

Product strategies, skills shortages and skill updating needs in England: New evidence from the National Employer Skills Survey, 2009

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Foreword

The UK Commission for Employment and Skills is a social partnership, led by Commissioners from large and small employers, trade unions and the voluntary sector. Our mission is to raise skill levels to help drive enterprise, create more and better jobs and promote economic growth. Our strategic objectives are to:

- Provide outstanding labour market intelligence which helps businesses and people make the best choices for them
- Work with businesses to develop the best market solutions which leverage greater investment in skills
- Maximise the impact of employment and skills policies and employer behaviour to support jobs and growth and secure an internationally competitive skills base.

These strategic objectives are supported by a research programme that provides a robust evidence base for our insights and actions and which draws on good practice and the most innovative thinking. The research programme is underpinned by a number of core principles including the importance of: ensuring '**relevance**' to our most pressing strategic priorities; '**salience**' and effectively translating and sharing the key insights we find; **international benchmarking** and drawing insights from good practice abroad; **high quality** analysis which is leading edge, robust and action orientated; being **responsive** to immediate needs as well as taking a longer term perspective. We also work closely with key partners to ensure a **co-ordinated** approach to research.

This report explores the relationship between firms' market strategies and their skills needs. Building on previous analysis and drawing on data from the National Employer Skills Survey, it addresses some key questions. To what extent do the skills available from a firm's workforce have a bearing on the markets in which it can operate? To what extent does a firm's market strategy shape its outlook on skills and its skill needs? These questions are of key importance when thinking about the economic case for skills and the challenge of galvanising sectors to improve the skills and productivity of their workforces.

Sharing the findings of our research and engaging with our audience is important to further develop the evidence on which we base our work. Evidence Reports are our

chief means of reporting our detailed analytical work. Each Evidence Report is accompanied by an executive summary. All of our outputs can be accessed on the UK Commission's website at www.ukces.org.uk

But these outputs are only the beginning of the process and we will be continually looking for mechanisms to share our findings, debate the issues they raise and extend their reach and impact.

We hope you find this report useful and informative. If you would like to provide any feedback or comments, or have any queries please e-mail info@ukces.org.uk, quoting the report title or series number.

Lesley Giles

Deputy Director

UK Commission for Employment and Skills

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Geoff Mason

Executive Summary

Background: why is the link between product market strategy and skills important?

The relationship between the product market strategies adopted by employers and the skills they require is important because of indications of a strong inter-relationship, in that:

- The level of skills available to employers may have a bearing on the markets employers can operate in and this is likely to impact on their productivity, performance and their future business aspirations;
- Product market strategies may influence the skill levels used in the workplace.

The existence of this relationship, and the direction of causality (i.e. do product market strategies drive skill levels or vice versa) is of key policy interest as the UK governments try to drive up skill levels in the UK. As a result it has been the subject of previous study (Prais, 1995; Wensley, 1999; Keep and Mayhew, 2003, Wilson and Hogarth, 2003). The aim of this current study is to examine whether there is a relationship between the type of product strategy adopted by an employer and the extent of the skills they require and the skills challenges they face. It uses data from the Employer Skills Surveys carried out in England in 2001 and 2009 to examine the nature of the relationships, and also investigate the extent to which patterns available in 2001 were still present in 2009. It builds on previous analysis carried out by Mason (2004) on the 2001 Employer Skills Survey.

Key Findings

The data on **product market strategies** shows that firms vary greatly in the extent to which they are seeking to engage in 'high-end' or high value added production, and that this degree of variation has persisted throughout the period from 2001 to 2009. The incidence of different types of product strategy differs greatly between sectors as well as within each sector. In both 2001 and 2009 product strategy scores tend to increase with establishment size and with the extent to which establishments operate

in national or international markets rather than confining themselves to regional or local markets.

The most important factors driving **skills updating and improvement needs** are new legislative or regulatory requirements, the introduction of new goods or services, new work practices and new technologies and increased competitive pressure in general. The types of skill that need updating cover a wide range of generic skills (such as customer-handling, team-working, problem-solving and communication skills), technical, practical or job-specific skills and management skills. Managers are the most likely occupation to be affected by skill updating needs.

Product market strategies and the level of workforce skill in an establishment are strongly positively correlated. This means that those with high product market strategy scores are also likely to register higher levels of workforce skill, whereas those with lower product market strategy scores are more likely to register lower workforce skill scores. By way of illustration, this means that whilst establishments registering in the upper quartile for product market strategy have a mean skill level of between NVQ3 and NVQ4, the mean level of skills in establishments below the upper quartile is some way below NVQ3. However, it is not possible to say that there is a primary direction of influence (i.e. that high product market strategies drive up skill levels or vice versa) rather, the relationship is co-determined.

There are also other relationships of interest:

- Employers registering high level product market strategies are more likely to see a need to raise the skill levels of staff in the future through updating their skills. This may indicate that managers in high-end establishments are more aware of ongoing changes in skill needs;
- Firms with high level product market strategies are less likely to have current skill gaps, however, indicating that the fact that they monitoring changes in skill needs more readily and identify future requirements prevents actual skill gaps from emerging as they deal with them before they do;
- There is a positive relationship between the provision of training and the level of skills in an establishment: firms that train are more likely register high on the skills index.

This report provides evidence that establishments pursuing high value-added product market strategies are more likely to have higher workforce skill levels than their counterparts with medium or lower value added product market strategies. In addition, these establishments are more likely to be actively looking to update the skill levels of their staff and less likely to have skill gaps, perhaps as a result of their pre-emptive action to address problems before they arise. The relationships identified are interdependent. This reinforces the message in literature on resource- and knowledge based theories of the firm, which suggests that business strategies and firm-level resources tend to evolve together over time.

1. Introduction

As competitive pressures continue to mount in the world economy, British firms are increasingly urged to move up-market to higher value added goods and services and to invest more heavily in the skills required to support such changes in product strategies. In this context the term 'product strategy' is typically used to refer to the choices made by firms about product or service differentiation within particular markets. Some firms may attempt to compete on high-specification products at premium prices in certain markets while others target the lower-priced end of those markets or opt for a medium-price strategy. In addition, firms may vary in the extent to which they seek to compete through new product development and other forms of innovation rather than rely on existing products or services of long standing.

The idea of a connection between firms' product strategies and skills was derived in large part from international comparisons which found that – compared to countries such as Germany – a relatively large proportion of British firms were concentrated towards the 'lower' (more standardised, lower-specification) end of the product quality spectrum for which skill requirements were relatively low (Prais, 1995). Subsequently, several researchers emphasised that the relationship between workforce skills and choice of product strategies was potentially two-way in nature. On the one hand, if firms adopted a relatively high (low) value-added product strategy, the associated skills required to deliver this strategy were likely to be relatively high (low). On the other hand, firms needing to upgrade product strategies in response to market competition might be constrained (assisted) in doing so if the in-house skill levels available to them were relatively low (high) (Wensley, 1999; Keep and Mayhew, 2003; Wilson and Hogarth, 2003).

Drawing on the Employers Skills Survey 2001 (ESS01), Mason (2004) found strong evidence of a positive relationship between measures of product strategy and skills, with considerable diversity between sectors and between establishments in different sectors in the incidence of 'high end' product strategies and associated skills. A later study comparing high value added and medium value added firms in four very different sectors – plastics processing, commercial printing, logistics and general insurance – showed that the high value added firms were distinctive for having invested more heavily over time in several different forms of capital. These firms had not just invested more in workforce skills development but also in machinery and

equipment and in product and process innovations (Mason, 2005a).¹ The disparities between high value added and medium value added firms reflected past strategic choices made by managers over considerable lengths of time. There was no evidence that medium value added firms had been impeded from moving to high value added product strategies by greater skill constraints than those found in high value added firms. Both groups of firms reported skill deficiencies of different kinds, and in the majority of cases these were not more important or limiting than capital constraints or market uncertainty (ibid).

The availability of data from the National Employer Skills Survey 2009 (NESS09) provides a welcome opportunity to revisit some of these issues. First, it contains employers' responses to questions about product strategy which are similar to those asked in ESS01. Second, it provides data for the first time on a national scale on the skills improvement and updating needs of firms. Questions about skill deficiencies of this kind were asked in addition to questions on skill-shortage vacancies and any lack of full proficiency on the part of employees (internal skill gaps). Hence in this report we are able to address the following questions:

1. How do product strategies in 2009 compare with those identified in 2001?
2. What relationship (if any) can be identified between product strategies and different indicators of skill deficiency – for example, skill updating needs and internal skill gaps of different kinds?
3. In particular, what impact (if any) do reported deficiencies in management and leadership skills have on product strategies?
4. What is the strength and nature of the relationship between product strategy choices and overall skill requirements? How is this relationship affected by different forms of market competition (in particular, exposure to foreign trade and involvement in international markets) and size of establishment?
5. How common are apparent mismatches between firms' product strategies and skills? In other words, how common is it for firms to seek to operate high value

¹ Within each sector high value added firms were defined as those in the upper quartile for average value added per employee over a three-year period. Medium value added firms were defined as those in the inter-quartile range on the same measure of performance (Mason, 2005a).

added product strategies (by the standards of their sectors) with relatively low levels of skill?

The report is ordered as follows:

- Section 2 compares measures of product strategy and skill at sector and establishment level in 2001 and 2009.
- Section 3 compares different measures of skill deficiency across sectors in 2009 and investigates how skill deficiencies of different kinds affect product strategies at establishment level.
- Section 4 examines the relationship between product strategies and overall skill levels in more detail.
- Section 5 seeks to identify the types of establishment that are most vulnerable to mismatches between product strategies and skill levels.
- Section 6 summarises the report's main findings.

2. Product strategies and skills at sector and establishment level: 2009 compared with 2001

Summary

- Comparisons of establishments' responses to product strategy questions in 2001 and 2009 show marked variation between establishments in the extent to which they are seeking to engage in 'high-end' or high value added production.
- This high degree of variation has persisted throughout the period from 2001 to 2009.
- In both years it is notable that product strategy tends to increase with establishment size and with the extent to which establishments operate in national or international markets rather than confining themselves to regional or local markets.
- At the same time the incidence of different kinds of product strategy differs greatly between sectors as well as within each sector. For example, in 2009 the proportions of establishments rating themselves at the top point of the scale on innovation leadership in 2009 ranged from 18% in fabricated metal products to 30% in electrical and electronic engineering. In construction sectors only 14-15% of establishments classified themselves as innovation leaders. In market services the proportion of self-described innovation leaders ranged from 21% in hotels, bars and transport services to 34% in non-specialised retailing and personal services.
- Sectoral variation is also high in both years in terms of establishments' self-classification on indicators of 'premium quality' production, customisation of goods and services and dependence on low prices for achievement of competitive success.

2.1 Overview of samples

The Employers Skills Survey 2001 (ESS01) was a nationally representative telephone survey of 27,031 establishments in England (where some 85% of the UK

labour force is located). In most establishments with 100 or more employees the principal respondents were senior managers in human resource or personnel departments; in smaller establishments the respondents tended to be owners or general managers. The main stage of interviewing was carried out between November 2000 and April 2001 (Hogarth et al, 2001). The National Employer Skills Survey 2009 (NESS09) was carried out in a similar way as ESS01 but with a much larger sample size: 79,152 establishments with at least two people working in them.² Fieldwork was conducted from March-July 2009 (Shury et al, 2010).³

In the present paper we focus on private sector establishments in order to make detailed use of the responses to certain questions on product strategy which were confined to private sector establishments. The private sector is defined here to include all industries except for public administration, education, health and social work and other community and social services (SIC 75-92). We also confine the analysis to establishments with five or more employees since, as Forth (2003) has shown, exclusion of micro-establishments with 1-4 employees permits a substantial degree of sectoral disaggregation while retaining confidence in the national representativeness of the sectoral sub-samples under consideration.

Tables 2.1-2.3 provide information on the sectoral, size and regional distributions of private sector establishments with five or more employees in each of the two surveys. These estimates are population-weighted, that is, grossed up to estimates of the total number of establishments in each sector with five or more employees. In both years the two largest sectors represented were business services and retailing. The 2009 survey captured a larger proportion of manufacturing establishments in the 5-plus size bracket than did the 2001 survey, while sectors with smaller (weighted) shares of establishments in the later survey included construction, motor vehicle sales, restaurants and business services (Table 2.1). The size-group and regional distributions are much the same in each year (Tables 2.2-2.3).⁴

Since previous research showed strong links between product strategies and the geographical market focus of establishments, it would be useful to be able to

² This contrasts with ESS01 where there was no lower bound to the size of participating establishments.

³ Note that fieldwork for ESS01 and NESS09 was carried out at different times of the year. It is not possible to assess how this may have affected comparisons between the two sets of survey results.

⁴ Note that the original weighting for the surveys was for populations of establishments which included those with fewer than five employees. The original sectoral populations drawn were based on Sector Skills Councils (SSCs). While a reweight has been done to Standard Industrial Classification (SIC) sectors, this is still based on the SSC-defined sectoral population counts. Neither of these factors is likely to have had a significant impact on the results presented here.

compare survey responses on market orientation between 2001 and 2009. However, there are substantial differences in survey design and administration which make it difficult to carry out any such comparison with confidence.

In 2001 private sector establishments were asked: Is the market for this establishment's main product or service primarily...: Local / Within your region / Within the rest of the UK / Within the European Union / Within other parts of the world? ⁵ Establishments were deemed to be 'private' if survey respondents classified their organisations as a 'private sector business' rather than as a 'public sector organisation' or a 'voluntary organisation'. Public and voluntary sector organisations were asked 'Is the geographical area that this establishment serves mainly....' before being given the same choice of regions as private sector establishments. ⁶

In 2009 private sector establishments were asked: Are your products primarily sold....locally / regionally / nationally / (or) internationally? ⁷ In this case establishments were deemed to be 'private' if survey respondents classified their organisations as either 'mainly seeking to make a profit' or as a 'charity or voluntary sector organisation' or if they specifically excluded themselves from designation as financed by either local government or central government. ⁸ No similar question about geographical market focus was asked of establishments deemed to be in the public sector.

⁵ ESS01, Question B11.

⁶ ESS01, Question B15.

⁷ NESS09, Question F1A.

⁸ Derived from responses to NESS09, Question A4.

Table 2.1: Sectoral distributions of private sector establishments with five or more employees, ESS01 and NESS09, unweighted and population-weighted estimates

		2001	2009	2001	2009
SIC 2003	Sector name	% of establishments (unweighted)		% of establishments (weighted)	
10-50	Agriculture, forestry and fishing	1.2	2.5	2.3	2.6
100-145	Mining and quarrying	0.3	0.2	0.3	0.2
151-160	Food, drink and tobacco	2.1	2.0	1.1	1.3
221-223	Printing, publishing, recorded media	2.7	2.2	2.6	1.4
241-252	Chemicals, rubber and plastics	2.8	1.6	1.7	1.0
281-287	Fabricated metal products	3.6	1.7	2.7	1.1
300-335	Electrical, electronic and instrument engineering	2.2	1.5	2.0	0.9
271-277, 291-297, 341-355	Mechanical engineering, vehicles and other engineering	4.2	2.2	2.9	1.4
171-212, 231-232, 261-268, 361-366, 371-72	Other manufacturing industries	4.6	5.4	4.1	3.7
452	Building of complete constructions; civil engineering	5.6	3.1	3.5	2.8
451, 453-455	Building installation, building completion and other construction activities	4.8	5.3	3.4	5.1
400-410	Electricity, gas and water	0.3	0.4	0.2	0.2
501-505	Sales of motor vehicles, parts, fuel	2.1	6.1	4.5	7.2
511-517	Wholesaling	4.1	6.6	8.1	7.7
522-524	Retailing – specialised stores	5.9	9.4	14.4	11.0
521, 525-527	Retailing - non-specialised stores; other retail and repair	4.1	4.7	3.3	3.9
551-552	Hotels, motels and other accommodation	3.9	2.3	2.2	2.2
553, 555	Restaurants, canteens, catering	6.0	5.6	4.2	6.9
554	Bars	5.0	3.4	4.7	5.0
601-603,611-623	Transport services	4.3	3.8	2.9	2.7
641-642	Postal and telecommunications services	2.2	1.8	1.1	1.4
631-634	Auxiliary transport activities, travel agents	2.9	2.0	2.1	1.5
651-652, 660, 671-672	Financial services, including insurance	4.0	3.9	4.6	4.2
721-726	Computer services	2.2	2.9	1.8	3.5
741	Legal, accounting, auditing, business and management consultancy, etc.	4.5	3.4	4.0	3.5
742-743	Architectural and engineering activities and related technical consultancy; technical testing, analysis	2.9	3.9	2.7	4.2
701-703, 712-714, 730-732, 744-748	Other business services (eg, real estate, rental, R&D services, advertising, employment agencies, security and industrial cleaning)	9.3	10.5	10.6	12.2
930	Personal and other services (eg, laundry, hairdressing, funeral and personal well-being services)	2.3	1.6	2.4	1.4
	Total	100	100	100	100
	<i>n</i> =	17657	41537	449670	538650

Table 2.2: Size distributions of private sector establishments with five or more employees, ESS01 and NESS09, population-weighted estimates

	2001	2009
	<i>% of establishments (weighted)</i>	
Employment size group		
5-9	43	44
10-24	35	37
25-49	11	10
50-99	6	5
100-199	2	2
200-499	2	1
500-plus	0.3	0.4
Total	100	100.0
<i>Weighted n =</i>	449670	538650
<i>Unweighted n =</i>	17657	41537

Table 2.3: Regional distributions of private sector establishments with five or more employees, ESS01 and NESS09, population-weighted estimates

	2001	2009
	<i>% of establishments (weighted)</i>	
Eastern	11	11
East Midlands	8	8
London	17	16
North East	4	4
North West	13	12
South East	17	17
South West	10	11
West Midlands	11	10
Yorkshire & Humberside	10	10
Total	100	100
<i>Weighted n =</i>	449670	538650
<i>Unweighted n =</i>	17657	41537

In addition to the differences in question wording, and the different definition of the private sector in each year, there is an additional problem with the 2001 data due to a proportion of respondents in private sector organisations with public sector customers who incorrectly classified their establishments as belonging to the public sector. In these cases the private sector organisations concerned were not asked any questions about market orientation.⁹ This problem seems to have affected up to 10% of all private sector organisations.

