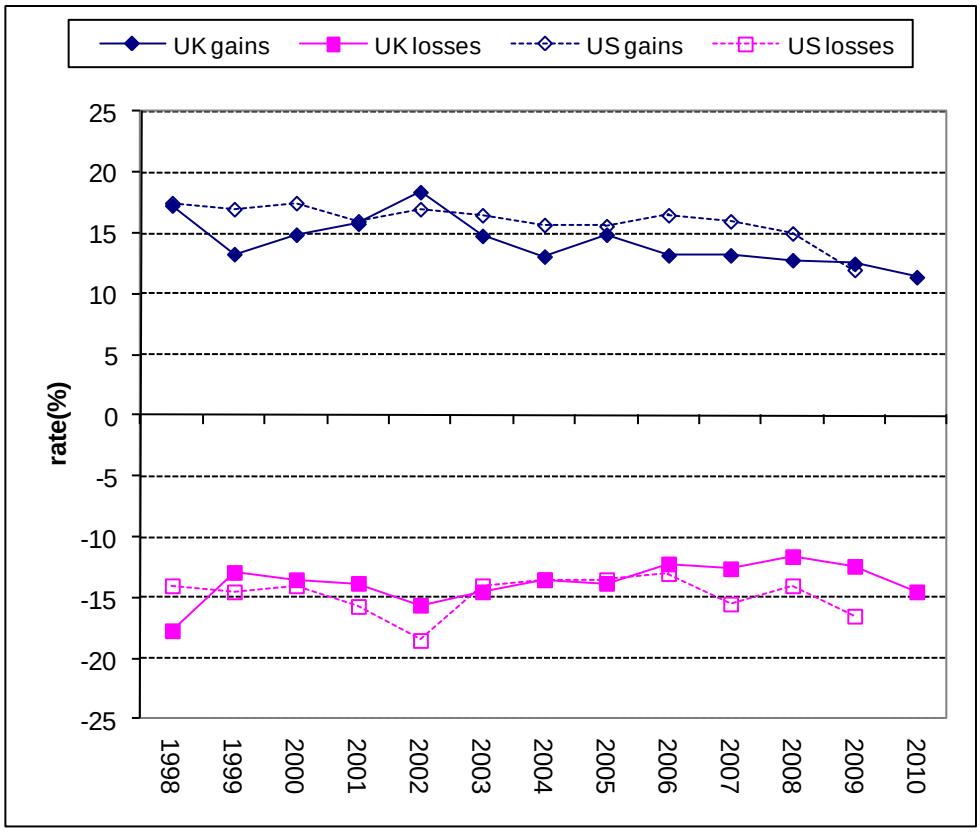
1997 to 2008 and showed that 'small' firms accounted for a disproportionately large fraction of job creation and destruction relative to their share of employment. Further, the study concluded that jobs created by small firms are no less likely to persist than those created by large firms.[33]

3.2 Job Creation and Destruction 1998-2010[34]

What we present in this section is a summary of the key job creation and destruction metrics developed in the US by Davis et al., (2008)[35]. From the application of these metrics we can make the following statements about job creation in the UK economy since 1998.

Average annual job creation and destruction rates were 15% and 13.4% respectively in the UK between 1998 and 2010[36]. This compares to 16% and 15% for the 1998-2009 period in the US. From Figure 1 we observe that the job creation and destruction metrics for US are quite similar to the UK the last decade[37].

Figure 1: Job Creation and Destruction in the UK and the US



Source: ONS BSD and Haltiwanger et al., (2011)

A study in Denmark using the same methodology also found a similar pattern of job creation and destruction over the period 1980-2007.[38] A cross-country analysis of 16 developed and emerging economies using harmonised data to examine the determinants of job flows also produced job creation and destruction rates[39]. The study found that small businesses had a higher degree of job creation and destruction and this pattern was found in all sectors and countries.

From the most recent UK analysis we can report that just over a quarter (28.0 per cent) of all jobs in the private sector were either destroyed or created over a typical 12 month period – a remarkable level of turbulence in the UK economy.

The majority of jobs in the UK were created by small firms; they also recorded the most churn. This confirms the findings of the previous studies reported above. Out of a total of 2.61 million jobs created on average each year between 1998 and 2010 existing small firms (i.e., less than 50 employees) contributed 34% (i.e., ~870,000 jobs) while start-ups (of which nine out of 10 employ less than five people at birth) contributed a further third (33%) – another 870,000 jobs.

Since the late 1990s smaller firms have been increasing their share of total employment year on year and in 2010 their share was triple that in 1998. Single employee firms increased from 3% of the total employment in 1998 to 10% in 2010, whilst at the large end the share of 250+ employee firms fell from 49% to 40% over the same period.

The components of job creation and destruction vary by firm size and highlight the source of the negative relationship between size and net job creation. For example, firms employing more than 50 persons exhibited little net annual employment change whereas for micro-enterprises (less than ten employees) it is positive - between two and 12%.

3.3 Summary

Unfortunately, these job creation and destruction metrics for the UK do not actually shed much light on the growth paths of firms. So, whilst we can state with some authority that small firms have higher job creation rates than larger firms we need to go much further if we are to provide policymakers with more fine-grained findings.

