Ipsos MORI
Social Research Institute

June 2018

Evaluation of Enterprise Management Incentive scheme

Appendix B – Market failure analysis

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Published by HM Revenue and Customs, June 2018
www.hmrc.gov.uk

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Enterprise Management Incentive: Market Failures

This paper provides an analysis of the economic case for the Enterprise Management Incentive. The scheme provides an implicit subsidy to SMEs by allowing them to offer tax efficient stock options to employees. The aim of the scheme is to enable SMEs with high-growth potential to compete with large firms for highly skilled employees. The paper outlines the range of market failures put forward to justify the subsidy implicit in the scheme, and provides a survey of the available evidence to assess the presence and prevalence of those imperfections and the suitability of the remedy (drawing on the secondary literature and a series of analyses of firm and worker level microdata).

A. Hypothesised Market Failures

The following market failures are put forward to justify the public subsidy implicit in the Enterprise Management Incentive:

i) Information asymmetries in the labour market

The future earnings of employees will be to some degree correlated with the performance of the firms for which they choose to work. As such, the decision to join a firm will carry a degree of risk, and if job seekers can be characterised as risk averse then those businesses whose future performance is more uncertain will need to make higher wage offers to attract equivalently skilled staff[1].

This is not a signal of a poorly functioning market. However, market failures may arise from the likelihood that the employer will have superior information in relation to the prospects of the firm than the prospective employee. Prior to joining a firm, employees would be unable to effectively judge the risks involved, influencing the wage offers they are prepared to accept. For lower risk firms, the wage offer job seekers are prepared to accept may need to exceed their (risk weighted) marginal product, putting the firm in the position where they would be better off leaving the vacancy unfilled[2].

These types of market failure may be expected to disproportionately affect smaller firms. There is often a large amount of public information available on the future performance of large firms (which can also usually call on extensive historic trading records) making it more straightforward for the prospective employee to evaluate the potential risks associated with joining the company. This does not hold for smaller firms, whose growth potential will rarely be exposed to similar levels of external scrutiny (and which do not have as extensive obligations to make their trading performance a matter of public record) but are known to carry a higher risk of failure on average[3]. Thus, smaller firms may be required to make higher wage offers than large firms to attract employees of equivalent skills (and risk aversion)[4]. Furthermore, it is likely that these issues will be most acute for younger firms without extensive trading records, and pre-revenue ventures whose value is connected to the future development and launch of novel products and services.

ii) Financial market imperfections

At the same time, smaller firms may face funding constraints that may limit their ability to make the higher wage offers needed to attract highly skilled staff. The role of financial market imperfections in constraining the growth of SMEs is well documented[5]:

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[1] Does Layoff Risk Explain the Firm-Size Wage Differential, Rudolf Winter-Ebmer, Applied Economic Letters, 1995

[2] A 'market for lemons' type problem as originally described in 'The Market for Lemons: Quality Uncertainty and the Market Mechanism,' George Akerlof, The Quarterly Journal of Economics, Volume 84, August 1970.

[3] Information Asymmetry, Small Firm Finance and the Role of Government, Lean and Tucker, Journal of Finance and Management in Public Services, 2001.

[4] Does Layoff Risk Explain the Firm-Size Wage Differential, Rudolf Winter-Ebmer, Applied Economic Letters, 1995

[5] The 2015 OECD paper 'Opportunities and Constraints of Market Based SME financing: OECD Report to the G20 Finance Ministers and Central Bank Governors,' (September 2015) provides a comprehensive overview.

- **Information asymmetries:** There are information asymmetries between borrowers and lenders that restrict the availability of credit at quantities and interest rates that are acceptable to the former. If potential lenders are not able to accurately assess the level of risk associated with the borrower, this will encourage them to increase interest rates or minimise their risk exposure by limiting lending volumes.
- **Intangible assets:** There are numerous strategies employed in financial markets to mitigate these types of problem – including use of credit histories to improve the assessment of risk and requirements for security to limit risk exposure. However, there are difficulties in applying these approaches where the firm's assets are primarily intangible or knowledge based. These assets can be difficult to price without specialist expertise and there is little prospect of recovering their value in the event of default as they are not straightforwardly tradable in markets.
- **Equity finance:** The availability of equity finance through angel investors and venture capital funds can help mitigate some of these issue, as the investor shoulders a greater share of the risk in exchange for higher returns. However, information asymmetries between the investor and the investee may still constrain investment (i.e. the investee has superior information regarding the likely technical and commercial risks involved). Moral hazard issues may also be present, for example, if the investee perceives an incentive to pursue a less risky business model once investment has been secured. These issues can be overcome if the investor undertakes due diligence and adopts extensive monitoring arrangements (e.g. taking positions on boards) but these transaction costs can be large, making it inefficient for venture capitalists to make investments in firms with relatively small equity requirements.

Again, these issues might be expected to affect early stage or pre-revenue firms most acutely. These types of firm will typically be seeking to commercialise intangible knowledge based assets and have little in the way of physical capital that could provide security for debt finance. Additionally, the risks associated with their business model may be highly challenging for external investors to evaluate (or the level of equity investment needed too small for this to be worthwhile), resulting in difficulties in obtaining equity finance at the scale needed to attract employees of the required skill levels to progress their business model.

iii) Knowledge Spill-overs

The issues above are likely to constrain the progression and growth of innovative and early stage companies – limiting their ability to invest in research and development (R&D) at an optimal scale. It is well established that there are positive externalities associated with investment in innovation, as benefits of the knowledge created cannot be fully captured by those investing. While some knowledge and invention can be protected in the form of Intellectual Property Rights (IPR), processes such as turnover in the labour market allow many forms of tacit knowledge to circulate in the economy which may be exploited by other firms. Many forms of innovation cannot be protected, and in some cases, it is possible to circumvent IPR restrictions by imitating the innovations developed by others through alternative means. A recent review found the social rate of return on R&D spending to be two to three times higher than the private returns[6], suggesting that the issues noted above may produce wider social costs if they constrain investment in R&D.

iv) Consequences

In combination, the market failures above would be expected to lead to the following consequences:

- **Recruitment and retention difficulties:** The expectation would be that smaller firms would be more likely to report difficulties recruiting staff (particularly at higher skill levels). This may manifest itself in unfilled vacancies or skills gaps within the workforce where smaller firms have recruited individuals that do not offer the portfolio of skills required. Additionally, even where smaller firms have recruited skilled staff, they may struggle to retain those workers if larger firms can fund higher wage offers.

[6] For example, see 'The Rates of Return to Investment in Science and Innovation,' Department for Business, Innovation and Skills (2014), 'Measuring the Returns to R&D,' Hall and Meiresse, Handbook on the Economics of Innovation, 2009, and 'The Intellectual Spoils of War? Defense R&D, Productivity and Spill-overs' Moretti, Steinwender and Van Reenan (2016).

- **Wage differentials:** In turn, this would lead to an expectation that wages amongst employees of SMEs would be lower than in large firms, other things being equal.
- **Sorting effects:** Additionally, a sorting pattern would be expected in which more highly skilled workers are employed by large firms, while lower skilled workers – or less qualified workers who are less able to evidence their skills - are sorted into smaller firms[7].
- **Business model:** Smaller firms may need to adapt their business models to the skills that they can acquire – such as offering more standardised product offerings.
- **Productivity:** The net effect of the above on productivity is not necessarily clear. Smaller firms may employ too few workers due to these constraints, which would imply that the marginal productivity of labour would be higher than for large firms. However, the sorting of lower skilled employees into smaller firms would have the opposite effect, causing productivity to be lower amongst SMEs.
- **Disproportionate effects on early stage technology businesses:** It may be reasonable to expect the above issues to be most acute for early stage or pre-revenue technology businesses.