In the light of all these differences between the 2001 and 2009 survey data on geographical market focus, it is not possible to carry out a valid comparison of these responses in the two years, and therefore Table 2.4 presents data for 2009 alone. Overall, about 20% of establishments described their primary market focus as international compared to 32% who primarily competed in national markets and 46% who largely catered for regional or local markets. There are clearly very marked differences between sectors in market orientation, with the proportion competing mainly in international markets ranging from 6% in construction sectors to 54% in electrical and electronic engineering. Other sectors with relatively high proportions of establishments serving international markets are chemicals, fabricated metal products, mechanical engineering and vehicles and auxiliary transport services (which includes cargo handling and storage and travel agencies). As might be expected from the nature of the services involved, the sectors most dominated by establishments serving only local markets are those providing food and drink services and personal and other services.

⁹ IFF Research Ltd, private communication, 10 June 2010.

Table 2.4: Geographical market focus in private sector establishments with five or more employees, NESS09, population-weighted estimates

Market focus:	Local	Regional	National	Inter-national	Not known	Total	Weighted n =	Unweighted n =
	<i>% of establishments in sector</i>							
Agriculture, forestry and fishing	32	27	31	9	1	100	13980	1040
Food, drink and tobacco	23	18	41	18	1	100	6844	817
Printing, publishing, recorded media	20	14	41	24	1	100	7518	904
Chemicals, rubber and plastics	9	8	43	40	1	100	5469	672
Fabricated metal products	10	13	42	34	0	100	5838	713
Electrical/electronic eng.	4	6	35	54	1	100	4706	604
Mechanical eng., vehicles	10	10	38	42	1	100	7257	912
Other manufacturing	20	15	40	24	1	100	19627	2224
Building complete constructions; civil eng.	33	33	26	6	1	100	14919	1286
Building installation, etc	32	29	33	6	0	100	27555	2204
Sales of motor vehicles, parts, fuel	49	15	21	14	1	100	38547	2513
Wholesaling	22	17	37	23	1	100	41138	2737
Retailing - specialised stores	35	10	32	23	1	100	59089	3901
Retailing - non-specialised	35	8	38	18	1	100	20825	1947
Hotels, motels etc	30	7	33	29	2	100	11887	955
Restaurants, canteens, catering	57	6	18	18	1	100	37057	2319
Bars	67	7	19	6	0	100	26972	1421
Transport services	39	14	30	16	1	100	14235	1544
Postal and telecommunications services	22	8	42	27	1	100	7363	722
Auxiliary transport activities	15	7	31	44	2	100	7842	819
Financial services, incl. insurance	19	13	46	21	1	100	22698	1629
Computer services	11	13	42	33	1	100	18343	1193
Legal, accounting, etc services	24	18	32	23	1	100	18426	1386
Architectural, engineering, etc services	9	19	43	28	1	100	22256	1588
Other business services	32	17	31	19	2	100	64687	4246
Personal and other services	55	15	16	12	1	100	7639	637
Total	32	14	32	20	1	100	534690	41201

Note:

The total row includes data for establishments in mining and utilities which are not reported in the table due to relatively small cell sizes in those sectors.

See Table 2.1 for definitions of sectors in terms of Standard Industrial Classification (SIC) codes. These definitions apply to sector listings in all tables and charts in this report.

2.2 Measures of product strategy

We now turn to indicators of product strategy on which we are better placed to carry out comparisons between 2001 and 2009, although we still need to take note of differences in the wording of questions between the two years. These indicators are based on respondents' answers to questions which invited them to say where their establishment was positioned on different four- or five-point scales -- as compared to other establishments in the same industries -- in respect of the following characteristics:

- the extent to which the establishment competed in a 'premium quality' product market as compared to a 'standard or basic quality' product market;
- the extent to which competitive success depended on price;
- the extent to which the establishment 'tend(ed) to lead the way' in the development of new products, materials or techniques;
- the extent to which they provided customised (one-off or low volume) products or services as compared to engaging in high volume production [ESS01 all establishments; NESS09 manufacturing and construction establishments];
- the extent to which they provided a limited range of products or services as compared to a wide range of products or services [NESS09 services establishments].

In addition to concerns about variation in the wording of questions between the two years, caution is generally needed in interpreting subjective responses to questions of this kind since there may be inconsistencies in the ways that respondents define the industries they use for comparative purposes and in the criteria on which they base their self-assessments (Mason, 2005b). However, previous analysis of ESS01 responses to these questions showed that 'high end' responses – for example, towards the upper ends of scales denoting 'premium quality' products and innovation leadership – were positively related in a plausible way to exposure to international competition, foreign ownership and rapid growth in sales. For this reason it is useful to explore these data at some length.

In the analysis which follows, all estimates are presented on a population-weighted basis.¹⁰ In 2009 some 37% of establishments classified themselves as supplying premium quality products or services compared to others in their industry, compared to 31% in 2001. At the other end of the scale about 9% of establishments rated themselves at points 1-2 on this quality scale, down from 17% in 2001 (Table 2.5). When we turn to another potential indicator of products and services being 'premium quality' in nature – that the competitive success of suppliers does not depend greatly on charging relatively low prices – some 12% of establishments in 2009 said that they were not at all price-dependent, much the same as in 2001 (11%). However, at the lower end of this scale the proportion rating themselves at points 1-2 in 2009 was 27%, six percentage points lower than in 2001 (Table 2.6). In general, the responses to this question on price-dependence were less concentrated towards the high end of the scale in both years than was the case for the question about premium quality products and services.

Table 2.5: Extent to which establishments compete in markets for standard or basic quality products as compared to premium quality products in manufacturing, construction and market services with five or more employees, ESS01 and NESS09, population-weighted estimates

	2001	2009
	<i>% of establishments</i>	
Positioning on 5-point scale:		
1 - Standard/basic quality	8	4
2	9	5
3	26	23
4	24	29
5 - Premium quality	31	37
Not known	2	3
Total	100	100
Weighted n =	404528	534690
Unweighted n =	15875	41201

Note: This question was confined in both years to establishments deemed to be in the private sector. See discussion in Section 3.1 about how this classification was carried out in each year.

¹⁰ Note that in some cases the actual five-point scales used in one or other of the surveys have been inverted here so that high values correspond in each case to what might typically be regarded as a 'high end' product strategy, for example, engaging in premium quality production or having only limited dependence on price for competitive success.

Table 2.6: Extent to which competitive success depends on price in private sector establishments in manufacturing, construction and market services with five or more employees, ESS01 and NESS09, population-weighted estimates

	2001	2009
	<i>% of establishments</i>	
Positioning on 5-point scale:		
1 - Wholly price-dependent	16	14
2	17	13
3	38	39
4	15	18
5 - Not at all price-dependent	11	12
Not known	2	3
Total	100	100
Weighted n =	404528	525445
Unweighted n =	15875	40490

Note: This question was confined in both years to establishments deemed to be in the private sector. See discussion in Section 3.1 about how this classification was carried out in each year.

One potentially interesting indicator of establishments' product strategies is the extent to which they stand out as innovators in their respective industries. In both 2001 and 2009 similar questions were asked about whether establishments rated themselves as 'leading the way' on product or process innovation compared to others in their industries. However, the responses were allocated to different scales in each year so that it is difficult to make direct comparisons. Approximately 25% of respondents in 2001 said that a statement concerning innovation leadership was 'very applicable' to their organisations while in 2009 a similar proportion rated themselves at the highest point on a five-point scale relating to innovation leadership (see Table 2.7). This suggests that the proportion of highly innovative establishments in 2009 was much the same as in 2001 but the difference in measurement scales between the two years prevents any firm conclusion about this.

In order to investigate the extent of customised production, manufacturing and service establishments in 2001 were asked to rate themselves on a five-point scale ranging from high volume production to one-off or low volume production. In 2009 the same question was only asked of manufacturing and construction establishments while service establishments were asked to position themselves on a very different scale ranging from a 'wide range of services' to a 'limited range of services'. The latter terminology does not address the issue of customisation and therefore manufacturing / construction and services' responses to these questions are shown

separately in Table 2.8. In manufacturing and construction about 15% of establishments reported that they typically engaged in one-off or low volume production in 2009, up from 12% in 2001. In market services about 6% of establishments in 2001 said that they supplied one-off or low volume services. As noted, no equivalent figure is available for 2009 but a majority of service establishments in the later year were concentrated around provision of a wide range of services rather than a limited range (Table 2.8, Part B). Perhaps surprisingly, even though offering a limited range of services (the subject of the 2009 survey question) does not equate to offering one-off or customised services (the subject of the 2001 survey question), the distributions of responses by services establishments to these two different questions are quite similar.¹¹

Taken together, the most striking thing about these different indicators of product strategy is not the degree of change between 2001 and 2009 (imperfectly measured as that is), but rather the high degree of variation between establishments in both years in the way that they responded to these questions. With the exception of the responses on premium quality production, there are very few tendencies for responses to bunch towards either end of the respective scales. The implication is that establishments vary greatly in the extent to which they are seeking to engage in 'high-end' or high value added production, and that this high degree of variation has persisted throughout the period from 2001 to 2009.

Further analysis of these data shows that the incidence of different kinds of product strategy differs greatly between sectors as well as within each sector. For example, in 2009 the proportions of establishments rating themselves at point 5 on the premium quality scale in electrical/electronic engineering and food, drink and tobacco were about 11-12 percentage points higher than in printing and publishing and fabricated metal products (Figure 2.1A). Similarly, in market services, establishments in personal services, architectural/engineering and legal services and computer services were far more likely to claim to offer premium quality services than were establishments in hotels, bars and transport services (Figure 2.1B).

¹¹ In future surveys it might be useful to ask a question which relates directly to customisation, for example: Which of the following best describes this business's goods or services? (a) standard range of goods or services (b) minor differences in goods or services according to customer requirements (c) substantial differences in goods or services according to customer requirements.

Table 2.7: Extent of innovation leadership in private sector establishments in manufacturing, construction and market services with five or more employees, ESS01 and NESS09, population-weighted estimates

	2001	2009
	<i>% of establishments</i>	
Applicability of statement: 'Compared to other establishments within our industry, we tend to lead the way in terms of developing new products, materials or techniques'		
1 - Not at all applicable	20	
2 - Not very applicable	23	
3 - Quite applicable	31	
4 - Very applicable	25	
Not known	2	
Positioning on 5-point scale:		
1 – Very rarely lead way in developing new products, services or techniques		14
2		11
3		24
4		22
5 – Often lead the way in developing new products, services or techniques		25
Not known		4
Total	100	100
Weighted n =	449670	534690
Unweighted n =	17657	41201

Table 2.8: Production volumes and range of services in private sector establishments in manufacturing, construction and market services with five or more employees, ESS01 and NESS09, population-weighted estimates

	2001	2009
	<i>% of establishments</i>	
A. Manufacturing & construction		
Positioning on 5-point scale:		
1 - High volume products	17	20
2	17	16
3	36	28
4	13	13
5 - One-off or low volume products	12	15
Not known	4	9
Total	100	100
Weighted n =	106683	99733
Unweighted n =	5737	10336
	2001	2009
	<i>% of establishments</i>	
B. Market services		
Positioning on 5-point scales:		
1 - High volume products	25	
2	23	
3	29	
4	12	
5 - One-off or low volume products	6	
Not known	5	
1 - Wide range of services		34
2		26
3		22
4		7
5 - Limited range of services		8
Not known		3
Total	100	100
Weighted n =	330205	419003
Unweighted n =	11592	29557

Note: In 2001 all establishments were asked how they rated on the scale relating to production volumes as shown in the table. In 2009 this same terminology was used for manufacturing and construction establishments. However, service establishments in 2009 were asked to rate themselves on a scale ranging from 1= Limited range of services to 5 = Wide range of services

Sectoral variation is also high in relation to customisation of goods and services and innovation leadership. In manufacturing in 2009, the proportion of establishments saying that they primarily engaged in one-off or low volume production ranged from 10% in printing and publishing to 21% in fabricated metal products (Figure 2.2A). To get equivalent figures for market services, we need to look at the 2001 responses (as discussed above). In that year the proportion reporting that they offered one-off or low volume services ranged from 3% in non-specialised retailing to 14% in computer services. A similar degree of variation applied in 2009 when respondents were asked whether or not they provided a limited range of services as compared to a wide range of services (Figure 2.2B).

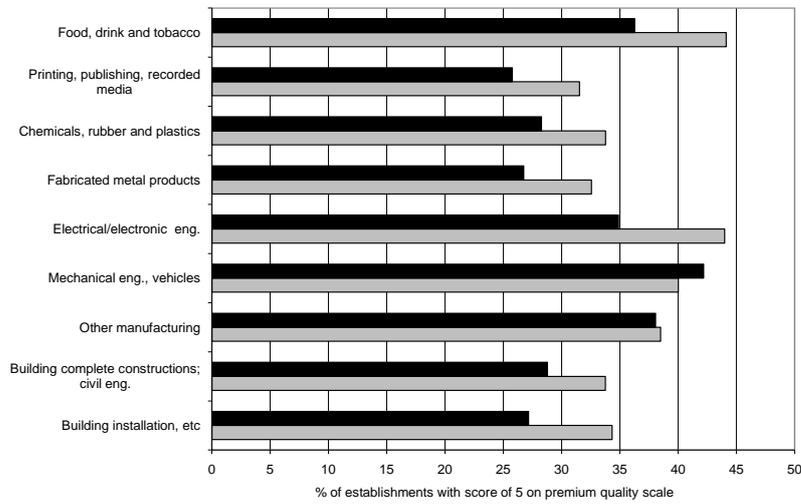
There was also a wide dispersion in innovation leadership in manufacturing, with the proportion of establishments rating themselves at the top point of the scale in 2009 ranging from 18% in fabricated metal products to 30% in electrical and electronic engineering. In construction sectors only 14-15% of establishments classified themselves as innovation leaders (Figure 2.3A). In market services the proportion of self-described innovation leaders ranged from 21% in hotels, bars and transport services to 34% in non-specialised retailing and personal services (Figure 2.3B).

With regard to dependence on low prices for achievement of competitive success, there was a greater degree of similarity between sectors with only 8-14% of establishments in most sectors rating themselves as 'not at all price-dependent' in 2009 (Figure 2.4). On this dimension of product strategy, personal services (which includes hairdressing, funeral and personal well-being services) stands out as unusual in that some 21% of establishments said they did not depend at all on low prices.