4. High-Growth Firms and Job Creation

4.1 Introduction

"[We have] the empirical observation that there is typically a small group of firms that are responsible for a large share of new jobs created. These rapidly expanding firms, by way of their supposed or actual potential to generate jobs, have attracted the attention of policy makers, eager to reduce unemployment."[40]

In 2008, a year after the publication of the Manual of Business Demography, the OECD began publishing data on HGFs, though not for the UK, and as yet there have been relatively few studies of HGF incidence which make use of the OECD definition[41]. Of course, there were studies of HGFs in the period before the OECD definition was agreed[42], but with respect to HGFs it appears that policy makers have been running somewhat ahead of the evidence – HGF-oriented policy has been enthusiastically promoted, even though it is accepted that the evidence base is very weak[43].

Here we are concerned with the contribution of HGFs to job creation. Although measuring the contribution to job creation played a role in the choice of HGF definition by the OECD, its potential for use in international comparisons appears to have been decisive in preferring it to the alternative high growth metric proposed by Birch[44].

The first stage in the OECD metric for identifying an HGF (see EUROSTAT-OECD [2007, Chapter 8]) requires that we consider only firms which,

- are born before the beginning of the period
- are alive at the end of the period

These two requirements imply that in each period we will have a 'balanced panel' of firms – the same firms are always present throughout the period

(often referred to as 'continuing firms'). An HGF is a firm in the balanced panel which,

- has at least 10 employees at the beginning of the period
- records an annual average growth of 20% in employment[45] over the period

Finally, we define HGF incidence[46] and the 'incidence rate' as the number of HGFs divided by the number of firms (in the balanced panel) with 10+ employees[47]. We use three years as our 'period': so, starting with 1998, there are ten 3-year periods: from 1998/2001 to 2007/2010 – this is the 'rolling balanced panel' (RBP) used throughout this discussion.

4.2 Contribution of HGFs to Job Creation – what we already know

The first attempt to calculate the contribution of HGFs to job creation in the UK economy showed that they represented only 6% of all UK firms employing ten or more people (11,530 firms in 2008), and an even smaller proportion of the total number of firms. However, HGFs generated a majority of jobs (1.3 million out of 2.4 million new jobs created by established businesses employing ten or more people in the previous three years, or 54%)[48]. Whilst this was useful in underlining the importance of this small group of firms to the job creation debate the method used here tells only part of the story as we shall see in the next section.

Using a slightly improved version[49] of the ONS UK longitudinal business demography dataset (BSD) we have now updated this analysis and also undertaken a more detailed investigation of previously unexplored aspects of the HGF concept[50] and we now have some reasonably clear findings about HGFs in the UK over the last decade[51]. In summary, about 12,500 HGFs were identified in each of the six three year periods from 2003/2007 to 2007/2010 and the incidence rate was about 7%. The HGF incidence rate declines the older the firm, at one year old it is about 15% and then falls at around 0.5 percentage points each year. In 2007/2010 almost half

of all HGFs were more than 10 years old, and it is the 'weight' of the old (with their lower incidence) which contribute largely to producing an average HGF incidence rate of 7.5%.

Further, the HGF incidence/age relationship is largely invariant to size, most size-bands decline at the all size average of 0.5 percentage points per year. Firms with more than 250 employees are different in that their HGF incidence rate – about 10% – is essentially independent of age. This finding about age is emerging as an important feature of the analysis on HGFs and we return to it in section 5.

4.3 HGFs and Job Creation – a necessary re-calibration

Despite the growing importance of HGFs to policy debates on stimulating growth there has been little discussion of how to measure their contribution to job creation, and certainly there is no agreed methodology. This latter point is rather puzzling because the initial rationale for the identification of HGFs was in fact their role as prolific job creators. So our motivation here is simple, to consider afresh answers to the question: *"what proportion of job creation is contributed by high growth firms?"*

The key difficulty stems from the fact that the number of firms is a stock – measured at a single time point, whereas job creation is a flow – the difference between the stock of jobs at two different time points. Consequently the relationship between the job creation flow and the stock of firms depends on the length of the measurement period. This dependence is important because many firms have relatively short lives and so, as the measurement period lengthens, larger numbers of firms do not survive, equally, as the measurement period lengthens, larger numbers of new firms are born within the period (indeed firms may be born and die within the measurement period). These side-effects of a lengthening measurement period render the short period dynamics of labour market flows increasingly invisible and serve to blur the distinction 'new' and 'existing' firms and their relative contributions to job creation.

The OECD definition of HGFs focuses on growth over a three year period (t to (t+3)) so investigating the contribution of HGFs to job creation effectively commits us to a three year measurement period. Obviously, this is an arbitrary choice which does not bear too much scrutiny but we persist with it in order to facilitate the comparability of our analysis.

With a three year measurement period (t to (t+3)), an obvious starting point would be to distinguish between job creation by HGFs from t to (t+3) and job creation by non-HGFs from t to (t+3). However, there is a further important component of the OECD definition that needs to be discussed: it covers only firms which are at least one year old (so born in (t-1) or earlier). So if we are to have a complete accounting framework for all jobs created in the UK between t and (t+3), there is an additional complication: there are firms which may create jobs but are not classified as HGFs or non-HGFs. The OECD HGF definition does not cover:

- any firms born in period t and alive in period (t+3)
- any firm born after period t up to and including period (t+3)

Firms in the first category may have jobs at time t and (t+3), whilst those in the second category may only have jobs at (t+3). For these two reasons – the three year measurement period and the character of the HGF definition – we need to adapt the conventional (annual) job creation and destruction accounts which we used in section 3[52]. Here we focus on job creating firms only, and we distinguish five categories,