It should also be acknowledged that there will be other distortionary market failures that could also affect the measures outlined above. For example, larger firms may wield monopoly or monopsony power that would raise their profitability and productivity relative to small firms (enabling them to make higher wage offers, as well as potentially giving them incentive to constrain their employment below socially optimal levels). Wages may also be higher in large firms within which unionisation of workforces is on average more likely.

iv) Principal-Agent Issues

Finally, there are a set of issues created by the difficulties faced by employees in monitoring the effort and motivation levels of staff. If effort levels cannot be monitored effectively by the employer, staff will have an incentive to 'shirk', producing negative effects on profitability and growth if firm performance is correlated with effort levels[8]. The solution to this problem is classically to offer the worker an incentive payment linked to company performance.

It may be reasonable to hypothesise that monitoring would be more challenging in firms with larger teams of workers performing similar tasks[9]. However, for innovative pre-revenue firms, the outcomes of R&D and other activity will tend to be highly uncertain and commercial results may not be realised for some time. At the same time, individuals in smaller teams can expect to have a much stronger influence over the likelihood that a positive outcome is realised[10]. This is likely to make incentives in the form of equity particularly attractive to the most able employees (who can expect to benefit the most from this type of incentive).

B. Role of SMEs in Contributing to Growth

It has long been known that small firms have become increasingly important drivers of economic growth in many economies in recent decades[11]. This phenomenon has been especially evident within the manufacturing sector, although the speed with which this shift has occurred has been found to vary considerably across countries[12]. Potential explanations include globalisation, increased economic uncertainty and market fragmentation, as well as changes in the character of technological progress. The economic effects of the market failures that restrict the growth of SMEs could therefore be expected to have more significance as smaller firms become increasingly prevalent in the economy.

[7] Does Layoff Risk Explain the Firm-Size Wage Differential, Rudolf Winter-Ebmer, Applied Economic Letters, 1995

[8] Theory of the Firm: Managerial Behaviour, Agency Costs and Ownership Structure, Jensen and Meckling, Journal of Financial Economics, 1976

[9] Executive Compensation and Incentives, Canyon, Academy of Management Perspectives, 2006

[10] Theoretical Study on Stock Options in Small and Medium Enterprises, Pendleton, Blasi, Kruse, Poutsma, and Sesil, Enterprise-Directorate General, Commission of the European Communities

[11] See, for example Carlsson B, The Rise in Small Businesses: Causes and Consequences in Adams W (1992), Singular Europe, Economy and Policy of the European Community After 1992, University of Michigan Press.

[12] Carree M and Thurik A (1998), Small Firms and Economic Growth in Europe, Atlantic Economic Journal Vol 26.

An OECD study[13] notes that SMEs account for 60 percent – 70 percent of jobs in most OECD countries. It suggests that between 30 percent and 60 percent of SMEs can be characterised as innovative, of which 10 percent are technology driven. It also notes that, "throughout they also account for a disproportionately large share of new jobs, especially in those countries which have displayed a strong employment record. However, relatively rapid employment growth is concentrated within very small firms, with medium sized firms often performing no better in these terms than large firms. The same study notes that small firms tend to be more market driven and are quicker to respond to opportunities and it identifies 'churn/turbulence' amongst such firms as an important dynamic driver of aggregate productivity growth in the economy.

Other research notes that SMEs employ most of the global labour force[14]. Other OECD data indicates that establishments with fewer than 50 employees accounted for over 80 percent of total manufacturing in 28 industrialised economies[15]. A report by a Goldman Sachs led group[16] finds that in the UK smaller businesses are creating 60 percent of all private sector jobs and argues that they are key to helping to close the productivity gap relative to international competitors.

Several studies have argued that it is new and young companies which are the key drivers of growth. The OECD study[17] notes that, "some evidence points to the importance of age, rather than size, in job creation: young firms generate more than their share of employment." In similar vein, Wiens and Jackson[18] argue that, "when it comes to job-creating power, it is not the size of the business which matters as much as its age. New and young companies are the primary source of job creation in the American economy. Not only that, but these firms also contribute to economic dynamism by injecting competition into markets and spurring innovation".

A somewhat different emphasis is suggested by research for NESTA[19]. This finds that Europe's high-growth firms (3 percent – 6 percent of firms) account for between a third and half of jobs created by all surviving firms with 10 or more employees. Significantly, it finds that, "young firms are more likely to achieve high-growth, but most high-growth firms are older than five years old. They also emerge in all sectors of the economy, and can be of all sizes." In a UK context, a report by the Enterprise Research Centre which tracks a cohort of start-ups in 1998 over a 15 year period finds that these firms created some 230,000 jobs in net terms[20]. However, significantly, it found that just 6 percent of these firms – what the study terms extraordinary prolific job creators - accounted for 40 percent of this growth and that these firms "can be found in all sectors of the economy". As such, not all SMEs may be restricted in a material way by the market failures outlined above (though remedies focused on specific sectors may not be appropriate).

OECD research identifies some defining characteristics of high-growth SMEs based upon case studies of France, the Netherlands and Canada[21] . These include, most importantly, ability to innovate, along with: a strong market orientation; a decentralised, participatory and readily adaptive organisation; measures to encourage teamwork (including profit-sharing mechanisms); and, integration into a network of alliances and partnerships.

C. Recruitment and Retention Difficulties

The main source of evidence on the recruitment and retention difficulties faced by firms in the UK is the UK Employer Skills Survey[22].