Overall, these sectoral differences are hard to interpret since the survey questions asked respondents to position themselves in relation to 'others in your industry'. One explanation might be that establishments in sectors which are above-average in terms of skill requirements or exposure to international competition are more likely to view themselves as engaged in premium-quality or innovative activities. In subsequent analysis at establishment level, we make use of multivariate analysis which enables us to control for sector-specific factors underlying the survey responses.

Figure 2.1: Extent to which establishments with five or more employees compete in markets for premium quality products, ESS01 and NESS09, population-weighted estimates

A. Manufacturing and construction



B. Market services

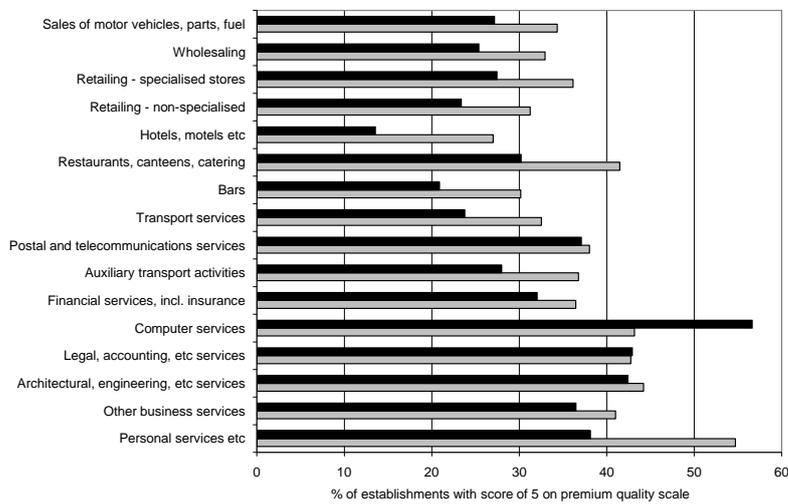
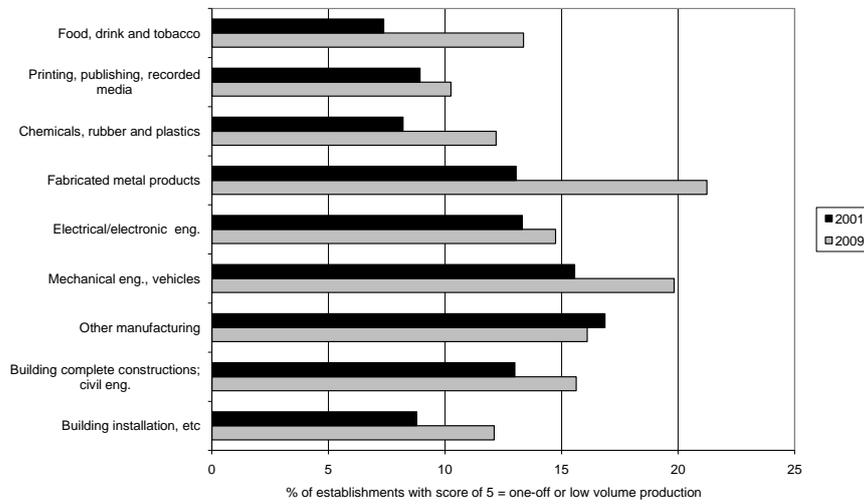


Figure 2.2: Extent of low-volume production or limited range of services, ESS01 and NESS09, population-weighted estimates

A. Manufacturing and construction



B. Market services

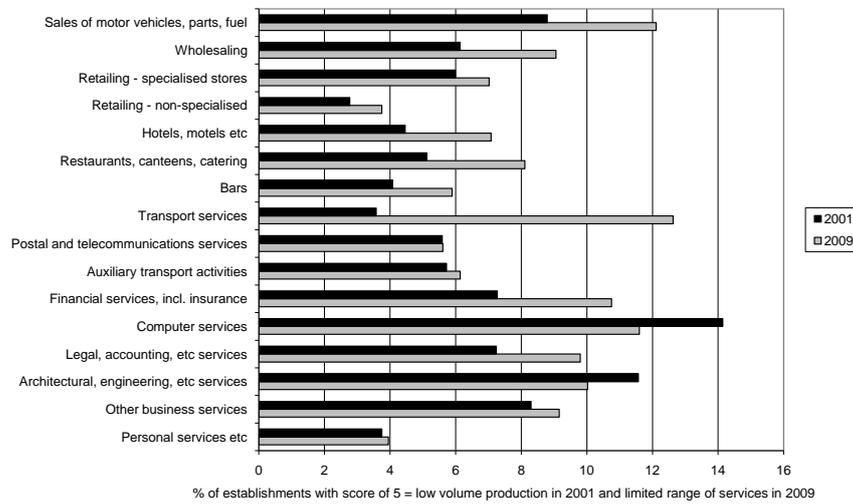
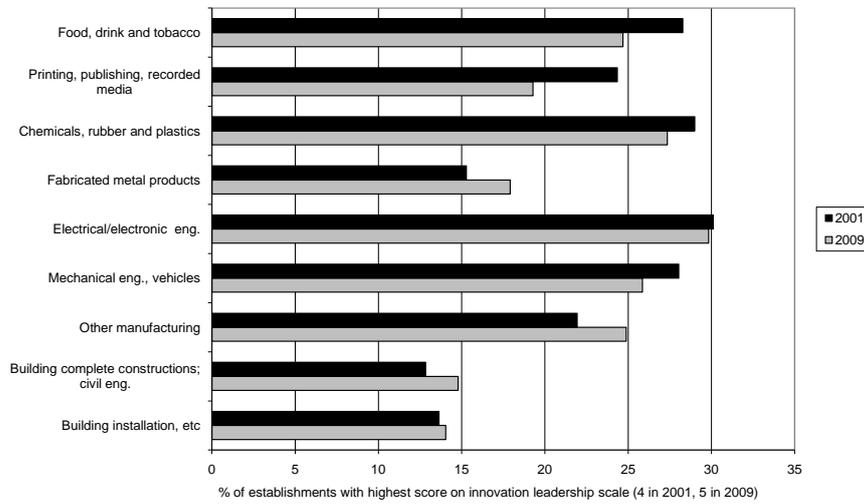


Figure 2.3: Extent to which establishments with five or more employees claim to be innovation leaders in their industries, ESS01 and NESS09, population-weighted estimates

A. Manufacturing and construction



B. Market services

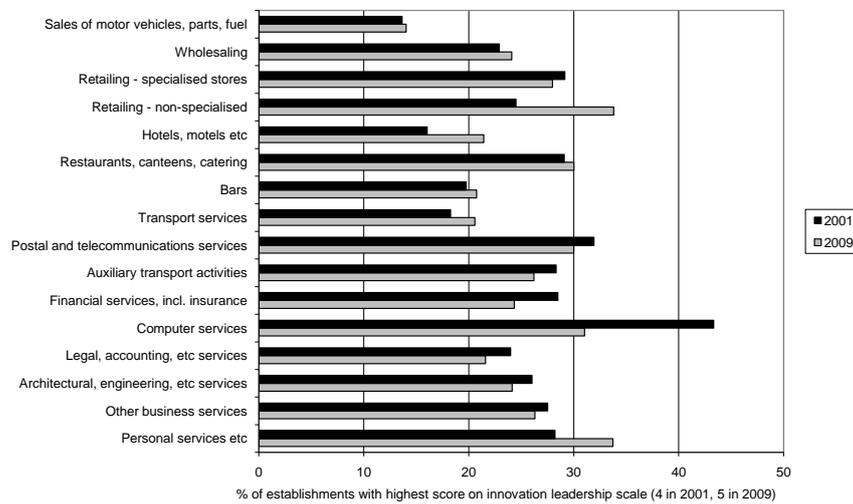
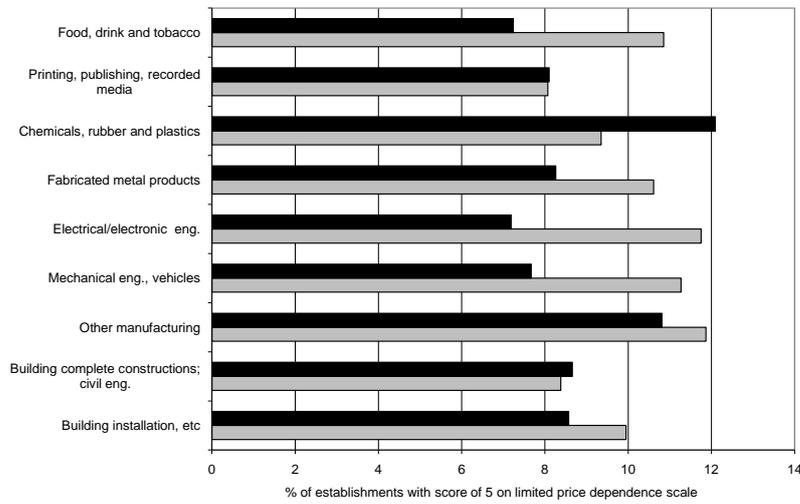
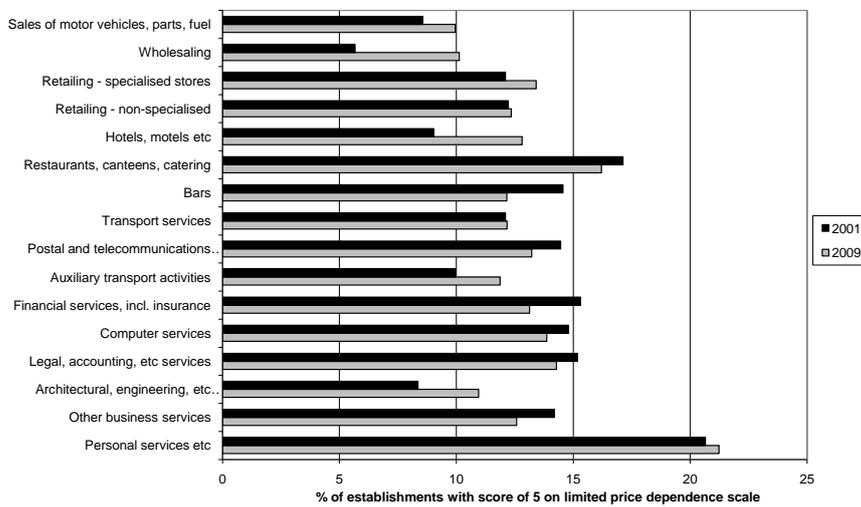


Figure 2.4: Extent to which establishments with five or more employees depend on low prices to achieve competitive success, ESS01 and NESS09, population-weighted estimates

A. Manufacturing and construction



B. Market services



2.3 Summary measure of product strategy

It is interesting to note that, in both 2001 and 2009, establishments' responses regarding price-dependence, premium quality and innovation leadership are positively and significantly correlated with each other. By contrast, all three of these characteristics are negatively correlated with one-off or low-volume production (Table 2.9A). For this reason we retain low volumes as a separate variable for each year and carry out a factor analysis of the other three dimensions of product strategy. This analysis extracts single factors with eigen values in excess of unity which explain 46% of the total variation of these three variables in 2001 and 49% in 2009. As Table 2.9B shows, all three variables load positively on these factors which are readily interpretable as indicators of positioning towards the high end of a product strategy spectrum.

Table 2.9: Product strategy responses, private sector establishments with five or more employees, ESS01 and NESS09: correlations and factor analysis (population-weighted)

A: Correlations

	2001	2001	2001		2009	2009	2009
	Low volumes	Limited price dependence	Premium quality		Low volumes	Limited price dependence	Premium quality
Limited price dependence	-0.063***	1			-0.120***	1	
Premium quality	-0.104***	0.220***	1		-0.201***	0.190***	1
Innovation leadership	-0.152***	0.119***	0.218***		-0.284***	0.167***	0.343***

Notes:

Pairwise correlations: *** statistically significant at 1% level or better
2001: n = 14857-16593; 2009: n = 37694-39076

B: Principal-component factor analysis

	2001	2009
Proportion of variation explained by single factor	0.459	0.492
Variable loadings on product strategy factor:		
Limited price dependence	0.641	0.573
Premium quality	0.746	0.766
Innovation leadership	0.639	0.749
Kaiser-Meyer-Olkin measure of sampling adequacy	0.565	0.573
n =	15054	37771

The resulting factor scores are standardised with mean zero and standard deviation of one. In subsequent analysis these variables are deployed as indices of product

strategy. As shown in Table 2.10, by this measure mean product strategy tends to increase with establishment size and with the extent to which establishments operate in national or international markets rather than confining themselves to regional or local markets.

Table 2.10: Product strategy indices: private sector establishments with five or more employees, ESS01 and NESS09, analysed by size group and geographical market focus

	2001	2009
	<i>Mean product strategy score</i>	

A: Mean product strategy by size group

5-9	-0.08	-0.09
10-24	-0.02	0.02
25-49	0.11	0.13
50-99	0.19	0.18
100-199	0.32	0.33
200-499	0.45	0.32
500-plus	0.54	0.36
Total	0.00	0.00

B: Mean product strategy by geographical market focus

Local	-0.12	-0.22
Regional	-0.11	-0.17
National	0.11	0.06
International	0.35	0.38
Total	0.00	0.00

Note:

Product strategy scores are derived though factor analysis as described in the main text.

2.4 Skill measures

The main ESS01 question from which estimates of workforce skill levels can be derived asked respondents to cite the ‘most common level of (formal) qualification’ amongst each of nine occupational groups. This can be combined with Labour Force Survey data on the mean hourly earnings of each of three qualification groups in the UK economy to derive a wage-weighted qualifications index which serves as a proxy measure of workforce skills. The three qualification groups are: (1) NVQ 4 and above (including, for example, Higher degrees, First degrees and BTEC Higher National awards); (2) NVQ3 (eg, A levels and trade apprenticeships); and (3) Low, Other or No Qualifications. At establishment level the wage-weighted skills index is then defined as:

$$(1) \text{ skills} = [\sum_{i=1}^3 w_i q_i] / N$$

where w_i = mean hourly earnings of qualifications group i (indexed to unity in the case of the 'low qualifications' group), q_i = numbers employed in qualifications group i and N = total employment in establishment.

For NESS09 a similar measure can be derived but with the proviso that the underlying data about qualifications were obtained in a very different way from ESS01. In 2009 respondents were asked to provide estimates of the total numbers of employees holding NVQ4 and NVQ3 qualifications; the remaining employees were then classified to the 'Low, Other or No Qualifications' group. The resulting estimates of qualification shares were then combined with data on qualifications-related wage differentials to produce a wage-weighted skills index for each establishment in that year.

For both skills indices mean hourly earnings for the three qualification groups were derived by averaging the 2001 and 2009 levels to obtain the following estimates (Index numbers): Low, Other or No Qualifications: 100; NVQ3: 122; and NVQ4 and above: 185 (Source: Labour Force Survey).

The impact of the very different ways that qualifications data were collected in ESS01 and NESS09 is shown by the fact that direct comparison of the two skill indices at aggregate level shows no sign of the growth in qualification levels which is known to have occurred between 2001 and 2009 (Mason and Bishop, 2010). However, unlike the product strategy indices described above, the skills indices are readily comparable across sectors at each point in time, and they draw attention to a number of sectors such as computer services, business services, financial services, printing, publishing and recorded media and electrical/electronic engineering which employ relatively large proportions of highly-qualified people. There is a notable degree of stability of sector rankings on skills between 2001 and 2009 (Table 2.11).

Table 2.11: Skills indices: private sector establishments with five or more employees, ESS01 and NESS09, analysed by sector, ranked by 2001 index (population-weighted)

	2001	2009	2001	2009
	Mean	Mean	Rank	Rank
Computer services	1.57	1.46	1	3
Legal, accounting, etc services	1.52	1.47	2	1
Architectural, engineering, etc services	1.48	1.47	3	2
Financial services, incl. insurance	1.30	1.31	4	4
Other business services	1.27	1.31	5	5
Printing, publishing, recorded media	1.26	1.24	6	7
Electrical/electronic eng.	1.26	1.25	7	6
Building complete constructions; civil eng.	1.20	1.16	8	18
Mechanical eng., vehicles	1.20	1.18	9	13
Auxiliary transport activities	1.19	1.21	10	9
Building installation, etc	1.18	1.17	11	17
Wholesaling	1.17	1.16	12	20
Personal services etc	1.17	1.15	13	22
Agriculture, forestry and fishing	1.16	1.17	14	16
Fabricated metal products	1.15	1.14	15	24
Sales of motor vehicles, parts, fuel	1.15	1.15	16	23
Bars	1.15	1.18	17	12
Chemicals, rubber and plastics	1.14	1.18	18	14
Postal and telecommunications services	1.14	1.22	19	8
Restaurants, canteens, catering	1.14	1.20	20	10
Retailing - specialised stores	1.14	1.19	21	11
Hotels, motels etc	1.13	1.18	22	15
Food, drink and tobacco	1.12	1.16	23	21
Other manufacturing	1.12	1.16	24	19
Transport services	1.09	1.10	25	26
Retailing - non-specialised	1.08	1.12	26	25
Total	1.21	1.22		
<i>Weighted n =</i>	<i>385077</i>	<i>425253</i>		
<i>Unweighted n =</i>	<i>15054</i>	<i>32051</i>		

Note:

Skill scores are wage-weighted qualifications indices, derived as described in the main text.