- firms born before t, and alive (t+3), at least 10 jobs in t and 20% average annual growth between t and (t+3) – **HGFs**
- firms born before t and alive (t+3) with more jobs in (t+3) than t, but not a HGF with less than ten jobs at t – **smaller Non-HGFs**
- firms born before t and alive (t+3) with more jobs in (t+3) than t, but not a HGF with more than ten jobs at t – larger **Non-HGFs**
- firms born in period t and alive (t+3) with more jobs in (t+3) than t – **Young firms**

- firms born after period t and alive (t+3) with jobs in (t+3) – **New Firms**

HGFs and non-HGFs will be referred to below (as elsewhere) as members of the 'OECD balanced panel' of firms which comprises all firms born before period t and surviving to (t+3)). It is also helpful, again as we shall see below, to distinguish between those relatively large non-HGFs which (like HGFs) have 10 or more employees (large non-HGFs) and those that do not, that is small non-HGFs – the larger non-HGF category is a useful comparator for the HGF category because it is so similar (by construction)[53].

Our particular interest here is the role of different categories of job creating firms[54]. There is a very clear hierarchy when we look at the absolute number of jobs for each category:

- New firms are at the top, in slow decline from about 2.25 million in 2002/05 to 1.7 million in 2007/10
- HGFs are next, again in slow, uneven, decline from 1.5 million to 1.4 million 2004/07, then a steeper drop to 1 million over the last three periods
- Larger non-HGFs are virtually constant at around 1 million per period
- Smaller non-HGFs series is more volatile but typically around 0.75 million
- Young firms job creation rate is more or less constant but just 250 thousand per period

We return to our question: *"What proportion of job creation is contributed by high growth firms?"* It depends. If we assume a three year measurement period there are four plausible alternatives following from different choices of denominator,

- all job creating firms
- all job creating firms alive in period t
- all job creating firms alive in period (t-1) (the OECD balanced panel)
- all job creating firms alive in period (t-1) with 10 or more employees in period t (10+ members of the OECD balanced panel)

The HGF contribution to job creation averages around 27% from 1998/2001 to 2004/07, and from 2005/08 to 2007/10 the average is 22%, five percentage points lower. The second measure, which excludes new firms, follows a similar path over time, with a 44% average in the early period and in the later period almost 10 percentage points down, at around 35%. The time path for the share of HGFs in job creation by the OECD balanced panel is very similar, essentially parallel to the second measure, and the HGF share drops from an average of 47% in the early period to 38%. Finally we have HGF job creation as a share of jobs created by 10+ members of the OECD balanced panel and again the share is down ten percentage points, from 60% in the years up to and 50% in more recent years[55].

In brief, across a range of plausible alternative denominators in the calculation, the contribution of HGFs to job creation varies by a factor of two – 60% versus 30%, HGF jobs as a ratio to jobs created by all job creating firms versus HGF jobs as a ratio to jobs created by a balanced panel of 10+ firms -- in the early period (up until 2004/07), 50% versus 22% (for the same comparators) in the last few years (since 2005/08). It is also clear that the contribution of HGFs to job creation has fallen irrespective of the measure, though the extent of the fall does depend on the measure.

Finally it is worth re-visiting the proposition which had originally motivated interest in HGFs: a comparison between the proportion of job creating firms and the proportion of job creation they contributed. Focusing on the broadest measure (all job creating firms) and using 2007/10 data we set out the relative contribution of HGFs in Table 1.

Table 1: Relative Contribution of HGFs to Job Creation (2007-10)[56]

Category of Firm	Proportion of Job Creating Firms	Proportion of Job Creation
New firms (born between 2007 & 2010)	61%	36%
Small and Larger firms – non-HGF (10 or more employees)	6%	22%
High-Growth Firms (OECD Definition)	1%	22%
Micro-enterprises – non-HGF (less than 10 employees)	27%	15%
Young firms (born in 2007)	5%	5%

Source: ONS Business Structure Database (BSD)

Clearly HGFs are relatively the most prolific category of job creating firms. However, their closest comparators – the larger non-HGFs – are quite prolific too. The point is, surely, that definitions are important, and that summary statements which gloss over the detail of the definitions may seriously mislead.

4.4 A Review of the International Evidence

As mentioned earlier, research on the incidence of HGFs using the OECD definition is relatively scarce. However, at roughly the same time as the OECD definition was agreed, a survey of the empirical literature on HGFs, and their findings provided a natural context for our own work on HGFs in the UK[57]. After a systematic search of bibliographic databases (from 1990 to 2008) a list of 20 studies was compiled which analysed data from a range of countries (though not the UK). They organised their results about the characteristics of HGFs – which they refer to as "Gazelles" – around three propositions[58]:

- "On average, Gazelles are younger"
- "On average, Gazelles are smaller than other firms"

- ”Gazelles are over-represented in high-technology industries”

There is considerable variation across the studies they survey in just about every dimension (definition of HGFs – only one study used the OECD definition, measurement of growth, choice of time period) and in the classification of HGF characteristics (sectors, size-bands, age range).

“However, in this case the large variation should be seen as an advantage, since the results regarding the importance of HGFs turn out to be quite robust. Regardless of method, definition, time period etc. some findings emerge.”[59]

With respect to age the answer was clear from this review as all the studies reported that Gazelles tend to be younger on average[60]. We found that the HGF incidence rate in the UK declined with age with a larger proportion of younger firms being HGFs which is consistent with the international evidence.