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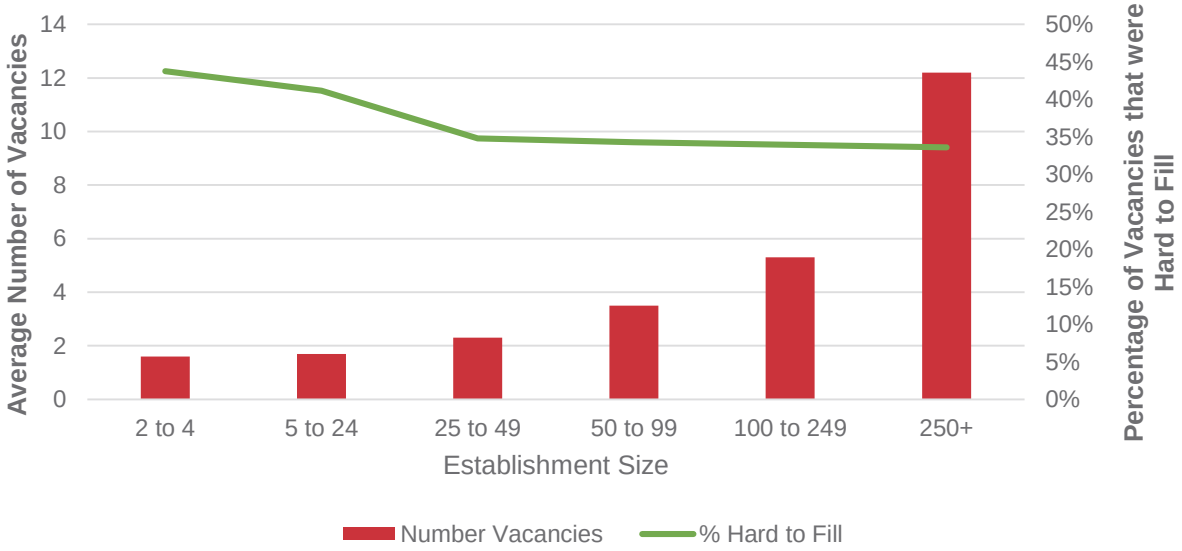
[13] 'Small and Medium Sized Enterprises: Local Strength, Global Reach,' OECD policy brief, June 2000.
[14] Ayyagari M, Beck T & Demirguc-Kunt A (2007) Small and Medium Enterprises across the Globe, Small Business Economics
[15] OECD Factbook, OECD, 2013.
[16] Goldman Sachs with the British Business Bank and the Enterprise Research Centre with support from the Scale-Up Institute and Said Business School (2015) Unlocking UK Productivity Internationalisation and Innovation in SMEs.
[17] Small Businesses, Job Creation and Growth: Facts, Obstacles and Best Practices, OECD (undated).
[18] Wiens J and Jackson C (2015), The Importance of Young Firms for Economic Growth, Ewing Marion Kauffman Foundation
[19] Bravo-Biosca A (2010) Growth Dynamics Exploring business growth and contraction in Europe and the US, NESTA Research Report.
[20] UK's Hidden Growth Champions. Hart M and Anyadike-Danes, 2014.
[21] High-Growth SMEs and Employment, OECD. 2002.
[22] UK Employer Skills Survey, UK Commission for Employment and Skills 2015. This is the latest data – results from the 2017 Employer Skills Survey will be available in summer 2018.

i) Hard to Fill Vacancies

- **Recruitment and current vacancies:** Smaller establishments were less likely to have reported that they have recruited any new staff over the past 12 months and had smaller numbers of open vacancies. At the time of the survey, organisations with fewer than 25 staff reported that they had an average of 1.7 open vacancies, rising to 5.3 for organisations with 100 to 249 employees (large firms reported an average of 12.2 open vacancies).

- **Hard to fill vacancies:** The smallest organisations were more likely to report vacancies that were hard to fill (44 percent of open vacancies were reported to be hard to fill by organisations with 2 to 4 employees, compared to 34 percent of large firms).

Figure 1: Open vacancies and hard to fill vacancies by size of establishment, 2015

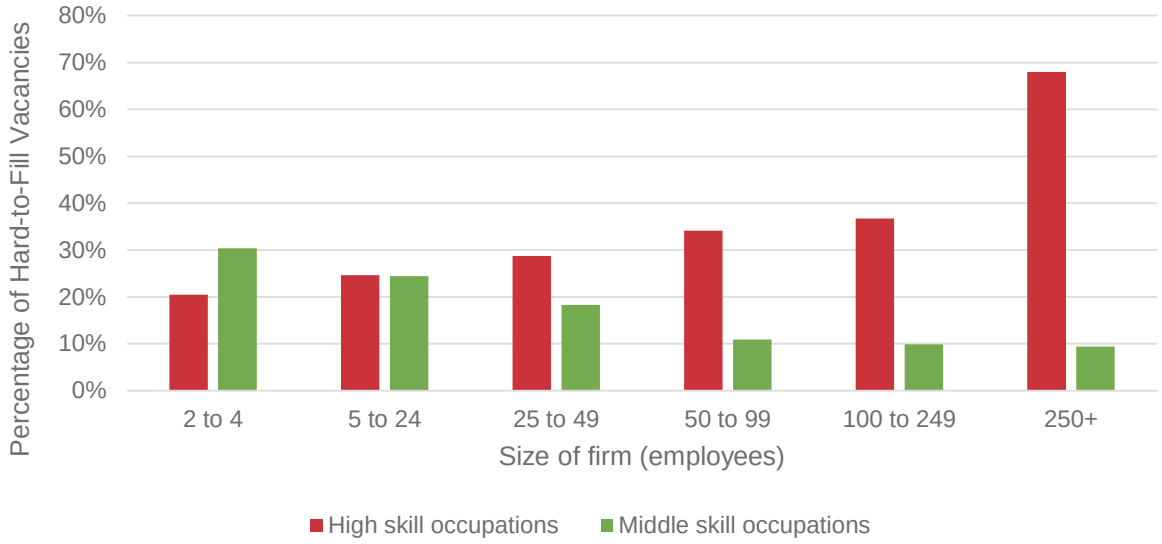


Source: Employer Skills Survey 2015, UK Commission for Employment and Skills

ii) Nature and Causes of Hard to Fill Vacancies

- **Skill levels:** There is a clear link between the size of the establishment and the skill levels associated with hard to fill vacancies. SMEs faced more difficulties in filling vacancies in 'middle-skill' occupations, while large firms face more challenges in filling vacancies in 'high skill' occupations. This is consistent with the expectation of sorting effects set out above.

Figure 2: Skill levels associated with hard to fill vacancies, 2015



Source: Employer Skills Survey 2015, UK Commission for Employment and Skills

- **Reasons for hard to fill vacancies:** There was little difference in the reasons for hard to fill vacancies reported by small, medium and large firms. Around 40 to 50 percent of employers reported that there were insufficient numbers of applicants with the required skills. However, the proportion of employers reporting that they found vacancies difficult to fill because they faced too much competition from other employers or that they offered poor terms and conditions (e.g. pay) increased with the size of the firm. Again, this is consistent with the sorting effects anticipated in Section A, in which large firms compete for highly skilled workers, while smaller firms compete for lower skilled workers who could be anticipated to be less scarce.

ii) Retention of Staff

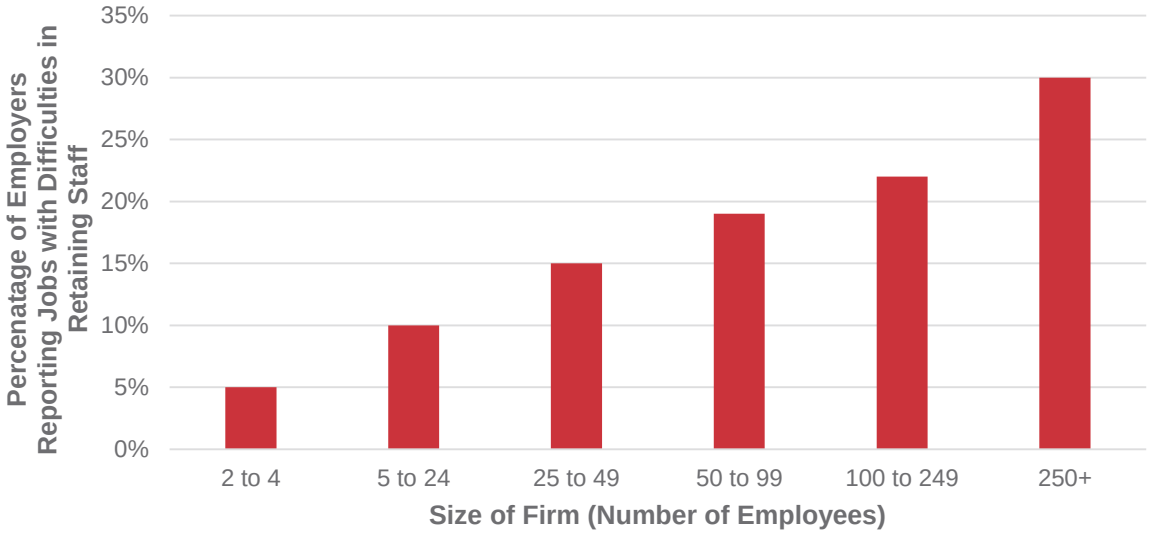
- **Retention of staff:** By contrast, smaller proportions of SMEs reported difficulties in retaining their staff (5 percent of employers with 2 to 4 employees, compared to 30 percent of employers with 250 employees or more).