The total row includes data for establishments in mining and utilities which are not reported in the table due to relatively small cell sizes in those sectors.

In common with the product strategy index, the skills index also tends to rise with establishment size and with the degree of exposure to national and international markets (Table 2.12). In each year both these indices are strongly positively correlated with each other (2001: $r = 0.217$, $p < 0.001$; 2009: $r = 0.165$, $p < 0.001$).

Table 2.12: Skills indices: private sector establishments with five or more employees, ESS01 and NESS09, analysed by size group and geographical market focus

	2001	2009
	<i>Mean skills index</i>	

A: Mean skills index by size group

5-9	1.20	1.22
10-24	1.20	1.22
25-49	1.21	1.23
50-99	1.22	1.24
100-199	1.24	1.28
200-499	1.24	1.28
500-plus	1.31	1.32
Total	1.21	1.22

B: Mean skills index by geographical market focus

Local	1.15	1.18
Regional	1.20	1.21
National	1.23	1.24
International	1.34	1.30
Total	1.21	1.22

We now go on to explore the relationship between skills and product strategies at establishment level through multivariate analysis which takes account of a number of factors that may complicate the relationship between product strategies and skills. These include indicators of different kinds of skill deficiency which are reviewed in Section 3.

3. Skill deficiencies and product strategies

Summary

- Almost three quarters (73%) of private sector establishments with five or more employees reported having skill updating needs in 2009 compared to 30% who reported internal skill gaps and only 3% who were experiencing skill-shortage vacancies at the time of the survey.
- The most important factors driving skills updating and improvement needs are new legislative or regulatory requirements, the introduction of new goods or services, new work practices and new technologies and increased competitive pressure in general. The types of skill that need updating cover a wide range of generic skills (such as customer-handling, team-working, problem-solving and communication skills), technical, practical or job-specific skills and management skills.
- Some 30% of establishments with skill updating needs reported that managers were the single most important occupation affected. The next most common occupations in this category were sales and customer service occupations (16% of establishments with skill updating needs) and skilled trades occupations (13%).
- The survey findings make clear that skill updating needs are not confined to low-skilled workers. Rather the pace of change and intensity of market competition tends to create new skill needs across large sections of the workforce.
- The probability of establishments being in the upper quartile on product strategy for their own sector is found to be negatively and significantly related to the existence of internal skill gaps, both skill gaps involving managers and gaps involving non-managerial occupations. We also identify a small but direct constraining effect of internal skill gaps on product strategy, and hence on the skill requirements resulting from product strategy choices.
- By contrast, high-end product strategy establishments are on average more likely than other establishments to report both skill-shortage vacancies and skills updating needs. These deficiencies do not operate as constraints on product strategy; rather they appear to be indicators of relatively high standards being set for skills and of a more dynamic approach to skills resourcing.

3.1 Measuring skill deficiencies and skill updating needs

Successive National Employer Skills Surveys have highlighted two main measures of skill deficiency:

(1) the proportion of employers reporting 'skill-shortage vacancies', ie, hard-to-fill vacancies which are attributable to lack of skills, qualifications and/or work experience; and

(2) the proportion of establishments reporting internal skill gaps, defined as having one or more employees who are not fully proficient in their jobs

Between 2004-07 the proportion of establishments reporting skill-shortage vacancies at a single point in time did not rise above 6%, according to estimates reported in Winterbotham et al (2008). Over the same time period the proportion of establishments reporting internal skill gaps varied between 15-20%, with approximately 6-7% of all employees regarded as lacking full proficiency (ibid). The most recent NESS09 findings show 3% of establishments with two or more employees reporting skill-shortage vacancies and 19% reporting internal skill gaps of some kind (Shury et al, 2010).

Such findings suggest that only a minority of British employers consider that there are any deficiencies in skills among their existing employees. However, when skill requirements are probed through different survey questions, then a more complex picture emerges. For example, in a 2004 survey of establishments in a number of different sectors –telecoms services, mechanical engineering, vehicle maintenance and textiles and clothing manufacturing – employers were asked to identify 'core groups' of employees defined as the group 'with the skills and knowledge which make the greatest contribution to the success of business' (excluding managerial staff). They were then asked a series of questions about the skill improvement and updating needs of their core employees. Of the 452 employers in the survey, only 17% said that no skills needed improving among core employees in the next 12 months. The proportions of employers reporting at least some skill improvement needs ranged from 67% in textiles and clothing manufacturing to as many as 93% in telecoms services (Mason, Osborne and Rincon-Aznar, 2005).

More recently, similar results have emerged from a 2008 survey of 409 employers spread across five different sectors and city-regions (retail in the Southampton area, social work in Glasgow, architectural and engineering services in Birmingham, cultural sectors in Manchester and electronics and related engineering activities in Bristol and the South West). As in the 2004 study, only a minority of establishments (11%) reported that no skills needed updating or improving among their core employees. The proportion of respondents who could identify skill improvement needs ranged from 82% in retail to 95% in social work (Mason and Bishop, 2010).

In both these surveys the skill improvement and updating needs in question covered a wide range of technical and practical skills, generic skills such as team-working, problem-solving, communication and management and leadership skills and general Information Technology (IT) and computing skills. The main factors driving these changes in skill requirements were the introduction of new goods or services, new work practices, new technologies and new legislative or regulatory requirements. It was notable that the incidence of skill improvement needs was just as high for core employees in highly-qualified and skilled occupations as it was for core employees with relatively low qualifications (ibid).

One innovation in NESS09 was to introduce similar questions about skills updating.¹² Respondents were first asked whether they expected that, over the next 12 months, any of their employees would need to acquire new skills or knowledge as a result of various factors which were read out in turn. Examples included new products and new work practices. Those who responded affirmatively to at least one type of skills updating need were then asked to identify the single occupation most affected by such needs, and to indicate which of a list of different types of skills were most in need of improvement for the occupation they had selected.

As shown in Table 3.1, almost three quarters (73%) of private sector establishments with five or more employees reported having skill updating needs compared to 30% who reported internal skill gaps and only 3% who were experiencing skill-shortage vacancies at the time of the survey. Thus the broad orders of magnitude for skill updating needs are consistent with those found in the earlier, smaller surveys described above. Table 3.2 shows that computer services ranked highest in terms of both skill-shortage vacancies and skill updating needs but was well down the list in

¹² The relevant questions in NESS09 are D7, D8 and D9A.

respect of internal skill gaps. By contrast, the sector with the highest incidence of internal skill gaps (hotels) was also highly-ranked in terms of skill-shortage vacancies but not in terms of skill updating needs. Hardly any sectors were high-ranked on all three measures of skill deficiency but some sectors (such as wholesaling and other manufacturing) were low-ranked on all three measures. As will be shown below, the pattern of correlation between the three types of skill deficiency is more clearcut when analysis is carried out at establishment level.

The most important factors driving skill updating needs were new legislative or regulatory requirements, the introduction of new goods or services, new work practices and new technologies and increased competitive pressure in general (Table 3.3). Some 30% of establishments with skill updating needs reported that managers were the single most important occupation affected (Table 3.4). The next most common occupations in this category were sales and customer service occupations (16% of establishments with skill updating needs) and skilled trades occupations (13%).

Table 3.1: Incidence of skill-shortage vacancies, internal skill gaps and skill updating needs: private sector establishments with five or more employees, NESS09 (population-weighted)

	Skill-shortage vacancies	Internal skill gaps	Skills updating needs	Weighted n =	Unweighted n=
	<i>% of establishments in sector</i>				
Agriculture, forestry and fishing	3.1	24.9	70.4	14115	1051
Food, drink and tobacco	3.1	29.8	66.0	6853	818
Printing, publishing, recorded media	2.7	26.0	68.9	7534	906
Chemicals, rubber and plastics	1.8	28.3	65.9	5484	674
Fabricated metal products	2.9	33.6	64.1	5838	713
Electrical, electronic and instrument engineering	4.6	35.1	72.5	4729	608
Mechanical engineering, vehicles and other engineering	2.7	34.2	67.0	7271	914
Other manufacturing industries	1.8	25.9	64.1	19681	2230
Building of complete constructions; civil engineering	2.0	26.6	73.8	14940	1288
Building installation, building completion and other construction activities	2.6	33.0	75.4	27610	2209
Sales of motor vehicles, parts, fuel	2.6	29.8	76.0	38573	2515
Wholesaling	1.7	23.5	66.2	41205	2742
Retailing - specialised stores	2.2	32.5	73.8	59309	3914
Retailing - non-specialised stores; other retail and repair	1.9	40.5	77.2	20886	1951
Hotels, motels and other accommodation	5.0	42.2	69.1	11956	958
Restaurants, canteens, catering	5.4	39.4	73.1	37162	2326
Bars	4.6	36.7	73.4	27047	1424
Transport services	3.2	22.5	67.1	14603	1589
Postal and telecommunications services	1.8	25.9	78.6	7598	744
Auxiliary transport activities, travel agents	2.7	27.2	69.9	8118	849
Financial services, including insurance	3.1	30.2	81.7	22826	1637
Computer services	5.9	24.1	83.9	18685	1217
Legal, accounting, auditing, business and management consultancy, etc.	5.2	27.5	79.3	18597	1401
Architectural and engineering activities and related technical consultancy; technical testing, analysis	4.1	27.6	76.3	22419	1601
Other business services	3.0	23.3	73.3	65858	4339
Personal and other services	4.4	31.1	73.4	7770	649
Total	3.2	29.8	73.3	538650	41537

Note:

The total row includes data for establishments in mining and utilities which are not reported in the table due to relatively small cell sizes in those sectors.

Table 3.2: Sector rankings on skill-shortage vacancies, internal skill gaps and skill updating needs: private sector establishments with five or more employees, NESS09 (population-weighted)

	Skill-shortage vacancies	Internal skill gaps	Skills updating needs
	<i>Sector ranking on skill deficiency measure</i>		
Agriculture, forestry and fishing	12	22	16
Food, drink and tobacco	11	12	23
Printing, publishing, recorded media	16	19	19
Chemicals, rubber and plastics	23	14	24
Fabricated metal products	14	7	25
Electrical, electronic and instrument engineering	6	5	15
Mechanical engineering, vehicles and other engineering	15	6	21
Other manufacturing industries	25	20	26
Building of complete constructions; civil engineering	21	18	10
Building installation, building completion and other construction activities	18	8	8
Sales of motor vehicles, parts, fuel	19	13	7
Wholesaling	26	24	22
Retailing - specialised stores	20	9	9
Retailing - non-specialised stores; other retail and repair	22	2	5
Hotels, motels and other accommodation	4	1	18
Restaurants, canteens, catering	2	3	14
Bars	5	4	12
Transport services	9	26	20
Postal and telecommunications services	24	21	4
Auxiliary transport activities, travel agents	17	17	17
Financial services, including insurance	10	11	2
Computer services	1	23	1
Legal, accounting, auditing, business and management consultancy, etc.	3	16	3
Architectural and engineering activities and related technical consultancy; technical testing, analysis	8	15	6
Other business services	13	25	13
Personal and other services	7	10	11

Table 3.3: Main factors contributing to skill updating needs: private sector establishments with five or more employees, NESS09 (population-weighted)

	<i>% of establishments</i>
New legislative or regulatory requirements	49
Development of new products or services	48
Introduction of new working practices	46
Introduction of new technologies or equipment	45
Increased competitive pressure	41
Other	5
No skill updating need	27
<i>Weighted n =</i>	<i>538650</i>
<i>Unweighted n =</i>	<i>41537</i>

Note: Multiple responses permitted

Table 3.4: Single occupation most affected by skill updating needs: private sector establishments with five or more employees, NESS09 (population-weighted)

	<i>% of establishments with skill updating needs</i>
Managers	30
Sales and customer service occupations	16
Skilled trades occupations	13
Elementary occupations	8
Administrative and secretarial occupations	7
Associate professional and technical occupations	6
Professional occupations	6
Process, plant and machine operatives	5
Personal service occupations	1
Not classified	9
Total	100
<i>Weighted n =</i>	<i>142837</i>
<i>Unweighted n =</i>	<i>30856</i>

Base: All private sector establishments with five or more employees which reported having skill updating needs

When asked about the specific nature of the skills that needed updating for their most important occupations affected by such needs, respondents cited a wide range of generic skills (such as customer-handling, team-working, problem-solving and communication skills), technical, practical or job-specific skills and management skills (Table 3.5). By comparison, numeracy and literacy skills were mentioned by much smaller proportions of establishments. Since two of the three top occupations in respect of skill-updating needs -- managers and skilled trades -- are typically well-qualified compared to the majority of workers, it is clear that adult skill gaps are not confined to low-skilled workers. Rather the pace of change and intensity of market competition tends to create new skill needs across large sections of the workforce.

Table 3.5: Main types of skill in need of updating: private sector establishments with five or more employees, NESS09 (population-weighted)

	% of establishments with skill updating needs
Technical, practical or job-specific skills	67
Customer handling skills	43
Team working skills	41
Management skills	40
Problem solving skills	39
General IT user skills	34
Oral communication skills	31
Written communication skills	22
Office admin skills	22
IT professional skills	21
Numeracy skills	14
Literacy skills	13
Foreign language skills	9
<i>Weighted n =</i>	<i>358376</i>
<i>Unweighted n =</i>	<i>27900</i>

Note: Multiple responses permitted

Base: All private sector establishments with five or more employees which reported having skill updating needs

Managers turn out to be the most commonly cited occupation in need of skills updating and they are also the occupation that we expect to be most closely involved in developing and implementing product strategies. Therefore, we examine skills issues relating to managers in detail. First, consider the specific skills in need of updating cited by establishments which identified managers as the single most important occupation with skill improvement needs. Table 3.6 shows that 'management skills' as such – involving leadership and supervision – were by no

means the only types of skills in need of updating for managers. Indeed, many of the gaps in generic and technical/practical skills mentioned for other occupations were also reported for managers.

Second, we note that ‘management skills’ featured as in need of updating for a wide range of non-managerial occupations as well. In total just over a third of all establishments with updating needs reported gaps in management skills of some kind and over half of these were referring to non-managerial occupations when they did so, for example, sales and customer services occupations, and skilled trades, professional and elementary occupations (Table 3.7).

Table 3.6: Main types of skill in need of updating for managers (where managers are the single occupation most affected by skills updating needs): private sector establishments with five or more employees, NESS09 (population-weighted)

	% of establishments reporting managers as single most important occupation in need of skills updating
Technical, practical or job-specific skills	58
Management skills	56
Problem solving skills	40
General IT user skills	40
Team working skills	40
Customer handling skills	38
Communication skills	35
Oral communication skills	30
Office admin skills	26
IT professional skills	24
Written communication skills	23
Numeracy skills	13
Literacy skills	12
Foreign language skills	11
<i>Weighted n =</i>	<i>118240</i>
<i>Unweighted n =</i>	<i>8943</i>

Note: Multiple responses permitted

Base: All private sector establishments with five or more employees which reported managers as the single most important occupation with skill updating needs

In this context it is useful to look at three different measures of gaps in managerial skills:

- (1) the proportion of respondents who reported *internal skill gaps (ie, lack of full proficiency) involving managers*;
- (2) the proportion of respondents who reported *skill updating needs* and cited *managers* as the single most important occupation in need of skills updating;

(3) the proportion of respondents who reported *skill updating needs* and cited *management skills* in need of updating for their single most important occupation (including non-managerial occupations as well as managers).