However, the international evidence about size is more nuanced and the results ambiguous. Gazelles can be of all sizes and the conclusion is that it appears that newness is a more important factor than small size[61]. This also fits with our findings from the UK: the HGF incidence by size-band showed little variation by period, and when HGF incidence by size-band is displayed against age the picture is dominated by the decline with age: size plays only a secondary role. It is worth noting that the importance of controlling for age when discussing the significance of firm size in a job creation context is increasingly being recognised[62].

More recent cross-country analysis reports some headline results for a varying selection of countries[63].

- the HGF incidence rate is higher for younger firms, but most HGFs are older (5 countries: Norway, Austria, Netherlands, Italy, Finland)
- most HGFs are small, but large firms can achieve high growth (9

countries: Norway, Austria, Netherlands, Denmark, Italy, Finland, Spain, United States, UK)

- HGFs are everywhere, not only in hi-tech or ”innovative” sectors (9 countries, Norway, Austria, Netherlands, Denmark, Italy, Finland, Spain, United States, UK)

The findings for age and size match ours regarding the HGF incidence rate, however the findings on sectors do not. Certainly we found HGFs to be ubiquitous, and also agree that the majority of HGFs are found in the service sectors[64], but, using data for 2-digit sectors we found that the HGF incidence rate was highest in hi-tech and knowledge intensive services[65].

The incidence and distribution of HGFs in the UK by age, size and sector are largely consistent with the general pattern found elsewhere in the (relatively sparse) previous studies. Having been derived from a much more comprehensive dataset – ten successive cross-sections – our results seem rather more clear cut (and likely more robust).

4.4 Summary

It has become commonplace to suggest that a researcher’s answer to most questions is to call for more research, but it may nonetheless be appropriate in respect of HGFs. Whilst there is widespread acceptance of the proposition that a relatively small proportion of firms are responsible for a disproportionate share of job creation, there is not yet complete agreement, despite the efforts of the OECD and EUROSTAT, about how such firms might be identified. Indeed, it could be argued that the answers do not lie within the confines of firm-level datasets no matter how robustly constructed.

5. From Growth Rates to Growth Trajectories

5.1 Introduction: the next step in studying job creation

A useful way of understanding the focus on HGFs – and the OECD metric for identifying them – is as a shortcut to identifying the relatively small class of prolific job creating firms to which Birch's 1979 report had drawn attention. Whilst the HGF approach succeeds in capturing such firms: how could it not? - the definition alone – three years of 20% plus growth in jobs -- virtually guarantees it. But what the HGF approach does not do is provide much insight into the dynamics of job creation over a firm's life, because the metric turns on a growth rate which it uses as a proxy for job creation.

5.2 Firm Birth, Survival and Growth – Age is Crucial

In a first step away from growth rates as the central concern towards 'growth trajectories' (our shorthand term for the dynamics of job creation over a firm's life – which capture the interplay between growth and survival) is to appreciate what we will call 'the five brutal facts of UK business demography. These have been derived from our work on the dataset for 1998-2010 which we compiled from the ONS UK Business Structure Database (BSD)[66]:

1. every year a very large number of private sector firms are born in the UK ~ typically between 200,000 and 250,000 firms;
2. most new born firms are very small ~ around 90% have less than 5 employees;
3. a decade later between 70% and 80% of those new born firms are likely to be dead;
4. a cohort is born with about 1 million jobs ~ a decade later the survivors employ just half a million;
5. of those firms which have survived to age 10 ~ around 75% of those born with less than five employees will still have less than five employees.

We knew already from the standard accounting by the job creation and destruction components (see section 3) that births and deaths of firms are responsible for a considerable amount of churning, but what the 'brutal facts' remind us is that much of this churn is age-related. It provides a pointer to the dynamic underpinning to the evolution of the stock of firms in the economy over time: as each new 'wave' of firms is born, firms from earlier waves - younger rather than older, smaller rather than larger - die away.

5.3 Job Creation – Next Steps

How then does job creation fit into this picture? Keeping our focus on the ten year horizon: the 20% to 30% of firms which survive their first decade of life will have about half a million employees at age ten, up from about 300 thousand at birth. Although, taken together, the survivors have added about 300 thousand jobs, this is a 'net' figure: some firms will have added jobs; some shed jobs; others will have exactly the same number as they had at birth. In fact, only half of the surviving firms are job creators and the bulk of job creators (like the bulk of firms) are very small, with less than five employees and most of them (as we know) remain very small and create very few jobs.

But the class of very small firms also contains an, admittedly very small group (around 5% of them) which are extraordinarily prolific job creators: between them accounting for almost one-third of job creation by all ten year survivors.

These findings take us quite close to the edge of what we presently know. Roughly, we can quantify the relationship which juxtaposes a relatively small number of small firms with a disproportionately large proportion of job creation over (in this case) a decade. Obviously, that relationship can be generalised by computing it by sector, by geography and for varying time horizons (limited only by data availability and the rules governing its disclosure).

What we don't yet know is much about the pace of job creation at the firm-level. For example, we don't yet know whether there is any uniformity in the performance the small group of very small extraordinarily prolific job creators; nor whether there are any firms not in that group which would have been had we interrogated the data at some other time horizon.

So what we need to do next is to investigate the growth trajectories of firms – tracking their employment history from birth to (say) age ten[67], because from such trajectories we can map directly into job creation. Indeed, such a 'cohort' approach is beginning to gain some traction in the UK with the use of business bank account data to analyse the 'growth paths' of all businesses and not just those with employees[68], and in the wider international community of researcher and policymakers[69].