- **Reasons for retention difficulties:** This appears consistent with the findings above that suggest that larger firms face more intense competition in labour markets:

  - The proportion of organisations reporting that competition from other employers was a cause of retention difficulties rose from 36 percent amongst firms with 2 to 4 employees to 69 percent amongst those with 250 employees or more. Similarly, the proportion reporting that retention difficulties were caused by lower wage offers than other organisations also rose with firm size (32 percent of firms with 2 to 4 employees, in comparison with 51 percent of firms with 250 employees or more).

  - Lack of opportunities for career progression and lack of interest in long-term commitment amongst staff were more commonly reported as causes of retention difficulties amongst small firms.

Figure 3: Percentage of Employers Reporting Jobs with Difficulties in Retaining Staff, 2015



Source: Employer Skills Survey 2015, UK Commission for Employment and Skills

iii) Impacts of Recruitment Difficulties

- **Impact of hard to fill vacancies:** The Employer Skills Survey suggests that in many respects the impact of hard to fill and skills shortage vacancies are similar for large and small firms. Between 80 to 90 percent of employers report the effect of recruitment difficulties are to increase workloads while 40 to 50 percent report difficulties in meeting customer services objectives.

- **Differential effects by size-band:** However, there were some impacts that varied systematically with firm size. Smaller firms were more likely to report that recruitment difficulties caused delays in developing new products or services, loss of business or orders to competitors, or withdrawal from offering certain products or services altogether. This broadly aligns with findings from other research that has shown that recruitment is perceived as an obstacle to growth amongst high-growth (though not potential high-growth) firms[23].

D. Financing Constraints on Small Firms

There is also clear evidence that SMEs face special problems in securing finance because of their greater variance in profitability, survival and growth rates. An undated OECD study[24] reports that they generally "tend to be confronted with both higher interest rates, as well as credit rationing due to shortage of collateral." The study notes that: "Financial institutions assess smaller and medium sized enterprises as being inherently more risky". It also highlights the importance of information asymmetries: "for many SMEs "insiders" (the entrepreneur, management) have better information about the expected profits of activities than external financial institutions" but, conversely, "in the case of new enterprises or activities, outsiders (experienced bankers or other specialised financial intermediaries) can, in many cases, better assess the risks involved than relatively inexperienced "insiders"."

There is strong evidence that, following a period in the early to mid-2000s when credit was more widely available, SMEs "faced a more challenging environment for accessing credit after the financial crisis of 2008 and subsequent recession"[25]. This study notes that, "even controlling for risk factors, rejection rates for both overdrafts and term loans were significantly higher in the period from 2008-9 onwards" though, "older more established businesses were less

[23] What holds back high-growth SMEs? Evidence from UK Firms, Neil Lee, Small Business Economics, 2014.
[24] Small Businesses, Job Creation and Growth: Facts, Obstacles and Best Practices, OECD (undated).
[25] Evaluating Changes in Bank Lending to UK SMEs Over 2001-2012 - Ongoing Tight Credit? (2013) NIESR Discussion Paper: 408.

likely to be rejected." Whilst the situation has improved subsequently, "there is clearly a funding gap (the difference between the funding required by SMEs and the funding available)"[26].

A study for the Bank for International Settlements[27] supports the view that young rather than small firms are the main contributors to employment growth, as well as being key contributors to profit growth across advanced economies. It finds "start-ups which report finance as their greatest constraint receive smaller new loans and evidence that financing constraints reduce start-up profitability." It also finds evidence of continuing effects on profitability from financial constraints within more mature firms which were start-ups just before the financial crisis.

A recent OECD report[28] confirms that, although the situation has improved, it remains fragile. "Almost a decade after the financial crisis, the financing situation of SMEs and entrepreneurs has generally improved in 2015 and the first half of 2016 in most participating countries, and indicates a more favourable business environment. While alternative sources of financing are gaining some traction, SMEs nevertheless remain very reliant on bank lending, making them vulnerable to credit market conditions and the economic climate."

There is also evidence that technology and other high-growth SMEs face funding challenges. One study finds that, though such firms are 9 percent more likely to apply for finance than other SMEs, they are no more or less likely to be successful. Such firms tend anyway to be "reluctant borrowers" because of "a lack of trust of banks and a resistance to any dilution of their own autonomy"[29].

Lack of collateral means that many such businesses can only achieve their growth with external equity finance. The availability of Venture Capital in the UK has been a longstanding issue[30]. The issue took on renewed significance following the collapse of the dot.com boom, the financial crisis and poor returns on European equity in the early to mid-2000s, leading to several British Business Bank initiatives to support the market. Subsequently, the situation has improved, particularly for smaller scale amounts, because of tax incentives and the improving economic environment but there are still areas of difficulty[31]. The availability of 'patient capital' is the subject of a current HM Treasury review and the UK's exit from the EU may create challenges because of the possible loss of the European Investment Fund as a potential cornerstone investor in new UK based venture capital funds.

It has been argued that the supply of finance in the UK, particularly equity, "is extremely regionally imbalanced: the share of equity finance going to businesses in London is more than twice as high as London's share of high-growth businesses"[32].

A substantial and increasing share of the market value of young and innovative SMEs is derived from their intellectual assets. Problems in securing realistic valuations of such assets contribute to the difficulties which innovative SMEs face in securing finance, meaning that, "technology is among the driving factors of economic growth, yet it is chronically underfinanced"[33].

ii) Marginal Product of Capital in Small and Large Firms

To further explore how far financial market imperfections disproportionately affect small firms, a series of analyses were completed to examine the marginal product of capital[34] in small and large firms. In principle, if SMEs are

[26] Stenrud (2017) Helping SMEs Access Finance: The importance of responsible finance providers, Civitas Briefing Note.
[27] Banerjee R (2014) SMEs, financial constraints and growth, BIS Working Papers No 475.
[28] OECD (2017) Financing SMEs and Entrepreneurs 2017 – An OECD Scorecard.
[29] Brown R and Lee N (2014) Funding issues confronting high-growth SMEs in the UK, LSE Research Online).
[30] For example, see HM Treasury (2003) Bridging the finance gap: a consultation on improving access to growth capital for small businesses.
[31] Ipsos MORI (2017) Evaluation of the Venture Capital Catalyst for the British Business Bank.
[32] Izzy Hatfield (2017) Equitable Equity: Increasing and Diversifying Finance for High-Growth SMEs in the UK's Regions, IPPR Report.
[33] European Commission Directorate-General for Enterprise and Industry (2006) Intellectual property and access to finance Discussion paper for the Workshop.
[34] The additional output (GVA) associated with a marginal increase in the capital stock.

financially constrained, the expectation would be that the marginal product of capital would be higher in small firms (on the assumption that the additional output associated with additions to the capital stock gets smaller as the stock gets larger). This hypothesis was explored using the firm level micro-data available within the ONS Virtual Microdata Laboratory to estimate the production function for firms of different sizes[35]. The analysis drew on the results of the ONS Annual Business Survey which collects information on the output (GVA) of firms, employment, net capital investment[36], and spending on intermediate goods and services of over 60,000 firms per annum.[37] Survey data for the two most recent years of final data (2013 and 2014) and the most recent year of provisional data (2015) were used in the analysis.