Across the whole sample of establishments with five or more employees, approximately 8% of establishments reported internal skill gaps involving managers; 23% reported skill updating needs with managers as the occupation most affected by these needs; and 28% reported gaps in management skills for their occupation most in need of skills updating.

Table 3.8 shows the variation between sectors in these three measures of management skill deficiency. One sector – non-specialised retailing – has the highest level of both internal skill gaps involving managers and skills updating needs where managers were the most important occupation affected. By contrast, the incidence of management skill updating needs across a range of occupations is greatest in legal, accounting and management-related business services and in computer services. However, when we look at correlations among establishment-level data, all three measures of management skills deficiency turn out to be positively and significantly correlated with each other (Table 3.9).

Table 3.7: Incidence of management skill updating needs for single most important occupations affected by skills updating, analysed by occupation: private sector establishments with five or more employees, NESS09 (population-weighted)

	% of establishments reporting management skill updating needs for single most important occupation affected by skills updating
Managers	46
Sales and customer service occupations	6
Skilled trades occupations	6
Elementary occupations	6
Professional occupations	8
Administrative and secretarial occupations	1
Associate professional and technical occupations	17
Process, plant and machine operatives	3
Personal service occupations	7
Total	100
<i>Weighted n =</i>	<i>143195</i>
<i>Unweighted n =</i>	<i>11150</i>

Base: All private sector establishments with five or more employees which reported having management skill updating needs for the single most important occupation affected by skills updating

Table 3.8: Incidence of management skill gaps and skill updating needs: private sector establishments with five or more employees, NESS09 (population-weighted)

	Internal skills gap - managers	Skills updating need - managers	Skills updating need - management skills, all occupations
<i>% of establishments in sector</i>			
Agriculture, forestry and fishing	5.0	21.5	21.6
Food, drink and tobacco	9.4	19.3	20.8
Printing, publishing, recorded media	8.2	18.5	22.4
Chemicals, rubber and plastics	9.3	17.8	20.1
Fabricated metal products	11.9	14.9	19.1
Electrical, electronic and instrument engineering	11.3	15.9	22.1
Mechanical engineering, vehicles and other engineering	11.3	14.3	19.9
Other manufacturing industries	7.0	21.3	22.7
Building of complete constructions; civil engineering	6.5	23.2	24.4
Building installation, building completion and other construction activities	6.3	16.1	20.8
Sales of motor vehicles, parts, fuel	6.3	16.4	24.4
Wholesaling	6.8	21.1	24.7
Retailing - specialised stores	8.2	29.2	31.4
Retailing - non-specialised stores; other retail and repair	14.1	35.5	34.1
Hotels, motels and other accommodation	13.6	26.1	28.7
Restaurants, canteens, catering	11.3	33.2	33.8
Bars	10.4	33.3	33.2
Transport services	5.8	14.5	17.7
Postal and telecommunications services	7.8	21.4	27.6
Auxiliary transport activities, travel agents	8.8	19.6	26.7
Financial services, including insurance	7.6	22.6	30.0
Computer services	8.2	14.9	34.3
Legal, accounting, auditing, business and management consultancy, etc.	7.7	21.3	34.4
Architectural and engineering activities and related technical consultancy; technical testing, analysis	7.1	14.6	29.2
Other business services	6.9	23.7	28.7
Personal and other services	5.9	20.6	29.9
Total	8.2	23.0	27.8

Base: All private sector establishments with five or more employees

Table 3.9: Correlations between skill-shortage vacancies, internal skill gaps and skills updating needs: private sector establishments with five or more employees, NESS09 (population-weighted)

	Skill-shortage vacancies	Internal skills gaps	Skill updating needs	Internal skills gap - managers	Skills updating need - managers
Internal skills gaps	0.096***	1			
Skill updating needs	0.057***	0.156***	1		
Internal skills gap - managers	0.072***	0.458**	0.099***	1	
Skills updating need - managers	-0.002	0.043***	0.341***	0.110	1
Skills updating need - management skills, all occupations	0.041*	0.054**	0.387***	0.110*	0.346***

Notes:

Pairwise correlations: *** statistically significant at 1% level or better

n = 38818-41530

3.2 Skill deficiencies and product strategies: multivariate analysis

We now turn to analyses involving the product strategy and skills indices developed in Section 2. In order to ensure comparability between each set of findings, these analyses are based on a sub-sample of 27110 private sector establishments with five or more employees for which there were no missing values on any of the components of the product strategy and skills indices. Although this represents a one third drop in sample size, it is reassuring that the sectoral and size group distributions of the sub-sample remain broadly in line with the original sample of establishments (Table 3.10).¹³

¹³ Note that we continue to report population-weighted estimates but, in view of the drop in sample size, all multivariate analyses shown in Sections 3.2 and 4 were checked using unweighted data as well. The use or non-use of weights was found to make very little difference to the overall pattern of results (details are available from the author on request).

Table 3.10: Comparison of sectoral and size-group distributions of main sample and sub-sample of private sector establishments with five or more employees, NESS09 (population-weighted)

	Main sample	Sub-sample
A: Sector		
Agriculture, forestry and fishing	2.6	2.8
Food, drink and tobacco	1.3	1.3
Printing, publishing, recorded media	1.4	1.4
Chemicals, rubber and plastics	1.0	1.1
Fabricated metal products	1.1	1.2
Electrical/electronic eng.	0.9	0.8
Mechanical eng., vehicles	1.4	1.4
Other manufacturing	3.7	4.0
Building complete constructions; civil eng.	2.8	2.9
Building installation, etc	5.1	5.7
Sales of motor vehicles, parts, fuel	7.2	7.7
Wholesaling	7.7	8.2
Retailing - specialised stores	11.0	11.7
Retailing - non-specialised	3.9	3.6
Hotels, motels etc	2.2	2.1
Restaurants, canteens, catering	6.9	6.9
Bars	5.0	5.1
Transport services	2.7	2.5
Postal and telecommunications services	1.4	1.3
Auxiliary transport activities	1.5	1.4
Financial services, incl. insurance	4.2	4.0
Computer services	3.5	3.1
Legal, accounting, etc services	3.5	3.0
Architectural, engineering, etc services	4.2	3.9
Other business services	12.2	11.0
Personal and other services	1.4	1.5
Total	100	100
B. Employment size group		
5-9	44.0	46.6
10-24	37.0	37.0
25-49	10.0	9.2
50-99	5.0	4.2
100-199	2.3	1.7
200-499	0.7	0.5
500-plus	0.4	0.3
Total	100	100
<i>Unweighted n =</i>	<i>41537</i>	<i>27110</i>

Note:

The total row includes data for establishments in mining and utilities which are not reported in the table due to relatively small cell sizes in those sectors.

In order to carry out a multivariate analysis of the relationship between product strategies and skill deficiencies of different kinds, we first define an indicator of product strategy that takes explicit account of the fact that establishments were asked to rank various aspects of product strategy against other establishments and firms in their own industry. This indicator takes the form of a binary variable with a value of one when the establishment is in the upper quartile on the product strategy index for its own sector, and a value of zero when the establishment is below the upper quartile for its own sector. We also create new dummy variables which distinguish between different kinds of internal skill gap and skills updating need in the following ways:

(1) 'Internal skill gaps – managers': = 1 if reported internal skill gaps among managers, = 0 otherwise;

(2) 'Internal skill gaps – non-managers': = 1 if reported internal skill gaps among non-managers and did not report internal skill gaps involving managers, = 0 otherwise.

The reference category for (1) and (2) is no internal skill gaps of any kind.

(3) 'Skill updating needs – managers': = 1 if reported skill updating needs for managers, = 0 otherwise;

(4) 'Skill updating needs – non-managers': = 1 if reported skill updating needs for non-managers and did not report skill updating needs involving managers, = 0 otherwise.

The reference category for (3)-(4) is no skills updating needs of any kind.

(5) 'Management plus non-management skill updating needs – all occupations': = 1 if reported both management and non-management skill updating needs for the single most important occupation affected by skills updating, = 0 otherwise;

(6) 'Non-management skill updating needs only – all occupations': = 1 if reported only non-management skill updating needs for the single most important occupation affected by skills updating, = 0 otherwise;

(7) 'Management skill updating needs only – all occupations': = 1 if reported only management skill updating needs for the single most important occupation affected by skills updating, = 0 otherwise.

The reference category for (5)-(7) is again no skills updating needs of any kind.

We then investigate the determinants of the probability of establishments being in their own-sector upper quartile on product strategy by carrying out a probit regression analysis which controls for establishment size, sector, region and geographical market focus as well as skill deficiencies. The results are reported in Table 3.11

which shows the marginal effects of each independent variable taking a value of one as compared to a value of zero, evaluated at the means of independent variables in each equation. Overall, there is an interesting pattern of difference between the different measures of skill deficiency.

First, the probability of establishments being in the upper quartile on product strategy is positively and significantly related to the presence of skill-shortage vacancies at the time of the survey (Table 3.11, Column 1). On average, the probability of establishments being in the upper quartile on product strategy is estimated to be 3.5 percentage points (pp) higher for those reporting skill-shortage vacancies than it is for establishments without skill-shortage vacancies.

Second, the probability of establishments being in the upper quartile on product strategy is significantly negatively affected by the presence of internal skill gaps, both skill gaps involving managers and skill gaps involving non-managerial occupations. On average, the probability of establishments being in the upper quartile on product strategy is estimated to be 2 pp lower for those reporting internal skill gaps than it is for establishments without any such gaps (Column 2).

Third, and by contrast, the probability of establishments being in the upper quartile on product strategy is *positively* and significantly related to skills updating needs as a whole (Column 3) and to updating needs defined separately for managers and non-managers (Column 5). If we look at the alternative measure of management skills updating needs across a range of occupations, then the probability of establishments being in the upper quartile on product strategy is estimated to be 2 pp higher for those reporting skills updating needs involving both management and non-management skills than it is for establishments with no skills updating needs at all (Column 6). The marginal effect attached to the variable denoting that *only* management skills need updating is positively-signed but poorly-defined, reflecting the fact that very few establishments fall into this category.

Broadly similar coefficients are obtained when current skill levels are included as an additional control variable (Table 3.12). In all equations the skills index is significantly positively correlated with establishments being in their own-sector upper quartile on product strategy. The overall pattern of findings suggests that product strategies are indeed restricted to some extent by internal skill gaps, though the estimated size of the effect is not large. However, other measures of skill deficiency such as skill

updating needs do not exert constraining effects on product strategy. On the contrary, it seems that establishments with relatively high-end product strategies are simply less likely to be satisfied with their existing skill levels than are establishments in the same sector with middle-ranking and low-end product strategies.

Similar inferences may be drawn from the results attached to skill-shortage vacancies. One possibility is that high-end product strategy establishments set higher standards in recruitment than do low-end product strategy establishments and are less likely on average to be satisfied with potential recruits. Another possible explanation is that, if high-end product strategies are positively associated with rapid growth in sales, as reported in Mason (2004), then high-end product strategy establishments may simply be more likely than low-end product strategy establishments to be in recruitment mode at any point in time.

In summary, high-end product strategy establishments are on average more likely than other establishments to report both skill-shortage vacancies and skills updating needs. But these deficiencies do not operate as constraints on product strategy; rather they appear to be indicators of relatively high standards being set for skills and of a more dynamic approach to skills resourcing. Conversely, internal skill gaps do appear to constrain product strategies to some extent. We now go on to incorporate this and other indicators of skill deficiency into our analysis of the wider relationship between product strategies and skill requirements.

Table 3.11: Determinants of the probability of being in own-sector upper quartile for product strategy: private sector establishments with five or more employees, NESS09 (population-weighted) – Marginal effects (evaluated at sample means)

	(1)	(2)	(3)	(4)	(5)	(6)
Skill-shortage vacancies	0.0352**					
	[0.0160]					
Internal skill gaps		-0.0201***				
		[0.0057]				
Skills updating needs			0.0223***			
			[0.0060]			
Internal skill gaps – managers				-0.0249***		
				[0.0083]		
Internal skill gaps – non-managerial occupations				-0.0182***		
				[0.0064]		
Skill updating needs - managers					0.0175**	
					[0.0079]	
Skill updating needs – non-managerial occupations					0.0253***	
					[0.0067]	
Management plus non-management skill updating needs (all occupations)						0.0198**
						[0.0077]
Non-management skill updating needs only (all occupations)						0.0113*
						[0.0065]
Management skill updating needs only (all occupations)						0.0322
						[0.0357]
Regional market focus	0.0213**	0.0220**	0.0207**	0.0220**	0.0208**	0.0209**
	[0.0098]	[0.0098]	[0.0097]	[0.0098]	[0.0098]	[0.0098]
National market focus	0.0749***	0.0757***	0.0754***	0.0758***	0.0749***	0.0756***
	[0.0083]	[0.0083]	[0.0083]	[0.0084]	[0.0083]	[0.0083]
International market focus	0.1881***	0.1888***	0.1883***	0.1889***	0.1884***	0.1883***
	[0.0105]	[0.0105]	[0.0104]	[0.0105]	[0.0104]	[0.0105]
Size10_24	0.0132**	0.0166***	0.0134**	0.0167***	0.0123**	0.0138**
	[0.0058]	[0.0060]	[0.0059]	[0.0060]	[0.0058]	[0.0059]
Size25_49	0.0304***	0.0365***	0.0302***	0.0368***	0.0285***	0.0310***
	[0.0085]	[0.0085]	[0.0084]	[0.0085]	[0.0084]	[0.0083]
Size50_99	0.0278**	0.0361***	0.0276**	0.0367***	0.0256**	0.0285**
	[0.0115]	[0.0120]	[0.0115]	[0.0121]	[0.0114]	[0.0115]
Size100_199	0.0549***	0.0661***	0.0551***	0.0673***	0.0531***	0.0558***
	[0.0180]	[0.0185]	[0.0178]	[0.0183]	[0.0178]	[0.0178]
Size200_499	0.0518***	0.0677***	0.0536***	0.0698***	0.0499***	0.0542***
	[0.0193]	[0.0204]	[0.0196]	[0.0206]	[0.0193]	[0.0196]
Size500plus	0.0648	0.0791*	0.0639	0.0815**	0.0601	0.0653*
	[0.0394]	[0.0407]	[0.0394]	[0.0406]	[0.0390]	[0.0395]
Observations	27110	27110	27110	27110	27110	27110
Log likelihood	-13837	-13829	-13829	-13829	-13831	-13832

Pseudo R sqd	0.03	0.03	0.03	0.03	0.03	0.03
Wald Chi2	817.5	866.2	835.4	867.6	828.5	827.4

Notes: *significant at 10%, ** significant at 5%, *** significant at 1%.

Weighted probit estimates. Robust standard errors in brackets are corrected for clustering of observations at sector and region level. Marginal effects are evaluated at the mean values of other independent variables. The reference category for firm size variables is size 5-9 employees. See main text for descriptions of the dependent variable and the reference categories for the skill deficiency dummy variables. All equations include dummy variables for sector, region and single establishment status.