6. Summary and Policy Discussion

6.1 Summary

We have reviewed the highlights of almost 35 years of research on job creation dating from the publication of the Birch report in 1979. We have integrated that discussion into our own work on the UK using the ONS Business Demography database and engaged afresh with some critical debates on job creation – some old and some new.

Based on research on employer-only businesses, we conclude that the majority of jobs in the UK are created by small firms including micro-enterprises; but these new small firms also exhibit the greatest rates of churn. Smaller firms have been increasing their share of total employment year on year in the UK and in 2010 their share was triple that in 1998. Single employee firms increased from 3% of the total employment in 1998 to 10% in 2010.

We can also conclude that there is widespread acceptance of the proposition that a relatively small proportion of firms are responsible for a disproportionate share of job creation. We also know that HGFs are relatively the most prolific category of job creating firms. However, their closest comparators – the larger non-HGFs – are quite prolific too. The point is, surely, that definitions are important, and that summary statements which gloss over the detail of the definitions may seriously mislead. We can also show that within each cohort of start-ups there will be a small number of extraordinarily prolific job creators.

6.2 Policy Discussion

What does this mean for policy? Well, we have confirmed some of the evidence upon which the rationale for the current range of policy initiatives has been based which is certainly encouraging. However, on its own the job creation narrative does not **yet** track into a set of clear conclusions for

policy. The analysis, for example, treats all jobs as equal and tells us nothing about the persistence of those jobs. We are also silent on the leadership role of the owner-manager(s) and managerial capabilities in the firm-level growth dynamic. So while we can identify prolific job creators in the UK economy we are unable to say too much more at this juncture based on this analysis alone.

Missing from this set of 'facts' is an understanding of the processes which drive them, which is required if we are to develop a robust set of policy interventions. In the meantime what can we usefully say about the policy implications? There is an obvious tension in existing policy discussions between the focus on developing the growth potential of existing firms and the promotion of start-ups (particularly by certain under-represented groups e.g., young people). Our evidence suggests that both start-ups and established businesses have rapid growth potential.

In a deliberately provocative paper: *"Why encouraging more people to become entrepreneurs is bad public policy",* Shane argued forcefully for a shift in policy priorities: *"It is about encouraging the formation of high quality, high growth companies. Policy makers should stop subsidizing the formation of the typical start-up and focus on the subset of businesses with growth potential."*[70]

However, even if the negative argument is accepted (stop subsidizing start-ups), it still not at all clear what the positive argument (encouraging formation of high growth companies) entails by way of policy[71]. Indeed, a recent policy brief for the European Commission listed as one of its policy implications: *"Since substantial evaluations of policies are apparently missing so far, it remains unclear what instruments of policies for innovative high-growth SMEs are particularly successful or unsuccessful."*[72]

Returning for the moment to Birch's 35 year-old study, there is a very little cited passage in his conclusion which may now seem ironic, given the stimulus that his work has given to the high growth 'agenda'. He was

profoundly sceptical about the practical policy usefulness of his 'discovery' of the prolific job creation performance of HGFs:

"We know that smaller, volatile firms are the major replacers of lost jobs, but we have no experience in identifying and assisting them in large numbers. Because they are small, we must reach many of them to have a measureable effect. Because they are volatile, we must monitor each individual firm's performance carefully if we are to gain maximum benefit from our invested dollars (on the high side) and avoid scandal (on the low side). From this researcher's viewpoint it seems like a very difficult problem to solve administratively. A massive bureaucracy would be required to monitor individual small businesses on the scale required ..." Birch [1979, p. 4p]

6.3 Next Steps

The challenge from Birch's conclusion is stark and one which we embrace. Our research programme over the next three years is designed to build a wider range of job creation metrics and provide a more robust foundation for understanding the drivers of both employment and productivity growth at the level of the firm. An important dimension of this will be a closer look at churn rates and the extent to which they might help us understand the growth trajectories of what is always a heterogeneous small business sector.

Connection to the research strands on innovation and exporting as well as finance, through a range of firm-level data-linking work, will be of immediate concern as we seek to develop a profile of the most prolific job creators in the UK economy.

We will also seek to extend our analysis beyond employer-only businesses and incorporate datasets which include the self-employed – to examine their contribution to the job creation story in the UK. This will enable us to

connect to an emerging strand of work on the growth paths of businesses using bank business account data.[73]

Notes

[1] Birch, DL (1979) The Job Generation Process. MIT Program on

[2] Bravo-Biosca, A. (2010) *"Growth Dynamics: Exploring business growth and contraction in Europe and the US"*, NESTA Research report: November 2010.

[3] See, for example, Haltiwanger, J; Jarmin, R and Miranda, J (2010) "Who creates jobs? Small vs large vs young," Working Paper 16300, NBER; Anyadike-Danes, M; Bjuggren, C-M; Gottschalk, S; Hoelzl, W; Johansson, D; Maliranta, M and Myrann, A "Accounting for job growth: disentangling size and age effects in an international cohort comparison", mimeo, March 2013; Knaup, A and Piazza, M (2007) "Business Employment Dynamics data: survival and longevity, II," Monthly Labor Review, September, pp.3–10. [Bureau of Labor Statistics for US, cohort98]; Stangler, D and Kedrosky, P(2010) "Neutralism and Entrepreneurship: The Structural Dynamics of Startups, Young Firms, and Job Creation" Kauffman Foundation Research Series: Firm Formation and Economic Growth, September 2010; Bartelsman, E;Haltiwanger, J and Scarpetta, S (2009), "Measuring and Analysing Cross-Country Differences in Firm Dynamics," in Timothy Dunne, J. Bradford Jensen, and Mark Roberts eds. Producer Dynamics, Chicago: Chicago UP.