The results of these analyses are set out in the figure below:

- **Micro-businesses:** The estimated marginal rate of return to capital amongst micro-businesses (0 to 9 employees) was substantially higher than for firms with larger numbers of employees. The marginal product of capital was estimated to range from 27 percent higher in the manufacturing sector in the UK to 70 percent in professional and business services. This is suggestive that micro-businesses deploy suboptimal levels of capital and is supportive of the hypothesis that the smallest firms face particular constraints in financial markets.

- **Small and medium sized firms:** The models did not generally show substantial differences in the estimated marginal rate of return to capital between firms with 10 to 249 employees and larger firms. The marginal product of capital fell with size in the retail and hospitality industry but rose in other sectors (such as professional and business services). As such, these results suggest that, if there are financial market constraints constraining the growth of small firms, these are likely limited to the smallest businesses (though across all areas of the economy). Overall, the marginal product of capital was estimated to range from 2.5 to 4.8 percent in the manufacturing sector to 3.7 to 19.0 percent in the professional and business services sector. These results are broadly consistent with other studies that have sought to estimate the marginal product of capital in the UK using other methodologies[38].

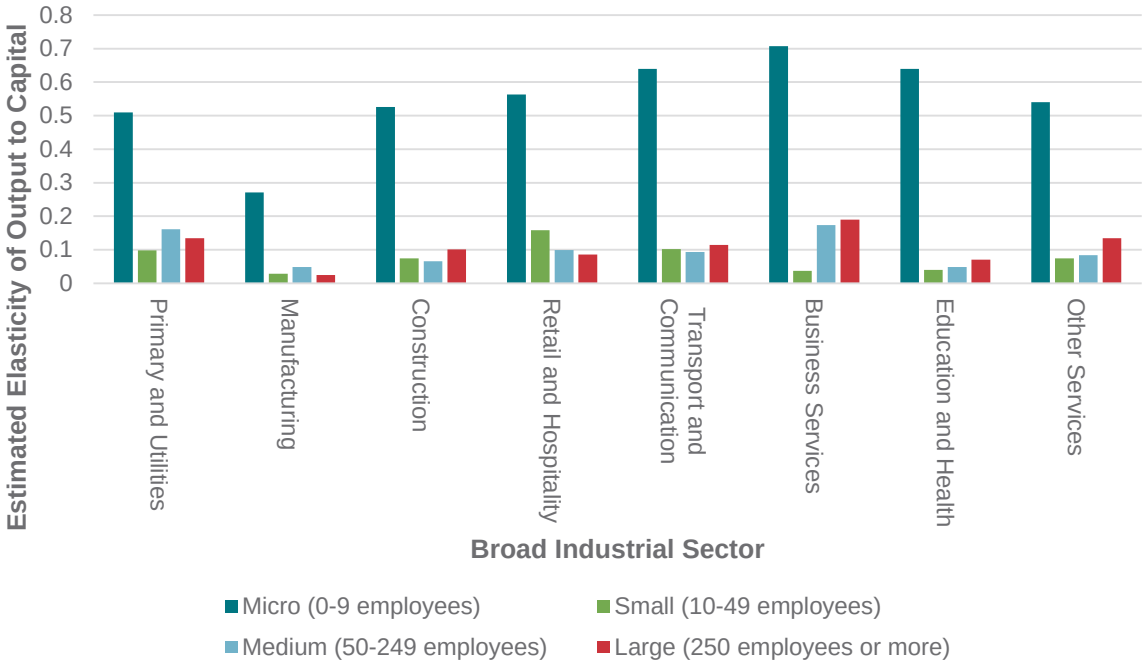
[35] This was achieved by assuming a Cobb-Douglas Production function: $Y = \alpha L^{\beta} K^{\delta} E^{\emptyset}$. In this model, output (Y) is a function of the levels of employment (L), capital (K), and expenditures on intermediate goods and services (E). The parameters β and δ represent the marginal products of labour and capital respectively and α represents the total productivity of factors (TFP). The model was estimated with econometric methods by taking the natural logarithm of both sides of the equation: $\ln Y = \ln \alpha + \beta \ln L + \delta \ln K + \emptyset \ln E + u$.

[36] To estimate the model described in Footnote 27, estimates of the capital stock (rather than net changes in the capital stock) are required. Estimates of the capital stock were derived using the perpetual inventory method, following the approach set out in 'The Causal Effects of an Industrial Policy,' Criscuolo, Martin, Overman and Van Reenan, CEP Discussion Paper.

[37] Variables expressed in financial terms (GVA, capital investment and spending on intermediate goods and services) were adjusted for inflation using ONS GDP deflators.

[38] See 'The Marginal Product of Capital,' Caselli and Feyrer, Quarterly Journal of Economics, 2007.

Figure 4: Estimated Elasticity of Output to Capital by Sizeband and Sector



Source: Annual Business Survey, Ipsos MORI analysis

E. Wage Differentials

i) The Employer Size-Wage Relationship

It has long been established within the literature that small firms typically offer lower wages and salaries, often lesser benefits in other terms and provide less employment security than larger counterparts, with the differential increasing at a decreasing rate with firm size. One seminal study found that the differential is "sizeable and omnipresent", with larger firmer paying higher wages but less for other inputs, including finance[39]. It found that around 50 percent of this differential is explained by observable worker characteristics with much of the remainder potentially explained by unobserved worker characteristics (such as ability or risk aversion).

Whilst studies in other countries confirm the prevalence of the effect, the picture is by no means straightforward – for example, one study for France finds that the effect is greater for gross than for basic wages and for males than for females[40]. The drivers of the phenomenon may differ between countries. For example, a comparative study of the US and Germany concludes that, "even after an empirical examination of the explanation in both countries, some aspects of the [employer-size wage effect] remain unexplained and some approaches need further explanation"[41].

ii) Wage differentials in the UK

Specific research has been completed as part of this study to explore the size and nature of wage differentials in large and small firms using the microdata collected through the Annual Survey of Hours and Earnings (available through the Office for National Statistics Virtual Microdata Laboratory). This survey collects information on the earnings and hours associated with 180,000 employee jobs annually and can be linked to business surveys to create an employee and employer matched dataset.

[39] The Employer Size-Wage Effect, Journal of Political Economy, Brown C and Medoff J, 1989.
[40] The Establishment Size Wage Premium: a reassessment of evidence for France, Syeda, Not dated.
[41] The Employer Wage-Size Effect: A Comparison between Germany and the USA, Adamczyk, The Bonn Journal of Economics, 2015.