Table 3.12: Determinants of the probability of being in own-sector upper quartile for product strategy, controlling for skill levels: private sector establishments with five or more employees, NESS09 (population-weighted) – Marginal effects (evaluated at sample means)

	(1)	(2)	(3)	(4)	(5)	(6)
Skill-shortage vacancies	0.0323**					
	[0.0160]					
Internal skill gaps		-0.0197***				
		[0.0056]				
Skills updating needs			0.0193***			
			[0.0060]			
Internal skill gaps – managers				-0.0247***		
				[0.0083]		
Internal skill gaps – non-managerial occupations				-0.0178***		
				[0.0064]		
Skill updating needs - managers					0.0148*	
					[0.0078]	
Skill updating needs – non-managerial occupations					0.0219***	
					[0.0067]	
Management plus non-management skill updating needs (all occupations)						0.0162**
						[0.0078]
Non-management skill updating needs only (all occupations)						0.0092
						[0.0065]
Management skill updating needs only (all occupations)						0.0249
						[0.0344]
Skills index	0.1232***	0.1228***	0.1204***	0.1228***	0.1203***	0.1217***
	[0.0157]	[0.0157]	[0.0155]	[0.0156]	[0.0156]	[0.0156]
Regional market focus	0.0193**	0.0200**	0.0189**	0.0201**	0.0190**	0.0191**
	[0.0096]	[0.0096]	[0.0096]	[0.0096]	[0.0096]	[0.0096]
National market focus	0.0692***	0.0699***	0.0698***	0.0700***	0.0699***	0.0692***
	[0.0082]	[0.0083]	[0.0083]	[0.0083]	[0.0082]	[0.0082]
International market focus	0.1745***	0.1752***	0.1751***	0.1754***	0.1754***	0.1748***
	[0.0103]	[0.0103]	[0.0103]	[0.0103]	[0.0103]	[0.0103]
Size10_24	0.0151**	0.0183***	0.0153**	0.0185***	0.0150**	0.0149**
	[0.0059]	[0.0061]	[0.0060]	[0.0061]	[0.0060]	[0.0059]
Size25_49	0.0332***	0.0392***	0.0332***	0.0395***	0.0328***	0.0327***

	[0.0084]	[0.0085]	[0.0083]	[0.0085]	[0.0083]	[0.0083]
Size50_99	0.0312***	0.0393***	0.0311***	0.0399***	0.0307***	0.0307***
	[0.0115]	[0.0121]	[0.0115]	[0.0122]	[0.0115]	[0.0115]
Size100_199	0.0570***	0.0678***	0.0574***	0.0691***	0.0570***	0.0565***
	[0.0182]	[0.0187]	[0.0180]	[0.0185]	[0.0180]	[0.0180]
Size200_499	0.0536***	0.0690***	0.0556***	0.0712***	0.0552***	0.0531***
	[0.0199]	[0.0209]	[0.0201]	[0.0212]	[0.0201]	[0.0199]
Size500plus	0.0608	0.0746*	0.0604	0.0771*	0.0595	0.059
	[0.0394]	[0.0407]	[0.0394]	[0.0407]	[0.0393]	[0.0392]
Observations	27110	27110	27110	27110	27110	27110
Log likelihood	-13797	-13790	-13791	-13790	-13790	-13797
Pseudo R sqd	0.03	0.03	0.03	0.03	0.03	0.03
Wald Chi2	946.2	985	958	986.5	958.4	953.3

Notes:
See notes to Table 3.11

4. Product strategies and skills: multivariate analysis

Summary

- Although product strategies and skills are strongly positively correlated at establishment level, it is not obvious from theoretical considerations and previous empirical evidence what the primary direction of influence is between these two variables.
- The results presented here provide strong evidence that the relationship between product strategies and skills is in fact interdependent in nature. The implication is that operating a high value added product strategy generates higher levels of skill requirements for the establishments concerned while, at the same time, high current levels of skills contribute positively to the development of high-end product strategies.
- Put another way, some employers may seek to drive up skill levels to support high value added production while others may find that internal skill gaps hinder any efforts to develop high-end product strategies.
- The mean level of skills in establishments in the upper quartile for their sector in terms of product strategy is estimated to be intermediate between NVQ3 and NVQ4.
- By contrast, the mean level of skills in establishments below the upper quartile level is some way below NVQ3.

4.1 Modelling the relationship between product strategy and skills

Although product strategies and skills are strongly positively correlated at establishment level, it is not obvious from theoretical considerations and empirical evidence what the primary direction of influence is between these two variables.

On the one hand, international comparisons of matched samples of establishments suggest that an establishment's choice of product strategy in terms of complexity of product specification and other factors is strongly influenced by the extent of competition in the principal market(s) for its main product or service. In particular,

these studies suggest that an establishment is more likely to pursue a high value added product strategy if the alternative option of supplying relatively low value added products or services is threatened or precluded by competition in its main markets from low cost foreign producers (Prais, 1995; Finegold and Mason, 1999; Mason and Wagner, 2002).

In this context, the choices of product strategy made by firms might very well be thought to dictate future skill requirements. This proposition is supported by the first Employers Skill Survey in 1999 which found that more than nine in ten companies that were planning to move to higher value added products (or to improve the quality of their existing products) expected new or additional skill requirements to arise as a *result* of the change in product specification (NSTF, 2000, Figure 6.6). At the same time, when establishments that were making no effort to move to higher quality-grades of product were explicitly asked about the constraints on their moving up-market, only a small minority referred to skill deficiencies whereas many more establishments referred to financial constraints (ibid, Figure 6.7). These findings were reinforced by later comparisons of high value added firms and medium value added firms in selected industries which found no evidence that medium value added firms had been impeded from moving to high value added product strategies by greater skill constraints than those found in high value added firms (Mason, 2005a).

On the other hand, some degree of reverse causation might also be expected since – all else being equal – firms' ability and willingness to move up-market in terms of product strategy may be enhanced (constrained) by ready availability (shortages) of the required skills within the firm. This proposition is central to the model developed by Redding (1996) who argues that firms' investments in product innovation and quality-enhancement and workers' investments in skill acquisition both exhibit pecuniary externalities and are strategic complements. In the present study we have found some evidence that internal skill gaps are negatively related to the product strategy index (Section 3.2), which is consistent with an argument that firms needing to upgrade product strategies in response to market competition may be constrained in doing by shortfalls of in-house skills.

In the light of these different considerations, we conclude that the relationship between product strategies and skill levels is potentially interdependent. Therefore,

in order to take account of this possible two-way causality, we estimate the following simultaneous equations:

$$(2) \quad Skills_i = \beta_0 + \beta_1 PS_i + \beta_2 Training_i + \beta_3 \sum_k X_{ki} + \varepsilon_1$$

$$(3) \quad PS_i = \beta_0 + \beta_1 Skills_i + \beta_2 \sum_j Mkt_{ji} + \beta_3 \sum_j SkillCon_{ji} + \beta_4 \sum_k X_{ki} + \varepsilon_2$$

where PS_i is the product strategy index for establishment i and $Skills_i$ is the wage-weighted qualifications index; $Training_i$ is a vector of indicators of different kinds of training provision; Mkt_i is a vector of geographical market focus variables; $SkillCon_i$ is a vector of measures of skill constraints; X_i is a vector of k establishment-specific characteristics such as employment size, sector and region; and ε_1 and ε_2 are error terms. An advantage of this specification is that we are able to distinguish clearly between skill levels and skill constraints in modelling the relationship between product strategies and skill levels.

In more detail the independent variables in the regressions include:

Geographical market focus: dummy variables denoting whether establishments' target markets are international, national, regional or local in nature

Training: dummy variables indicating whether establishments engaged in both on- and off-the-job training; on-the-job training only; off-the-job training only; or no training at all

Skill constraints: dummy variables indicating whether establishments reported internal skill gaps or skill updating needs, as described in Section 3

Employment size: dummy variables with a reference category of 5-9 employees

Single: a binary variable where 1 = a single-establishment firm

Low volumes: a binary variable where 1 = response of five on a five-point scale regarding production volumes (see Section 2.2)

Descriptive statistics for these and other variables are shown in Appendix Table A1.

4.2 Empirical results

In the analysis that follows, Equations (2) and (3) are jointly estimated by three-stage least squares (3SLS) which is a well-known means of taking account of endogeneity (reverse causality) in the relationships between economic variables. In principle, 3SLS estimates should provide consistent and more efficient estimates than two-stage Instrumental Variables (IV) methods of dealing with endogeneity problems

because 3SLS is able to take account of any correlation between cross-equation error terms (Pindyck and Rubinfeld, 1981).

However, before proceeding with our main analysis, we explore the extent of endogeneity between product strategies and skills by carrying out IV estimates of Equation (2) where the dependent variable is the skills index. In Table 4.1, Column 1, the product strategy index is instrumented by the geographical market focus variables. The results support the validity of our instruments and clearly reject a null hypothesis that the potentially endogenous regressor (product strategy) is exogenous.¹⁴ At the same time skills are found to be positively and significantly related to product strategies, as expected. The strength of this relationship is such that a one standard deviation increase in the product strategy index is associated with a 14% increase in the skills index (evaluated at the mean level of the latter index).

This overall pattern of results is confirmed by a second equation which takes account of the sector-specific nature of the product strategy index by entering the own-sector upper quartile indicator of product strategy as an independent regressor in place of the product strategy index. The relevant coefficient shown in Table 4.1, Column 1A shows that, after controlling for training levels, establishment size and sector- and region-specific characteristics, the average level of the skills index in establishments in the upper quartile on product strategy for their sector is an estimated 0.51 points higher than in establishments below the upper quartile level on product strategy. By way of illustration, this distance suggests that the mean level of skills in the upper quartile of establishments is intermediate between NVQ3 and NVQ4 whereas the mean level of skills in establishments below the upper quartile level is some way below NVQ3.¹⁵

Turning to the 3SLS simultaneous equations estimates of the relationship between product strategies and skills, the skills index is again positively and significantly related to the product strategy index with a coefficient on product strategy of a very similar size to that found in the IV estimates. The estimates also capture positive relationships between skills and training provision and skills and low volume

¹⁴ See notes to Table 4.2 for details of the test statistics relating to instrument validity and .

¹⁵ As described in Section 2.4, the skills index ranges from 1.00 (signifying that all employees are in the Low, Other or No qualifications category) to 1.85 (when all employees are qualified at NVQ4 or above). The mean level of the skills index as a whole is 1.22, representing an average level of skill associated with NVQ3 qualifications.

production (Table 4.2, Column 1B). At the same time product strategy is positively and significantly influenced by skills and by the geographic scale of the market for each establishment's main product or service, with the relevant coefficients rising monotonically from regional to national to international market scales. One interesting outcome is that, while the product strategy index generally increases with establishment size, the reverse is true of the skills index.

When indicators of reported skill constraints are entered as independent variables in the product strategy equation, internal skill gaps are found to be negatively related to product strategies, with a slightly larger negative impact if the skill gaps concern managers (Column 3A) rather than the workforce as a whole (Column 2A). At the same time skill updating needs are positively related to product strategies, in line with the results discussed in Section 3.2. The overall effect of including these indicators is to slightly weaken the observed relationships between the product strategy and skills indices but these relationships remain strongly positive.

Thus we find clear evidence of interdependence between product strategies and skills. While the results are consistent with arguments that operating a high value added product strategy generates higher levels of skill requirements for the establishments concerned, they also suggest that high current levels of skills contribute positively to the development of high-end product strategies. Here it is important to distinguish between skill *levels* and skill *constraints*. Taking the 3SLS estimates together with the probit estimates presented in Section 3.2, there is evidence that internal skill gaps do have some negative effects on the implementation of high-end product strategies, and these negative effects occur independently of current skill levels. However, as shown in Section 3.2, and confirmed by the relatively small coefficient on internal skill gaps in Table 4.2, Column 2A, the negative effects of skill gaps on product strategies are not large.¹⁶

In many ways the interdependence between product strategies and skills at establishment level is only to be expected because, as emphasised in resource- and knowledge-based theories of the firm, business strategies and firm-level resources

¹⁶ As described in Section 2.2, the product strategy index is a standardised factor score with mean zero and standard deviation of one. The median value of this index is 0.011 while the lower quartile value is -0.662. The coefficient value of -0.025 on internal skill gaps in Table 4.2, Column 2A suggests that, evaluated at the mean level of the product strategy index, the difference between an establishment with internal skill gaps and an establishment without internal skill gaps would only be about 7% ($=-0.025/0.338$) of the distance between the mean and lower quartile values on the product strategy scale.

and capabilities tend to co-evolve together over time (Teece, Pisano and Shuen, 1997; Eisenhardt and Martin, 2001; Teece, 2007). Thus when firms encounter opportunities for moving into high value added product areas, their ability to respond to these opportunities (and indeed to identify their potential in the first place) will be partly shaped by the firm-specific resources and capabilities (including skills) which they have accumulated over time. At the same time, shifting to more complex and demanding product strategies is likely to increase the skills required by firms, and this may help explain why firms with relatively high-end product strategies are more likely to report skill updating needs.

Table 4.1: Instrumental variables estimates of determinants of skill levels, private sector establishments with five or more employees, NESS09, (population-weighted)

	(1)	(2)
Product strategy index	0.1699***	
	[0.015]	
Upper quartile, product strategy index		0.5094***
		[0.049]
Off- and on-the-job training	-0.0071	0.0066
	[0.005]	[0.006]
Off-the-job training only	-0.0013	0.01
	[0.006]	[0.007]
On-the-job training only	-0.0156***	-0.0025
	[0.005]	[0.006]
Single establishment	0.0277***	0.0217***
	[0.006]	[0.006]
Low volumes	0.0664***	0.0240***
	[0.007]	[0.005]
Size10_24	-0.0236***	-0.0221***
	[0.005]	[0.005]
Size25_49	-0.0412***	-0.0378***
	[0.005]	[0.006]
Size50_99	-0.0432***	-0.0421***
	[0.008]	[0.009]
Size100_199	-0.0508***	-0.0445***
	[0.012]	[0.014]
Size200_499	-0.0439***	-0.0416**
	[0.014]	[0.017]
Size500plus	-0.0167	-0.0123
	[0.024]	[0.031]
Observations	27,110	27110
F statistic	175.1	100.2
SEE	0.228	0.266
Hansen J test	0.134	4.008
Hansen P value	0.935	0.135
C statistic	47.10	41.15
C statistic P value	<0.001	<0.001
Kleibergen-Paap LM statistic	388.1	243.2
Kleibergen-Paap P value	<0.001	<0.001

Notes: *significant at 10%, ** significant at 5%, *** significant at 1%.

Population-weighted IV estimates with the skills index as dependent variable. Robust standard errors in brackets are corrected for clustering of observations at sector and region level. The reference category for the training variables is 'no training provision'. The reference category for the establishment size variables is 5-9 employees. All equations include dummy variables for sector and region. In the presence of heteroscedasticity (clearly indicated by Breusch-Pagan tests), the Hansen J statistic is an appropriate test of the null hypothesis of instrument validity. The C statistic tests the null hypothesis that potentially endogenous regressors are in fact exogenous. The Kleibergen-Paap LM statistic tests the null hypothesis that the matrix of reduced-form coefficients in the first-stage regression is under-identified.

Table 4.2: Three-stage least squares estimates of the determinants of product strategy and skills indices: private sector establishments with five or more employees, NESS09, (population-weighted)

	(1A)	(1B)	(2A)	(2B)	(3A)	(3B)
Dependent variable:	Product strategy	Skills	Product strategy	Skills	Product strategy	Skills
	(Model 1)	(Model 1)	(Model 2)	(Model 2)	(Model 3)	(Model 3)
Product strategy index		0.1701***		0.1665***		0.1654***
		[0.008]		[0.007]		[0.007]
Skills index	4.3799***		3.5256***		3.5204***	
	[0.517]		[0.542]		[0.543]	
Off- and on-the-job training		0.0094***		0.0136***		0.0138***
		[0.003]		[0.003]		[0.003]
Off-the-job training only		0.0021*		0.0021		0.0021
		[0.001]		[0.002]		[0.002]
On-the-job training only		0.0017		0.0012		0.0012
		[0.001]		[0.001]		[0.002]
Regional market focus	0.0222**		0.0362***		0.0368***	
	[0.010]		[0.011]		[0.011]	
National market focus	0.0654***		0.1064***		0.1082***	
	[0.025]		[0.026]		[0.026]	
International market focus	0.1368***		0.2233***		0.2269***	
	[0.052]		[0.054]		[0.054]	
Internal skill gaps			-0.0272***			
			[0.007]			
Skills updating needs			0.0506***			
			[0.013]			
Internal skill gaps – managers					-0.0354***	
					[0.009]	
Internal skill gaps – non-managerial occupations					-0.0253***	
					[0.007]	
Skill updating needs – managers					0.0456***	
					[0.013]	
Skill updating needs – non-managerial occupations					0.0542***	
					[0.014]	
Single establishment	-0.1922***	0.0329***	-0.1903***	0.0325***	-0.1902***	0.0322***
	[0.016]	[0.004]	[0.015]	[0.003]	[0.015]	[0.003]
Low volumes		-0.0055*		-0.0077***		-0.0078***
		[0.003]		[0.003]		[0.003]
Size10_24	0.1266***	-0.0268***	0.1134***	-0.0271***	0.1130***	-0.0270***
	[0.018]	[0.003]	[0.017]	[0.003]	[0.017]	[0.003]
Size25_49	0.2253***	-0.0465***	0.2063***	-0.0471***	0.2058***	-0.0469***
	[0.029]	[0.005]	[0.027]	[0.005]	[0.028]	[0.005]
Size50_99	0.2343***	-0.0498***	0.2112***	-0.0506***	0.2109***	-0.0504***
	[0.040]	[0.007]	[0.038]	[0.007]	[0.038]	[0.007]
Size100_199	0.3025***	-0.0588***	0.2902***	-0.0595***	0.2907***	-0.0592***

	[0.057]	[0.011]	[0.053]	[0.011]	[0.053]	[0.011]
Size200_499	0.2752***	-0.0537***	0.2662***	-0.0546***	0.2678***	-0.0543***
	[0.075]	[0.015]	[0.070]	[0.015]	[0.070]	[0.015]
Size500plus	0.1706	-0.0269	0.1919	-0.0277	0.1933	-0.0273
	[0.141]	[0.027]	[0.131]	[0.027]	[0.131]	[0.027]
Observations	27110	27110	27110	27110	27110	27110
Chi2	1871	13574	2307	9700	2345	9662
p-value	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
SEE	1.173	0.229	1.091	0.227	1.090	0.227

Notes: *significant at 10%, ** significant at 5%, *** significant at 1%.