[4] It is not the intention to provide a comprehensive literature review on the subject of job generation/job creation. Since the 1970s (and importantly pre-dating Birch's work) there have been hundreds of studies published on this theme and it would be beyond the scope of this paper.

[5] Anyadike-Danes, M; Bonner, K and Hart, M (2011) "Job Creation and Destruction in the UK: 1998-2010", *BIS Analytical Report*, October 2011.

[6] Anyadike-Danes, M; Bonner, K and Hart, M (2013a) *Getting the lie of the land: exploring the incidence of High Growth Firms in the UK*, NESTA

Working Paper; Anyadike-Danes, M and Hart, M (2013a) *Accounting for the contribution of High Growth Firms to job creation*, NESTA Working Paper; Anyadike-Danes, M and Hart, M (2013b) *Foreign firms in the UK: headline numbers, the incidence of high growth and its dynamic*, NESTA Working Paper; Anyadike-Danes, M; Bonner, K and Hart, M (2013b) *Exploring the incidence and spatial distribution of High Growth Firms in the UK and their contribution to job creation*, NESTA Working Paper No. 13/05.

[7] See, for example, Haltiwanger, J; Jarmin, R and Miranda, J (2010) *op. cit.*

[8] Birch, DL (1979) *op. cit.*

[9] For an accessible summary see Birch, DL (1981) "Who Creates Jobs?" *Public Interest*, Vol. 65, pp. 3–14. However, the antecedents of this debate stretch back into the realms of industrial and economic geography in the late 1960s and early 1970s when there were a plethora of *'industrial components of change'* studies of regional economies which sought to disaggregate net employment change into its gross components of firm births, firm deaths, expansions and contractions.

[10] See for example Davis, S J; Haltiwanger, J and Schuh, S (1996) "Small Business and Job Creation: Dissecting the Myth and Reassessing the Facts," *Small Business Economics*, Vol. 8, No. 4, pp. 297–315.

[11] See, for example, the 1995 Special Issue of *Small Business Economics (Vol 7. 5) which* carried a symposium discussion on Harrison's book "Lean and Mean" – the job generation debate.

[12] An interesting recent reprise of the debate appeared in 2011: Hurst, E and Pugsley, B W (2011) "What do Small Businesses do?" *Brookings*

Papers on Economic Activity, Fall, 2011, pp 73-118 and the reply by Haltiwanger, J (2011) in the same issue (pp 119-142).

[13] Haltiwanger, J; Jarmin, R and Miranda, J (2010) "Who creates jobs? Small vs large vs young," Working Paper 16300, NBER (revised in November 2012).

[14] See for example the discussion in Storey, D.J. and Johnson, S (1987) *Job Generation and Labour Market Change*, Basingstoke, Hants: Macmillan.

[15] For two recent contributions see Haltiwanger, J; Jarmin, R and Miranda, J (2010) "Who creates jobs? Small vs large vs young," Working Paper 16300, NBER; Neumark, D; Wall, B and Zhang, J (2011) "Do Small Businesses Create More Jobs? New Evidence for the United States from the National Establishment Time Series," *The Review of Economics and Statistics*, Vol. 93, No. 1, pp. 16–29.

[16] Neumark, D et al., (2011) *op. cit.*

[17] See Davis, SJ and Haltiwanger, J (1999) "Gross Job Flows", in Ashenfelter, O and Card, D (eds) *Handbook of Labor Economics Volume 3B,* Elsevier, Amsterdam.

[18] See Schreyer, P (2000) "High-Growth Firms and Employment," OECD Science, Technology and Industry Working Papers 2000/3, OECD Publishing; OECD (2002) "High-Growth SMEs and Employment," OECD report, OECD.

[19] OECD (2008) "Measuring Entrepreneurship A Collection of Indicators 2008 Edition," OECD-EUROSTAT Entrepreneurship Indicators Programme Publication, OECD Statistics Directorate.

[20] However, while great progress has been made in terms of the availability of firm-level data many of the important cross-country analyses are

constrained by having to use datasets which are almost 10 years old and pre-date the economic crises in 2008. As such the relevance of their findings to the current policy debates can be challenged.

[21] Barnes, M and Haskel, J (2002*) "Job Creation, Job Destruction and the Contribution of Small Firms: Evidence for UK Manufacturing"*, Working Paper No. 461, Department of Economics, Queen Mary College, June 2002.

[22] This data is compiled from a series of annual 'snapshots' of the Inter-Departmental Business Register, an administrative database which captures information from a range of sources, amongst them VAT returns and employer Pay As You Earn (PAYE) tax and social security records. The unit of analysis is an "employer enterprise" – a business with at least one employee – which we refer to as a firm. Firms may comprise a number of distinct local units (establishments or plants) but our data refer to firm-level employee numbers.