A first set of analyses were completed to examine the relative wages of employees in SMEs and in large firms[42]. To avoid possible distortions that could be caused by differences in the sectoral profile or the nature of occupations in SMEs and large firms, a set of OLS regressions were completed to control for the following aspects of the employer and employee:

- Occupation (using the Standard Occupational Classification)
- Industry (using the Standard Industrial Classification)
- Region
- Gender
- Full-time / Part-time
- Years with current employer (a proxy for experience)
- Age

In addition, a supplementary propensity score matching algorithm was applied to create a matched sample of employee jobs in large firms and SMEs in which the jobs shared similar observable characteristics. The analysis was repeated for 2013, 2014, and 2015 and the results are set out in the table below.

These findings confirm that SMEs pay lower wages for job roles with similar characteristics. This effect appears stable across years at around 11-12 percent (or £55-£60 per week). The data available does not allow us to control for all characteristics of workers that may influence productivity and wage offers. Most critically, there are no direct or indirect measures of skills or ability available within the ASHE. However, the findings are largely what would be expected should the hypothesised market failures be present (though these could potentially also be explained by the presence of other market failures, such as monopsony or monopoly power amongst large firms).

Table 1: Estimates of the Wage Differential between SMEs and Large Firms

Model	2013	2014	2015
OLS: Gross Weekly Pay (£)	£58.87	£56.49	£59.14
OLS: Log Gross Weekly Pay (percent)	11.3	12.0	11.9
PSM: Gross Weekly Pay (£)	£56.10	£53.96	£56.43

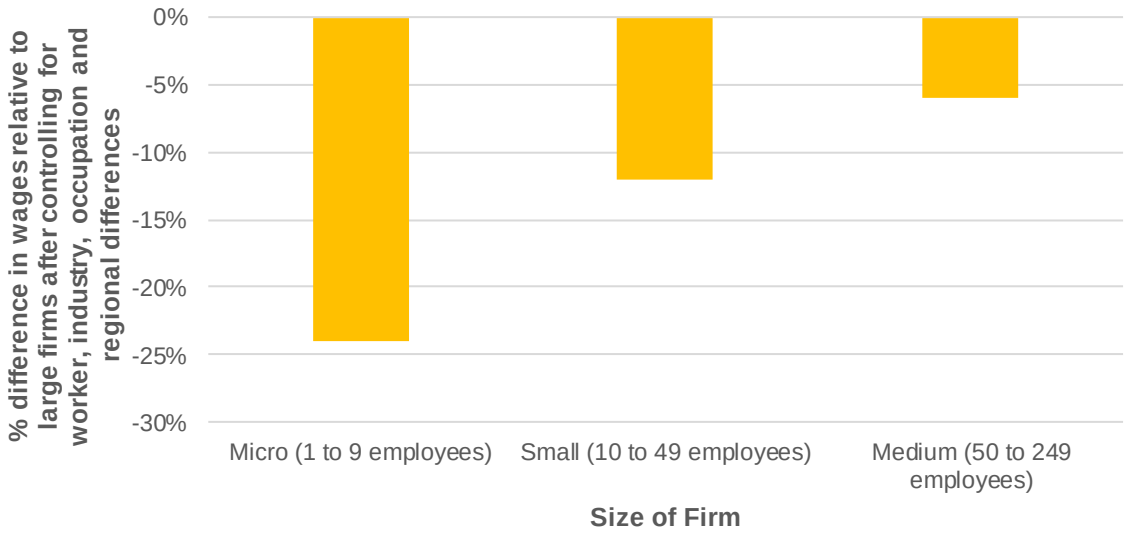
Source: Annual Survey of Hours and Earnings, Ipsos MORI analysis, Nominal Prices

The matched sample was also used to explore wage differentials by size of business, by sector, and by local labour market conditions:

- **Wage differentials by size of business:** The regression models were used to explore variance in wages by size of business and suggested that wage differentials narrowed with the size of the firm. After controlling for industry, occupation, hours worked, region and worker attributes (gender, years in current job, and age), the results suggested that wages were 23 percent lower in micro-businesses (1 to 9 employees), 12 percent lower in small firms (10 to 49) employees and 6 percent lower in medium sized firms (50 to 249 employees). This is illustrated in the following figure.

[42] Large firms were defined as firms with 250 or more employees: European Commission Directorate-General for Enterprise and Industry, 2006.

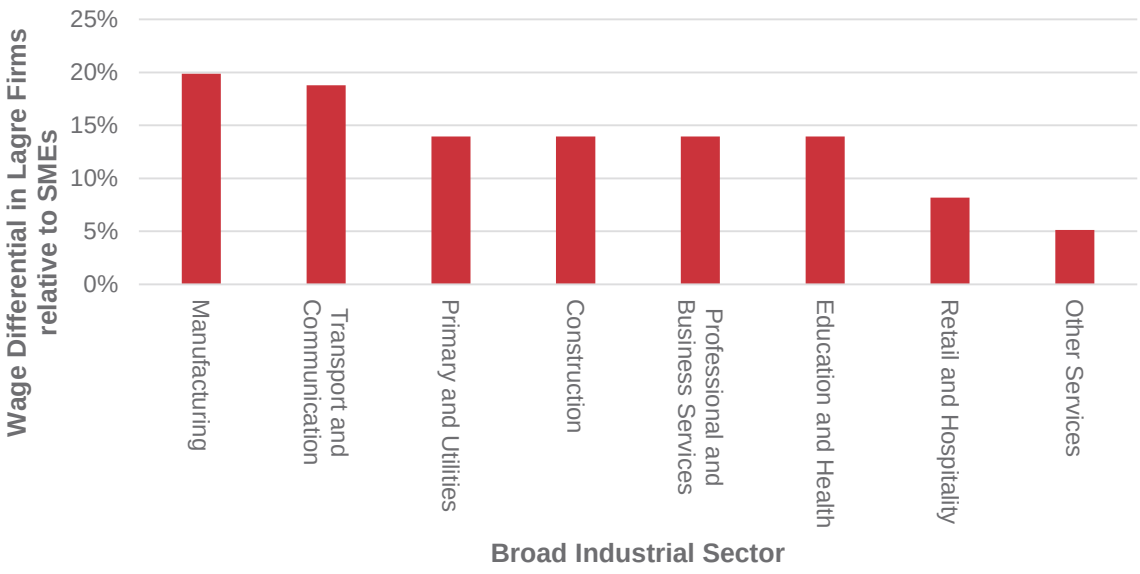
Figure 5: Wage Differentials by Size of Business



Source: Annual Survey of Hours and Earnings, Ipsos MORI analysis

- **Wage differentials by sector:** The following figure provides estimates of the wage differential between large firms and SMEs (again, after controlling for region, occupation and worker attributes). The estimated wage differential is estimated to vary from 20 percent in the manufacturing sector to 5 percent in the other services sector.