Population-weighted 3SLS estimates with product strategy and skills as dependent variables. Standard errors are shown in brackets. The reference category for geographical market focus variables is local markets. The reference category for the training variables is 'no training provision'. The reference category for firm size variables is size 5-9 employees. For internal skill gap and skills updating measures the reference category is establishments without, respectively, internal skill gaps or skill updating needs. All equations include dummy variables for sector and region.

5. Mismatches between product strategies and skill levels

Summary

- In some cases establishments appear to be above their sectoral median in terms of product strategy while being simultaneously below their sectoral median on skill.
- The results presented here suggest that high-end product strategy establishments with below-median skill levels are not significantly different from other high-end product strategy establishments with regard to reported internal skill gaps.
- By contrast, high-end product strategy establishments with below-median skill levels are significantly *less* likely to report skills updating needs.
- It seems likely that establishments attempting to operate high-end product strategies with relatively low levels of skills may be doing so partly because they are less able for one reason or another to recognise skills updating needs in the same way as higher-skilled establishments do.
- This could reflect weaknesses in skills and knowledge at senior management level and in the organisational cultures which have evolved over time within the firms of which they are part.

For policy-makers hoping to encourage more firms to move to high value added production, there is considerable interest in learning more about the extent of any 'mismatches' between firms' product strategies and skills. For example, how many firms are seeking to operate high value added product strategies (by the standards of their sectors) with relatively low levels of skill? Arguably, firms in this category might be expected to be particularly responsive to government policy interventions designed to encourage skills development and utilisation.

One way to approach this issue is to examine how establishments in different quartiles of their own-sector product strategy distribution map against quartiles of the skills index. Recall that the product strategy index defined in this paper is sector-

specific in nature whereas the skills index is generic and applies across all sectors. Table 5.1 shows the distribution of establishments when they are allocated to their respective quartiles on each of these two indices. About 26% of establishments are in the top two quartiles for both skills and sector-specific product strategy (Rows 1-2 and 4-5) while another 28% of establishments are below median values on both these indices (Row 9). By contrast, as many as 21% of establishments are in the top two quartiles for sector-specific product strategy but below the median value for skills (Rows 3 and 6) while 26% are below-median on product strategy but above-median on skills (Rows 7-8).¹⁷

To understand what this means in terms of skill levels, consider the wage-weighted skills index which ranges from 1.00 (signifying that all employees are qualified at levels below NVQ3) to 1.85 (signifying that all employees are qualified to level NVQ4 or higher). Across all private sector establishments with five or more employees, the lower quartile value for skills is as low as 1.05; the median value is 1.15; and the upper quartile is 1.30. Thus the 7% of establishments classed as upper quartile on own-sector product strategy but lower quartile in terms of skills are attempting to deliver above-average product strategies compared to others in their sector while operating with very low levels of skill (to the extent that skill is adequately proxied by certified qualifications).

Table 5.1: Positioning of establishments on own-sector product strategy and cross-sector skills indices: private sector establishments with five or more employees, NESS09, (population-weighted)

	<i>% of establishments</i>
Product strategy UQ, Skills UQ	7
Product strategy UQ, Skills 3Q	6
Product strategy UQ, Skills below median	10
Product strategy 3Q, Skills UQ	7
Product strategy 3Q, Skills 3Q	6
Product strategy 3Q, Skills below median	11
Product strategy below median, Skills UQ	13
Product strategy below median, Skills 3Q	13
Product strategy below median, Skills below median	28
Total	100
<i>Weighted n =</i>	<i>359719</i>
<i>Unweighted n =</i>	<i>27110</i>

Notes:

UQ = Upper quartile; 3Q = Third quartile

¹⁷ These percentages do not sum to 100 due to rounding.

What are the main characteristics of establishments in this position of apparent mismatch between product strategies and skills? Table 5.2 suggests that there are very few differences between establishments in different size groups, regions and geographical market focus groups in terms of their propensity to be above (below) median on own-sector product strategy while being simultaneously below (above) median on skill. By contrast, a great deal of variation in the degree of mismatch, by the measure under consideration, seems to arise from sectoral differences. Table 5.3 shows that, in sectors with above-average skill levels such as computer services and legal, architectural and other knowledge-intensive business services, the proportions of establishments with high-end (upper quartile) product strategies and below median skills are relatively low (1-3%) while in lower-skilled sectors such as transport services and retailing, the proportions of establishments in this same category – high-end product strategies, below-median skills -- are much higher at 16-18% (Table 5.3, Column 1).¹⁸

To what extent do such differences in this type of mismatch reflect skill deficiencies as compared to sector-specific differences in skill-intensity or unobservable sectoral characteristics reflected in the own-sector measure of product strategy? As a first attempt to explore this issue, we carry out another probit regression analysis which is confined to establishments which are in the upper quartile in terms of the own-sector product strategy measure and in which (as before) we are able to control for sector-specific characteristics to some extent by the inclusion of sector dummies. The dependent variable in this analysis takes a value of one if the establishment has below-median skill levels while being in the upper quartile in terms of own-sector product strategy. The reference group is other establishments in the upper quartile on own-sector product strategy establishments which have above-median skills.

The results (shown in Table 5.4) suggest that high-end product strategy establishments with below-median skill levels are not significantly different from other high-end product strategy establishments with regard to reported internal skill gaps (Column 2). However, high-end product strategy establishments with below-median skill levels are significantly *less* likely to report skills updating needs. Thus, in terms of the discussion set out in Sections 3 and 4, there is some evidence to suggest that establishments attempting to operate high-end product strategies with relatively low

¹⁸ Full versions of Tables 5.1-5.2 are provided in Appendix Tables A3-A6.

levels of skills may be doing so partly because they are less able for one reason or another to recognise skills updating needs in the same way as higher-skilled establishments do. This could reflect weaknesses in skills and knowledge at senior management level and in the organisational cultures which have evolved over time within the firms of which they are part.

Does this matter, so far as establishments with skills/product strategy mismatches are concerned? If the establishments concerned are surviving successfully in their respective markets with adequate levels of profit, and look like being able to do so into the foreseeable future, then there may be no reason for policy-makers to be concerned. However, if the establishments concerned are struggling to survive, then there may be a role for Sector Skills Councils, further education colleges and other publicly-funded bodies to develop training programmes and initiatives that will help establishments with high-end product strategy aspirations to develop the skills they need to support those strategies. Commercial performance cannot be examined using NESS alone but future analysis of NESS data matched to datasets such as the Annual Business Inquiry should be able to explore links between product strategies, skills and financial performance in depth.

Table 5.2: Extent of mismatch between sector-specific product strategy positioning and cross-sector skill levels, analysed by employment size group, region and geographical market focus: private sector establishments with five or more employees, NESS09, (population-weighted)

A: Employment size group

	Product strategy UQ, Skills below median	Product strategy 3Q, Skills below median	Product strategy below median, Skills UQ	Product strategy below median, Skills 3Q
5-9	8	10	15	15
10-24	10	12	11	13
25-49	12	13	10	10
50-99	12	13	10	10
100-199	12	12	11	9
200-499	14	13	11	6
500-plus	12	10	11	5
Total	10	11	13	13

B: Region

	Product strategy UQ, Skills below median	Product strategy 3Q, Skills below median	Product strategy below median, Skills UQ	Product strategy below median, Skills 3Q
East of England	11	11	12	13
East Midlands	10	13	10	12
London	5	6	24	11
North East	10	11	11	14
North West	10	11	12	14
South East	10	12	12	14
South West	11	13	10	13
West Midlands	11	13	9	13
Yorkshire and Humberside	9	10	12	15
Total	10	11	13	13

C: Geographical market focus

	Product strategy UQ, Skills below median	Product strategy 3Q, Skills below median	Product strategy below median, Skills UQ	Product strategy below median, Skills 3Q
Local	9	12	10	16
Regional	9	11	15	13
National	10	12	14	13
International	11	10	13	9
Total	10	11	13	13

Table 5.3: Extent of mismatch between sector-specific product strategy positioning and cross-sector skill levels, analysed by sector: private sector establishments with five or more employees, NESS09, (population-weighted)

	Product strategy UQ, Skills below median	Product strategy 3Q, Skills below median	Product strategy below median, Skills UQ	Product strategy below median, Skills 3Q
	<i>% of establishments in sector</i>			
Agriculture, forestry and fishing	13	14	7	14
Food, drink and tobacco	12	14	7	10
Printing, publishing, recorded media	7	9	11	17
Chemicals, rubber and plastics	10	14	7	14
Fabricated metal products	12	11	4	14
Electrical, electronic and instrument engineering	5	6	14	14
Mechanical engineering, vehicles and other engineering	9	10	5	14
Other manufacturing industries	12	14	6	13
Building of complete constructions; civil engineering	12	14	7	13
Building installation, building completion and other construction activities	11	13	6	18
Sales of motor vehicles, parts, fuel	14	16	6	13
Wholesaling	13	14	8	11
Retailing - specialised stores	10	11	8	15
Retailing - non-specialised stores; other retail and repair	14	16	5	9
Hotels, motels and other accommodation	10	13	9	14
Restaurants, canteens, catering	9	12	11	14
Bars	9	13	9	17
Transport services	16	18	4	8
Postal and telecommunications services	9	10	14	14
Auxiliary transport activities, travel agents	13	13	12	10
Financial services, including insurance	6	6	21	18
Computer services	2	3	37	9
Legal, accounting, auditing, business and management consultancy, etc.	2	1	42	11
Architectural and engineering activities and related technical consultancy; technical testing, analysis	3	3	39	9
Other business services	7	7	21	11
Other service industries	13	15	6	11
Total	10	11	13	13

Note:

The total row includes data for establishments in mining and utilities which are not reported in the table due to relatively small cell sizes in those sectors.

Table 5.4: Determinants of the probability of having below-median skill levels while being in the upper quartile on own-sector product strategy: private sector establishments with five or more employees, NESS09 (population-weighted) – Marginal effects (evaluated at sample means)

	(1)	(2)	(3)	(4)	(5)	(6)
Skill-shortage vacancies	-0.0025					
	[0.042]					
Internal skill gaps		-0.0216				
		[0.018]				
Skills updating needs			-0.0667***			
			[0.016]			
Internal skill gaps – managers				-0.0073		
				[0.027]		
Internal skill gaps – non-managerial occupations				-0.0265		
				[0.019]		
Skill updating needs - managers					-0.0633***	
					[0.020]	
Skill updating needs – non-managerial occupations					-0.0673***	
					[0.017]	
Management plus non-management skill updating needs (all occupations)						-0.0670***
						[0.019]
Non-management skill updating needs only (all occupations)						-0.0544***
						[0.016]
Management skill updating needs only (all occupations)						-0.1852***
						[0.062]
Size10_24	0.0182	0.0202	0.0205	0.0197	0.0206	0.02
	[0.019]	[0.019]	[0.019]	[0.019]	[0.019]	[0.019]
Size25_49	0.0664***	0.0703***	0.0710***	0.0698***	0.0712***	0.0703***
	[0.023]	[0.023]	[0.023]	[0.024]	[0.023]	[0.023]
Size50_99	0.0536*	0.0591**	0.0601**	0.0573**	0.0602**	0.0594**
	[0.028]	[0.029]	[0.028]	[0.028]	[0.028]	[0.028]
Size100_199	-0.0075	-0.0006	0.0013	-0.0036	0.0013	0.0015
	[0.040]	[0.040]	[0.040]	[0.040]	[0.040]	[0.040]
Size200_499	0.0235	0.0325	0.0323	0.0268	0.0325	0.0326
	[0.047]	[0.048]	[0.047]	[0.048]	[0.047]	[0.047]
Size500plus	-0.0423	-0.0329	-0.0302	-0.0383	-0.0298	-0.0317
	[0.073]	[0.073]	[0.075]	[0.074]	[0.075]	[0.074]
Observations	6169	6169	6169	6169	6169	6169
Log likelihood	-3808	-3807	-3799	-3806	-3799	-3797
Pseudo R sqd	0.099	0.100	0.101	0.100	0.101	0.102
Wald Chi2	608.4	614.9	661	613.6	669.7	693.2

Base: All establishments which are in the upper quartile on own-sector product strategy

Notes to Table 5.4:

*significant at 10%, ** significant at 5%, *** significant at 1%.

Weighted probit estimates. Robust standard errors in brackets are corrected for clustering of observations at sector and region level. The dependent variable takes the value of one if the establishment is in the upper quartile on own-sector product strategy and has below-median skills; it takes the value of zero if the establishment is in the upper quartile on own-sector product strategy and has above-median skills. Marginal effects are evaluated at the mean values of other independent variables. The reference category for firm size variables is size 5-9 employees. See main text for descriptions of the dependent variable and the reference categories for the skill deficiency dummy variables. All equations include dummy variables for sector, region, single establishments and low volumes.

6. Summary and assessment

As competitive pressures continue to mount in the world economy, British firms are increasingly urged to move up-market to higher value added goods and services and to invest more heavily in the skills required to support such changes in product strategies. In this context the term 'product strategy' is typically used to refer to the choices made by firms about product or service differentiation within particular markets. Some firms may attempt to compete on high-specification products at premium prices in certain markets while others target the lower-priced end of those markets or opt for a medium-price strategy. In addition, firms may vary in the extent to which they seek to compete through new product development and other forms of innovation rather than rely on existing products or services of long standing.

Using data from the Employers Skills Survey (ESS01) and the National Employer Skills Survey 2009 (NESS09), this paper develops an index of product strategy at establishment level which is based on survey respondents' evaluations of how their establishments compare against others in their industry in terms of dependence on price in order to achieve competitive success, their involvement in 'premium quality' production as compared to 'standard or basic quality' production and the extent to which they are innovation leaders in their industries. This measure of product strategy is found to be strongly and positively related to the geographic scale of the market for each establishment's main product or service and to establishment size. It is also found to be strongly positively correlated with an index of workforce skills at establishment level which is developed using wage-weighted qualifications data.

(1) Product strategies in 2001 and 2009

Direct comparison of establishments' responses to product strategy questions in 2001 and 2009 is hindered by changes in question wording and differences in the way that private sector establishments were identified as such in each year. The most striking feature of the data is the high degree of variation between establishments in both years in the way that they responded to questions on product strategy. With the exception of the responses on premium quality production, there are very few tendencies for responses to bunch towards either end of the respective scales. The implication is that establishments vary greatly in the extent to which they

are seeking to engage in 'high-end' or high value added production, and that this high degree of variation has persisted throughout the period from 2001 to 2009.

In both years it is notable that product strategy tends to increase with establishment size and with the extent to which establishments operate in national or international markets rather than confining themselves to regional or local markets. At the same time the incidence of different kinds of product strategy differs greatly between sectors as well as within each sector. For example, in 2009 the proportions of establishments rating themselves at the top point of the scale on innovation leadership in 2009 ranged from 18% in fabricated metal products to 30% in electrical and electronic engineering. In construction sectors only 14-15% of establishments classified themselves as innovation leaders. In market services the proportion of self-described innovation leaders ranged from 21% in hotels, bars and transport services to 34% in non-specialised retailing and personal services. Sectoral variation is also high in both years in terms of establishments' self-classification on indicators of 'premium quality' production, customisation of goods and services and dependence on low prices for achievement of competitive success. A notable feature of the sector rankings on these different measures of product strategy is their stability between 2001 and 2009.