[23] For a full discussion of how the longitudinal version of the BSD has been constructed for the analysis contained in this report see Anyadike-Danes (2013a) *op.cit.*

[24] Daly, M; Campbell, G; Robson, G and Gallagher, C (1991) "Job creation 1987–1989: the contributions of small and large firms", *Employment Gazette*, Vol. 99, pp. 589–596; Hart, M and Hanvey, E (1995) "Job Generation and New and Small Firms: some evidence from the late 1980s", *Small Business Economics*, Vol. 7, 2, pp. 97-109.

[25] Daly *et al.* (1991) *op. cit.*

[26] Storey, D.J (1994), *Understanding the Small Business Sector (Routledge, London) p.113 summarising findings from his research in the 1980s.*

[27] BIS Business Population Statistics http://www.bis.gov.uk/assets/BISCore/statistics/docs/B/12-92-bpe-2012-stats-release.pdf

[28] Barnes, M and Haskel, J (2002) *op. cit.*

[29] Dale, I and Morgan, (2001) *Job Creation Study*, Small Business Service and Trends Business Research.

[30] Hijzen, A; Upward, R and Wright, PW (2007) *Job creation, job destruction and the role of small firms: firm-level evidence for the UK*, Research Paper 2007/01, GEP, University of Nottingham.

[31] The data used in this research was, in fact, the forerunner of the ONS Business Structure Database and based on the Inter-Departmental Business Register.

[32] A full official description of the Business Structure Database (BSD) is given by Evans, P and Welpton, R (2009) "Methods explained – Business Structure Database," *Economic and Labour Market Review*, Vol. 3, No. 6, pp. 71–75.

[33] Hijzen, A; Upward, R and Wright, PW (2010) "Job Creation, Job Destruction and the Role of Small Firms: Firm-Level Evidence for the UK." *Oxford Bulletin of Economics and Statistics*, 72, 5.

[34] We are awaiting the 2012 and 2013 data extractions from the IDBR (provided by the ONS) in order to extend this time period.

[35] Davis, SJ, Haltiwanger, J and Jarmin, R (2008) *"Turmoil and Growth: Young Businesses, Economic Churning and Productivity Gains".* Ewing Marion Kauffman Foundation; Davis, S; Haltiwanger, J and Schuh, S (1996) Job Creation and Destruction, MIT Press.

[36] Anyadike-Danes, M; Bonner, K and Hart, M (2011) *Job Creation and Destruction in the UK*: 1998-2010, BIS Report, October 2011.

[37] US data taken from Haltiwanger et al., (March 2011) "Historically Large Decline in Job Creation" Kaufmann Business Dynamics Statistics Briefing No. 5.

[38] Ibsen, R and Westergaard-Nielsen, N (2010) *Job creation by firms in Denmark* Center for Corporate Performance, Aarhus School of Business and Social Sciences, Aarhus University, Denmark.

[39] Haltiwanger, J; Scarpetta, S and Schweiger, H (2010) *Cross country differences in job reallocation: the role of industry, firm size and regulations.* EBRD Working Paper No. 116 July 2010

[40] Schreyer (2000) *op cit*, p. 6.

[41] Amongst them are: Anyadike-Danes, M; Bonner, K; Hart, M and Mason, C (2009) "Measuring Business Growth: High-growth firms and their contribution to employment in the UK," research report, NESTA; Bravo-Biosca (2011) "A look at business growth and contraction in Europe," October, presented 3rd European Conference on Corporate R&D and Innovation, CONCORD-2011, Seville (Spain); and Teruel, M and de Wit, G (2011) "Determinants of High-Growth Firms," Scales Research Reports H201107, EIM Business and Policy Research.

[42] For a comprehensive survey see Henrekson, M and Johansson, D (2010) "Gazelles as job creators: a survey and interpretation of the evidence," *Small Business Economics*, Vol. 35, No. 2, pp. 227–244.

[43] For a policy-oriented overview of the evidence see Lilischkis, S (2011) "Policies in support of high-growth innovative SMEs," An INNO-Grips Policy Brief 2, European Commission.

[44] See the discussion in Ahmad, N (2006) "A Proposed Framework For Business Demography Statistics," OECD Statistics Working Papers 2006/3, OECD Publishing (page 57) and for Birch's "growth index", see Birch, DL (1987) Job Creation in America, New York: New York: Free Press, pp 36-38.

[45] Alternatively, an annual average growth of 20% in turnover over the period can be used as the criterion, but only employment is used here.

[46] We use the term 'incidence' here by analogy with epidemiology, to serve as a reminder that HGF status is time-dependent – in the present framework a firm which is an HGF in one three year period may, or may not, be an HGF in some other period.

[47] The 'incidence rate' is similar to the term "share" used by the OECD in its most recent digest of indicators OECD [2011]. However the OECD (for reasons which are not explained) use a denominator in this calculation wider than the balanced panel: "The share of high-growth enterprises is compiled as the number of high-growth enterprises as a percentage of the population of enterprises with ten or more employees." OECD [2011, p. 74]. In other words their denominator also includes all firms which are alive at the beginning of the period (so adding in those born in the first year of the period), whether or not they survive the period. It is also worth noting that in the earlier Manual of Business Demography did use the term "rate" rather than share, but its treatment of the dating of the denominator was only slightly less vague: "Rate of high growth enterprises: Number of high-growth enterprise as a percentage of the total population of active enterprises with at least 10 employees." EUROSTAT-OECD [2007, p. 63]. The use of incidence rate, instead of 'share' (or HGF rate), allows us to distinguish clearly between conclusions about the incidence of HGFs by characteristics and their distribution across characteristics.