Figure 6: Estimated Wage Differential (%) in Large Firms Relative to SMEs



Source: Annual Survey of Hours and Earnings, Ipsos MORI analysis

- **Wage differentials by local labour market conditions:** A final analysis explored the relationship between the wage differentials between large firms and SMEs and local labour market conditions. Data on unemployment rates at a local authority level (derived from the Annual Population Survey) were matched to the postcodes of employers responding to the Annual Survey of Hours and Earnings, and the model described above was adapted to allow the magnitude of the wage differential to vary by local unemployment rates. This analysis suggested that the wage differential falls when local unemployment is higher with a 1 percentage point increase in unemployment reducing

the differential by 0.61 percentage points. This result aligns with expectations – in conditions of higher unemployment, workers will be more constrained in terms of their employment options and more willing to accept lower wage offers.

iii) Evidence from Job Moves

The ASHE also includes panel data describing the earnings and hours of individuals over time and captures the changes in the wage when employees move between employers. Analysis of the relative change in wages when employees move from SMEs to large firms (and vice versa) will potentially allow unobserved worker characteristics to be accounted for (presuming that aspects such as skills and ability do not change immediately following the move):

- Analysis of 126,000 full-time to full-time job moves between 1998 and 2015 confirms the findings set out above. Workers moving from SMEs to large firms see their wages increase on average by 33.1 percent per week. Workers moving from large firms to SMEs see their wages increase on average by 20.6 percent per week. The difference between the two is of a similar magnitude to the findings set out above.

iv) Relationship with Productivity

The results of the Annual Business Survey provide a breakdown of both total Gross Value Added and employment costs by size of firm, and suggest a more complex relationship. GVA per £1 spent on employment costs is highest amongst firms with 1 to 9 employees, and around 3 percent higher than for large firms. GVA per £1 spent on employment costs is lowest amongst firms with 10 to 49 employees (around 4 percent lower than large firms). It should be noted that these figures do not control for industry differences. Nevertheless, this finding is at least consistent with the hypothesis that employment levels in very small firms are constrained by market failures.

Figure 7: Estimated Differentials (%) in GVA per £1 of Employment Costs, Large Firms Relative to SMEs

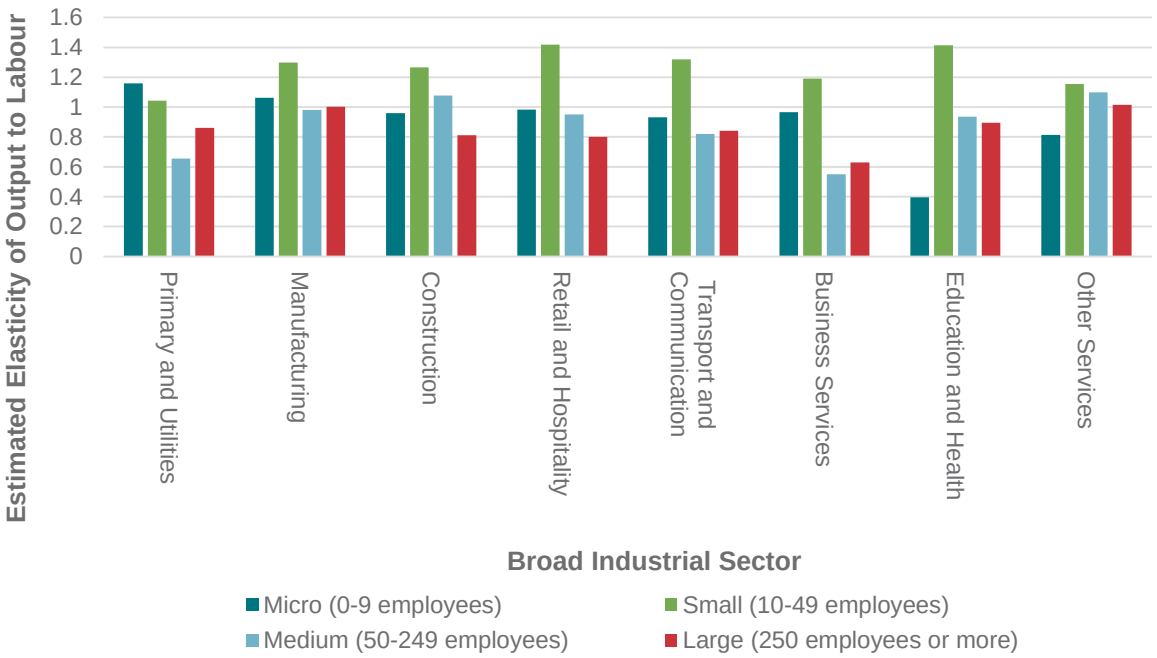
Source: Annual Business Survey, Office for National Statistics, and Annual Survey of Hours and Earnings, Ipsos MORI analysis

The models described in Section D were used to further explore the relationship between firm size, the marginal product of labour, and total factor productivity. The following figure sets out the estimated elasticity of GVA to labour by business size[43]. These results show that, in general, the marginal product of labour is highest in small firms and

[43] That is the percentage increase in GVA associated with a doubling of employment.

falls with firm size. This suggests that small firms are suboptimally small - in most cases, it is estimated that the output of small firms would more than double in response to a doubling of employment. This result is consistent with the hypothesised market failures described in section A, suggesting that small firms are constrained in their employment. The relationship was less consistent with respect to micro and medium sized business.

Figure 8: Estimated Elasticity of GVA to Labour, by Firm Size



Source: Annual Business Survey. Ipsos MORI Analysis

The findings also pointed to the reverse relationship with respect to Total Factor Productivity (TFP), which – with the exception of the 'other services' sector - was positively correlated with firm size as illustrated in the following figure). The data available did not allow us to construct measures of the quality of factor inputs employed by firms (such as the education of workers). Under the approach taken, higher quality human and physical capital will feed through into higher TFP and the results are indicative of the types of sorting effect described in Section A (i.e. that more highly skilled workers sort themselves into larger firms). It is important to note, however, that while this result is not inconsistent with the framework defined at the beginning of this paper, higher TFP in large firms could also be linked to other factors that are unrelated to their ability to recruit highly skilled workers - such as the quality of intangible assets or the degree of monopoly or monopsony power.

Figure 9: Total Factor Productivity in Micro, Small, and Medium Sized Businesses Relative to Large Firms

Source: Annual Business Survey. Ipsos MORI Analysis

iii) Explanations of the Size-Wage Relationship

A seminal study by Oi and Idson[44] suggests that the wage gap in the United States is 35 percent, although it notes that this is larger than in other countries. It finds that large firms "demand a higher quality of labour defined by such observable characteristics as education, job tenure, and a higher fraction of full-time workers". It notes that, "rent sharing cannot be dismissed as an explanation for the size of the wage-size premium" but concludes that, "The organization of work and the selection of employees (whose productive traits are not always observable) are responsible for the positive relationship between wages and employer size".

In similar vein, a US study supports the suggestion above and others that the differential is an efficiency wage effect. It argues that larger firms respond to the greater difficulty which they face in monitoring performance by paying a premium. It is suggested that this generates a return in motivating employees and reducing potential 'shirking' and associated supervision costs[45]. Another analysis for the US found that only workers in establishments with 250+ employees receive a wage premium (of 9 percent) which reduces to about 4 percent when non-wage benefits and measures of training are included. It is argued that, "efficiency wages, working conditions and job/sorting/matching are all reasonable explanations", although job sorting/matching is much more prevalent"[46].