[48] Anyadike-Danes et al., (2009) *op. cit.;* NESTA (2009) *The Vital 6 per cent: How high-growth innovative businesses generate prosperity and jobs*, NESTA, London.

[49] The newer version of the dataset has, amongst other improvements, a better algorithm for determining births and deaths and produces smaller numbers of HGFs and slightly higher estimates of the incidence rate.

[50] See note 4 for details of the Working Papers summarising this body of work.

[51] Anyadike-Danes, M and Hart, M (2013a) *op.cit.*

[52] Which were based on those developed by Davis, S *et al.,* (1996) *op. cit.*

[53] This framework has been designed to account for job creation, and firms which do not create jobs have simply been left out of the picture – some of these will have the same number of jobs at period (t+3) as they had at t, others will have died (so no jobs at (t+3)).

[54] The reader is referred to the NESTA Working Paper for a fuller discussion of these results – Anyadike-Danes, M *et al.,* (2013a) *op. cit.*

[55] We reported this fourth measure for 2002/05 and 2005/08 in our earlier report on HGFs, see Michael Anyadike-Danes, M *et al.,* (2009) op cit. p. 19.

[56] See Anyadike-Danes, M *et al.,* (2013a) *op. cit.*

[57] Henrekson, M and Johansson, D (2010) *op.cit.*

[58] Henrekson, M and Johansson, D (2010) *op.cit.,* p. 228

[59] Henrekson, M and Johansson, D (2010) *op.cit.,* p. 240.

[60] The exception being Acs, *et al.,* (2008) who presented evidence from the US to show that high-impact firms were more likely to be older firms: Acs, Z; Parsons, W and Tracy, S (2008) "High-Impact Firms: Gazelles Revisited," Research Report 328, SBA Office of Advocacy. Incidentally, this study uses the Birch 'growth index' rather than the OECD definition of a HGF.

[61] Henrekson, M and Johansson, D (2010) *op.cit.,* p. 240.

[62] Haltiwanger, J; Jarmin, R and Miranda, J (2010) *"Who creates jobs? Small vs large vs young,"* Working Paper 16300, NBER.

[63] There are two more recent studies which relied on the OECD definition: Bravo-Biosca, A (2011) *op. cit.* and Teruel and de Wit (2011) *op. cit.*

The second of these – a cross country investigation of the determinants of incidence used the turnover variant of the HGF definition and was restricted to firms with more than 50 employees – so its results are not comparable with ours for the UK. Bravo-Biosca (2011) is also a cross-country study focused on growth rate distributions but covers HGF incidence rates and, like us, uses the employment variant of the OECD definition, in his case computed for the three year period 2002/2005 – the use of 'old' data reflects the problems in constructing robust data for cross-country comparisons.

[64] Bravo-Biosca, A (2011) *op. cit.,* p. 19.

[65] Bravo-Biosca's data was more highly aggregated – 4 broad sectors – and he found no detectable cross-sector pattern in HGF incidence.

[66] This builds substantially on earlier work using these data for cohort analysis and published in Anyadike-Danes et al., (2009) op. cit. as well as in Anyadike-Danes, M; Hart, M and Bonner, K (2010) *"Who Creates the Jobs?*" Significance, Journal of the Statistical Society, pp 5-8.

[67] For a recent discussion of growth trajectories see Hamilton (2012) "How firms grow and the influence of size and age*" International Small Business Journal*, vol. 30, no. 6, pp.611-621. This paper summarises the background literature then analyses the growth paths of 60 New Zealand firms (but from different ages, these are not members of a birth cohort).

[68] In a series of papers Coad *et al.,* (2012a) (2012b) (2012c) have used data on a cohorts of firm births (a large sample of Barclays Bank "new business current accounts") 'born' between March and May 2004 to explore the connections between survival and growth. However, they work with business turnover data ("credit turnover" and do not (apparently) have employment data for these firms. Coad, A; Frankish

J, Roberts R and Storey, DJ (2012a) "Growth paths and survival chances; An application of Gambler's Ruin theory", *Journal of Business Venturing*, http://dx.doi.org/10.1016/jjbusvent.2012.06.002 (forthcoming); Coad, A; Frankish J, Roberts R and Storey, DJ (2012b) *"New Venture Survival and Growth: When does the fog lift?"*, SPRU Electronic Working Paper Number 202, 9 November 2012; Coad, A; Frankish J, Nightingale P, Roberts R and Storey, DJ (2012c) *"Business Experience and Start-up Size: Buying More Lottery Tickets Next Time Around?",* SPRU Electronic Working Paper Number 202, 9 November 2012.

[69] See, for example, the presentation by Criscuolo, C and Squicciarini, M (2012) "On-going Research at the OECD/WPIA", at the workshop on Intangible Investment, Innovation and Productivity National Institute of Science and Technology Policy (NISTEP) Tokyo, 27 January 2012. In a wide-ranging presentation the cohort approach is highlighted as one component of the OECD WPIA employment and productivity data collection and analysis project.

[70] Scott, S (2009) "Why encouraging more people to become entrepreneurs is bad public policy," *Small Business Economics*, Vol. 33, No.2, pp. 141–149.

[71] Mason, C and Brown, R (2013) "Creating good public policy to support high-growth firms," *Small Business Economics*, forthcoming (just accepted manuscript, on website).

[72] Lilischkis, S (2011) *op cit.*, p. 94.

[73] Coad, A *et al.,* (2012a; 2012b; 2012c) *op. cit.*

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