A study of data for Canada supports the apparent mainstream finding of the literature view that, "unmeasured/unobserved worker heterogeneity influences the wage gap but cannot explain all of it". However, it finds evidence finds that, "wage differentials reflect the non-random assignment of workers into firms of different sizes, in accordance with the ability sorting argument". "From a worker's standpoint, the results suggest that the decision to join a small, medium or large firm depends on the relative level of measured vs unmeasured skills. For

[44] Oi W and Idson T (1999) Firm Size and Wages in Handbook of Labor Economics, Elselvier.
[45] Ewing B and Payne J (1999) The Trade-off between Supervision and Wages: Evidence of Efficiency Wages from the NLSY, Southern Economic Journal.
[46] Pedace R (2010) Firm-Size wage Premiums: Using Employer Data to Unravel the Mystery, Journal of Economic Issues.

example, among higher-ability workers, those who possess greater education or experience than other workers will achieve the greatest wage advantage by joining a large firm, while those with less education or experience will derive the greatest comparative advantage by joining a medium sized firm". However, "firms with 100- 499 employees seem to have rewarded both unmeasured ability and measured skills more than smaller firms did". Nevertheless, it finds that monitoring and screening issues are also important[47].

On a different tack, one study for Norway finds that, "the unexplained firm or establishment size effect turns out to be 'skill group size effect on wages'. Given group size, the number of employees of other types has small or negligible effects on the wage". These findings imply that wages are higher where there a larger numbers of workers within the firm that share similar skills or in similar occupations. The authors interpret this as a supply side or internal bargaining power effect[48] - i.e. where there are larger number of workers with similar skills within the firms, they are better able to bargain with employers, enabling them to capture a higher share of the product of the firm.

A further study of the US finds that the wage premium paid by large firms has declined over the last 20 years, particularly for the least educated workers[49]. This is attributed in particular to sectoral shifts in the pattern of large firm employment (from manufacturing to retail) and the greater decline of unionism in large firms – although the literature generally tends to suggests that unionisation and the threat of unionisation are not major influences on the size-wage premium.

Finally, a study of the Korean labour market finds that imperfect information contributes to the bias against SMEs, "for example, a firm's inadequate ability to identify a pool of potential employee candidates or to provide them comprehensive firm - or job specific - information tends to worsen labour shortages, and an employee's *ex-ante* incomplete knowledge of on-the-job training or education tends to increase *ex-post* turnover intentions[50].

ii) Turnover and Wage Differentials

One study explores the maintained hypothesis that, "large employers have an inherently greater capacity to establish long-term relationships with their employees due to the larger job market within the firm and their higher survival probabilities. As a result, the expected returns to on-the-job training are greater, leading to higher levels of training, internal job mobility, employee selection with an eye towards hiring people who exhibit a both a capacity for training and relatively stable employment histories, and mobility inhibiting wage premia and non-vested fringe benefits"[51].

Another study finds that one-third of the employer-size wage effect can be explained by predicted layoff risk as, "less stable (and also less able) workers select themselves into small, unstable and low-paying firms[52]. One of the OECD studies[53] cited above notes that less than half of start-ups survive for more than five years which clearly affects their attractiveness to potential job seekers. It also finds that the combination of high rates of job creation and destruction within the sector result in job turnover rates in many countries of 20 percent. Although there is a recognition that this is a source of economic dynamism, it has costs to those who are adversely affected in terms of income losses and creates a reluctance to invest in training. "*High job turnover* poses problems for employment security…. Small firms also tend to invest less in training and rely relatively more on external recruitment for raising competence."

iii) Firm Age, Technology and Wage Differentials

[47] Ferrer A and Lluis S (2008) Should Workers Care about Firm Size, ILR Review.
[48] Barth E and Dale-Olsen H (2011) Industrial and labour Relations Review.
[49] Even W and Macpherson D (2012) Is Bigger Still Better? The Decline of the Wage Premium at Large Firms, Southern. Economic Journal.
[50] Imperfect Information and Labour Market Bias against Small and Medium-sized Enterprises: A Korean Case, Park S, Kim B-Y, Jang W and Nam K-M, Small Business Economics, 2014.
[51] Idson T (1993) Employer Size and Labour Turnover, Columbia University Discussion Paper No. 673.
[52] Winter-Ebmer (1995) Does layoff risk explain the firm-size wage differential? Applied Economic Letters.
[53] Small Businesses, Job Creation and Growth: Facts, Obstacles and Best Practices, OECD (undated).

One paper[54] seeks to explain the U shaped relationship between wages and firm *age* which was also observed in the seminal Brown and Medoff study after allowance was made for readily observed worker characteristics. This suggests that firms of intermediate age are able to pay the lowest wages. The study argues that mangers of younger and smaller firms are less able than managers of older firms to provide precise instructions to employees which means that they need to pay a premium to recruit alpha type employees able to act on their own assessment of the direction that work should take. However, one study indicates the tendency for new firms to pay lower wages in Portugal[55].

Significantly in the current context, research focussed on Silicon Valley confirms the motivating effects of equity shares and explores the advantages that R&D intensive firms enjoy in crafting incentive-intensive employment contracts which lure and motivate top talent[56].

Conclusions

- It seems clear that financial constraints are a barrier to achieving growth potential and that, though the problems involved appear to have eased in recent years, they are far from resolved. The findings set out in this paper suggest that it is micro-businesses that likely face the most acute funding constraints, earning a marginal rate of return on capital which is substantially higher than that of firms with more employees and suggesting they are only able to undertake below socially optimal levels of investment. Innovative, pre-revenue R&D intensive businesses can be expected to face significant information asymmetries which may make securing adequate levels of funding particularly problematic.

- There is clear evidence that smaller firms face more challenges in recruiting staff and that more highly skilled workers are sorted into larger firms (reflected both in reported skill requirements associated with open vacancies and the lower levels of Total Factor Productivity observed in smaller firms). Smaller firms typically pay lower wages, provide less secure employment and are less likely to invest in training. There was also evidence that employment in small firms is sub-optimally low, with the estimated elasticity of output to labour substantially higher in small firms. These findings are largely consistent with the expected consequences of the market failures put forward to justify the subsidies implicit in the Enterprise Management Incentive.

- The wage-size effect and financial constraints suggest that smaller firms will face particular difficulties in recruiting high calibre/highly qualified R&D workers - although the Silicon Valley study suggests that small R&D intensive firms have been able to construct employment contracts involving equity finance to both attract and motivate talented workers. In this respect, the choice of remedy embodied in EMI may be appropriate in achieving the schemes objectives. However, the suggestion in some studies that larger firms pay higher wages to counter the difficulties in measuring individual worker performance sits uneasily with the 'principal and agent' rationale for an EMI type scheme focused on smaller firms (as difficulties in monitoring employee effort are likely typically less acute in a small firm).

- It is far from clear that growth potential is associated with smaller rather than newer firms. In any event, any policy targeted on growth potential has to confront the problems that potential in either case is concentrated in only a small proportion of firms (perhaps 6 percent to 10 percent). While this could provide an argument for a scheme with more refined targeting than the Enterprise Management Incentive, it should also be acknowledged that many firms with the potential for growth fall outside obvious potential definitions based upon size, newness or sector – making such targeting very difficult, and perhaps infeasible, in practice.

[54] Thompson P (2009) Managers, Coordination, and the Firm Size-Wage Relationship.
[55] Viera J (2011) Do wages really vary with firm age? New Evidence using linked employer-employee panel set, Conference on Economic Modelling.
[56] Zenger T and Lazzarini S (2004) Compensating for Innovation: Do Small Firms Offer High-powered Incentives That Lure Talent and Motivate Effort? Managerial and Decision Economics.

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