Overall, these sectoral differences are hard to interpret since the survey questions asked respondents to position themselves in relation to 'others in your industry'. One explanation might be that establishments in sectors which are above-average in terms of skill requirements or exposure to international competition are more likely to view themselves as engaged in premium-quality or innovative activities. In view of the way that the questions were posed, we take a particular interest in how establishments compare against each other in terms of product strategy within their own sectors. We also make use of multivariate analysis which enables us to control for sector-specific factors underlying the survey responses.

(2) Product strategies and skill deficiencies

Successive National Employer Skills Surveys have highlighted two main measures of skill deficiency:

- (1) the proportion of employers reporting 'skill-shortage vacancies', ie, hard-to-fill vacancies which are attributable to skills-related factors; and
- (2) the proportion of establishments reporting internal skill gaps, defined as having one or more employees who are not fully proficient in their jobs

In NESS09 data are also available on the proportion of establishments who reported skills updating and improvement needs among their existing employees. Almost three quarters (73%) of private sector establishments with five or more employees reported having skill updating needs in 2009 compared to 30% who reported internal skill gaps and only 3% who were experiencing skill-shortage vacancies at the time of the survey.

The most important factors driving skills updating and improvement needs are new legislative or regulatory requirements, the introduction of new goods or services, new work practices and new technologies and increased competitive pressure in general. The types of skill that need updating cover a wide range of generic skills (such as customer-handling, team-working, problem-solving and communication skills), technical, practical or job-specific skills and management skills.

Some 30% of establishments with skill updating needs reported that managers were the single most important occupation affected. The next most common occupations in this category were sales and customer service occupations (16% of establishments with skill updating needs) and skilled trades occupations (13%). The survey findings make clear that skill updating needs are not confined to low-skilled workers. Rather the pace of change and intensity of market competition tends to create new skill needs across large sections of the workforce.

(3) The impact of deficiencies in management and leadership skills

Since managers are the most commonly cited occupation in need of skills updating, and they are also the occupation most closely involved in developing and implementing product strategies, the paper examines skills issues relating to managers in detail. Using NESS09 data, it identifies three different measures of gaps in managerial skills:

(1) the proportion of respondents who reported *internal skill gaps (ie, lack of full proficiency) involving managers*

(2) the proportion of respondents who reported *skill updating needs* and cited *managers* as the single most important occupation in need of skills updating

(3) the proportion of respondents who reported *skill updating needs* and cited *management skills* in need of updating for their single most important occupation (including non-managerial occupations as well as managers).

Across the whole sample of private sector establishments with five or more employees, approximately 8% of establishments reported internal skill gaps involving managers; 23% reported skill updating needs with managers as the occupation most affected by these needs; and 28% reported gaps in management skills for their occupation most in need of skills updating.

The paper reports additional multivariate analyses exploring the impact of different kinds of skill deficiency on product strategy. The probability of establishments being in the upper quartile on product strategy for their own sector is found to be negatively and significantly related to the existence of internal skill gaps, both skill gaps involving managers and gaps involving non-managerial occupations. We also identify a small but direct constraining effect of internal skill gaps on product strategy, and hence on the skill requirements resulting from product strategy choices.

A further interesting finding is that the probability of establishments being in the upper quartile on product strategy is *positively* related to skills updating needs, with fairly similar degrees of correlation with skills updating needs involving either managers or non-managers. This suggests that establishments with relatively high-end product strategies are less likely to be satisfied with their existing skill levels than are establishments in the same sector with middle-ranking and low-end product strategies. It is possible that, not only are the skill requirements of high-end product strategy establishments higher on average than those in rival establishments, but

that managers in high-end establishments are more aware of ongoing changes in skill needs than are their counterparts in establishments pursuing low value added product strategies. In this context it may be that *failure* to identify skills updating needs is a better indicator of skill deficiency than the reported presence of such needs, and that this kind of failure is a key area of weakness in management and leadership skills in some organisations with low value added product strategies.

(4) The relationship between product strategies and skills

Although product strategies and skills are strongly positively correlated at establishment level, it is not obvious from theoretical considerations and previous empirical evidence what the primary direction of influence is between these two variables. On the one hand, international comparisons of matched samples of establishments suggest that an establishment's choice of product strategy in terms of complexity of product specification and other factors is strongly influenced by the extent of competition in the principal market(s) for its main product or service. In this context the choices of product strategy made by firms might very well be thought to dictate future skill requirements. On the other hand, some degree of reverse causation might also be expected since – all else being equal – firms' ability and willingness to move up-market in terms of product strategy may be enhanced (constrained) by ready availability (shortages) of the required skills within the firm.

The multivariate analyses presented in this paper provide strong evidence that the relationship between product strategies and skills is interdependent in nature. The strength of this positive relationship is such that a one standard deviation increase in the product strategy index is associated with a 14% increase in the skills index (evaluated at the mean level of the latter index). At the same time product strategy is positively and significantly influenced by skills and by the geographic scale of the market for each establishment's main product or service, with high-end product strategies much more likely to be operated by establishments serving national and international markets than by those catering to local or regional markets. One interesting outcome is that, while the product strategy index generally increases with establishment size in a multivariate context, the reverse is true of the skills index. The analysis also captures positive relationships between skills and training provision and skills and low volume production.

While these results are consistent with arguments that operating a high value added product strategy generates higher levels of skill requirements for the establishments concerned, they also suggest that high current levels of skills contribute positively to the development of high-end product strategies. This overall pattern of results is confirmed by analyses which take account of the sector-specific nature of the product strategy index by entering the own-sector upper quartile indicator of product strategy as an independent regressor in place of the product strategy index. After controlling for training levels, establishment size and sector- and region-specific characteristics, the average level of the skills index in establishments in the upper quartile on product strategy for their sector is an estimated 0.51 points higher than in establishments below the upper quartile level on product strategy. By way of illustration, this distance suggests that the mean level of skills in the upper quartile establishments is intermediate between NVQ3 and NVQ4 whereas the mean level of skills in establishments below the upper quartile level is some way below NVQ3.

(5) Mismatches between product strategies and skills

In many ways the interdependence between product strategies and skills at establishment level is only to be expected because, as emphasised in resource- and knowledge-based theories of the firm, business strategies and firm-level resources and capabilities tend to co-evolve together over time. Thus when firms encounter opportunities for moving into high value added product areas, their ability to respond to these opportunities (and indeed to identify their potential in the first place) will be partly shaped by the firm-specific resources and capabilities (including skills) which they have accumulated over time. At the same time, shifting to more complex and demanding product strategies is likely to increase the skills required by firms, and this may help explain why firms with relatively high-end product strategies are more likely to report skill updating needs.

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Appendix Tables

Table A1: Descriptive statistics for variables used in regression analyses

Variable	Obs	Mean	Std. Dev.	Min	Max
Product strategy index	27110	-0.04	1.00	-2.92	1.79
Skills index	27110	1.22	0.21	1.00	1.84
Skill-shortage vacancies	27110	0.03	0.18	0	1
Internal skills gap	27110	0.32	0.47	0	1
Skill updating needs	27110	0.72	0.45	0	1
Internal skill gaps – managers	27110	0.08	0.28	0	1
Internal skill gaps – non-managerial occupations	27110	0.24	0.42	0	1
Skill updating needs - managers	27110	0.23	0.42	0	1
Skill updating needs – non-managerial occupations	27110	0.49	0.50	0	1
Management plus non-management skill updating needs (all occupations)	27110	0.28	0.45	0	1
Non-management skill updating needs only (all occupations)	27110	0.41	0.49	0	1
Management skill updating needs only (all occupations)	27110	0.01	0.08	0	1
No skill updating needs	27110	0.30	0.46	0	1
Local market focus	27110	0.34	0.47	0	1
Regional market focus	27110	0.15	0.36	0	1
National market focus	27110	0.32	0.47	0	1
International market focus	27110	0.19	0.39	0	1
Single establishment	27110	0.52	0.50	0	1
Low volumes	27110	0.10	0.30	0	1
Off- and on-the-job training	27110	0.48	0.50	0	1
Off-the-job training only	27110	0.13	0.33	0	1
On-the-job training only	27110	0.19	0.40	0	1
No training provision	27110	0.20	0.40	0	1
Size5_9	27110	0.47	0.50	0	1
Size10_24	27110	0.37	0.48	0	1
Size25_49	27110	0.09	0.29	0	1
Size50_99	27110	0.04	0.20	0	1
Size100_199	27110	0.02	0.13	0	1
Size200_499	27110	0.01	0.10	0	1
Size500plus	27110	0.00	0.05	0	1
East Midlands	27110	0.08	0.27	0	1
London	27110	0.13	0.34	0	1
Eastern	27110	0.11	0.31	0	1
North East	27110	0.04	0.20	0	1
North West	27110	0.13	0.33	0	1
South East	27110	0.18	0.39	0	1
South West	27110	0.12	0.33	0	1
West Midlands	27110	0.11	0.31	0	1

Yorkshire & Humberside	27110	0.10	0.30	0	1
Agriculture, forestry and fishing	27110	0.03	0.17	0	1
Mining and quarrying	27110	0.00	0.04	0	1
Food, drink and tobacco	27110	0.01	0.11	0	1
Printing, publishing, recorded media	27110	0.01	0.12	0	1
Chemicals, rubber and plastics	27110	0.01	0.10	0	1
Fabricated metal products	27110	0.01	0.11	0	1
Electrical/electronic eng.	27110	0.01	0.09	0	1
Mechanical eng., vehicles	27110	0.01	0.12	0	1
Other manufacturing	27110	0.04	0.20	0	1
Building complete constructions; civil eng.	27110	0.03	0.17	0	1
Building installation, etc	27110	0.06	0.23	0	1
Electricity, gas and water	27110	0.00	0.04	0	1
Sales of motor vehicles, parts, fuel	27110	0.08	0.27	0	1
Wholesaling	27110	0.08	0.27	0	1
Retailing - specialised stores	27110	0.12	0.32	0	1
Retailing - non-specialised	27110	0.04	0.19	0	1
Hotels, motels etc	27110	0.02	0.14	0	1
Restaurants, canteens, catering	27110	0.07	0.25	0	1
Bars	27110	0.05	0.22	0	1
Transport services	27110	0.02	0.16	0	1
Postal and telecommunications services	27110	0.01	0.11	0	1
Auxiliary transport activities	27110	0.01	0.12	0	1
Financial services, incl. insurance	27110	0.04	0.20	0	1
Computer services	27110	0.03	0.17	0	1
Legal, accounting, etc services	27110	0.03	0.17	0	1
Architectural, engineering, etc services	27110	0.04	0.19	0	1
Other business services	27110	0.11	0.31	0	1
Personal and other services	27110	0.02	0.12	0	1

Table A2: Extent of mismatch between sector-specific product strategy positioning and cross-sector skill levels, analysed by sector: private sector establishments with five or more employees, NESS09, (population-weighted)

	PS UQ, Skills UQ	PS UQ, Skills 3Q	PS UQ, Skills below median	PS 3Q, Skills UQ	PS 3Q, Skills 3Q	PS 3Q, Skills below median	PS below median, Skills UQ	PS below median, Skills 3Q	PS below median, Skills below median	Total	Grossed-up n =	Unweighted n =
	<i>% of establishments in sector</i>											
Agriculture, forestry and fishing	6	6	13	4	7	14	7	14	30	100	10112	743
Food, drink and tobacco	5	6	12	4	7	14	7	10	35	100	4811	560
Printing, publishing, recorded media	10	4	7	8	6	9	11	17	29	100	4922	573
Chemicals, rubber and plastics	6	5	10	5	6	14	7	14	33	100	3797	456
Fabricated metal products	4	7	12	2	7	11	4	14	40	100	4168	508
Electrical, electronic and instrument engineering	9	7	5	6	11	6	14	14	27	100	2964	372
Mechanical engineering, vehicles and other engineering	5	8	9	4	10	10	5	14	36	100	5148	635
Other manufacturing industries	5	6	12	4	6	14	6	13	34	100	14401	1599
Building of complete constructions; civil engineering	4	7	12	4	6	14	7	13	35	100	10582	891
Building installation, building completion and other construction activities	4	8	11	3	8	13	6	18	29	100	20498	1616
Sales of motor vehicles, parts, fuel	3	5	14	3	5	16	6	13	33	100	27529	1754
Wholesaling	5	5	13	4	5	14	8	11	34	100	29423	1891
Retailing - specialised stores	6	6	10	6	8	11	8	15	29	100	42121	2694
Retailing - non-specialised stores; other retail and repair	2	4	14	3	4	16	5	9	43	100	12928	1100
Hotels, motels and other	4	6	10	4	8	13	9	14	32	100	7633	587

accommodation												
Restaurants, canteens, catering	6	6	9	7	7	12	11	14	29	100	24777	1504
Bars	6	8	9	5	8	13	9	17	27	100	18484	963
Transport services	2	5	16	3	3	18	4	8	41	100	8924	945
Postal and telecommunications services	8	4	9	8	6	10	14	14	26	100	4755	457
Auxiliary transport activities, travel agents	5	4	13	7	6	13	12	10	30	100	5031	520
Financial services, including insurance	10	6	6	11	7	6	21	18	15	100	14362	1023
Computer services	17	3	2	17	3	3	37	9	8	100	11209	728
Legal, accounting, auditing, business and management consultancy, etc.	17	3	2	17	3	1	42	11	4	100	10795	806
Architectural and engineering activities and related technical consultancy; technical testing, analysis	14	3	3	14	4	3	39	9	10	100	13913	1005
Other business services	11	5	7	12	6	7	21	11	21	100	39653	2560
Other service industries	4	4	13	5	8	15	6	11	34	100	5522	454
Total	7	6	10	7	6	11	13	13	28	100	359719	27110

Table A3: Extent of mismatch between sector-specific product strategy positioning and cross-sector skill levels, analysed by employment size group: private sector establishments with five or more employees, NESS09, (population-weighted)

	PS UQ, Skills UQ	PS UQ, Skills 3Q	PS UQ, Skills below median	PS 3Q, Skills UQ	PS 3Q, Skills 3Q	PS 3Q, Skills below median	PS below median, Skills UQ	PS below median, Skills 3Q	PS below median, Skills below median	Total	Grossed- up n =	Unweighted n =
	<i>% of establishments in sector</i>											
5-9	6	5	8	7	6	10	15	15	28	100	167753	10869
10-24	7	6	10	7	6	12	11	13	29	100	133238	8264
25-49	7	6	12	7	7	13	10	10	27	100	33010	4345
50-99	9	6	12	7	6	13	10	10	27	100	15171	1985
100-199	10	9	12	10	8	12	11	9	18	100	6178	933
200-499	9	7	14	11	9	13	11	6	20	100	3424	561
500-plus	17	5	12	12	10	10	11	5	19	100	946	153
Total	7	6	10	7	6	11	13	13	28	100	359719	27110

Table A4: Extent of mismatch between sector-specific product strategy positioning and cross-sector skill levels, analysed by region: private sector establishments with five or more employees, NESS09, (population-weighted)

	PS UQ, Skills UQ	PS UQ, Skills 3Q	PS UQ, Skills below median	PS 3Q, Skills UQ	PS 3Q, Skills 3Q	PS 3Q, Skills below median	PS below median, Skills UQ	PS below median, Skills 3Q	PS below median, Skills below median	Total	Grossed- up n =	Unweighted n =
	<i>% of establishments in sector</i>											
East of England	5	6	11	6	6	11	12	13	29	100	39931	2954
East Midlands	5	6	10	5	7	13	10	12	33	100	29024	2478
London	12	5	5	13	5	6	24	11	18	100	47302	3376
North East	5	5	10	5	6	11	11	14	33	100	15001	1838
North West	6	6	10	6	8	11	12	14	27	100	45520	3499
South East	8	6	10	7	7	12	12	14	26	100	65272	4069
South West	6	6	11	5	6	13	10	13	31	100	43430	3204
West Midlands	6	5	11	6	6	13	9	13	30	100	38504	2943
Yorkshire and Humberside	5	5	9	6	6	10	12	15	32	100	35734	2749
Total	7	6	10	7	6	11	13	13	28	100	359719	27110

Table A5: Extent of mismatch between sector-specific product strategy positioning and cross-sector skill levels, analysed by geographical market focus: private sector establishments with five or more employees, NESS09, (population-weighted)

	PS UQ, Skills UQ	PS UQ, Skills 3Q	PS UQ, Skills below median	PS 3Q, Skills UQ	PS 3Q, Skills 3Q	PS 3Q, Skills below median	PS below median, Skills UQ	PS below median, Skills 3Q	PS below median, Skills below median	Total	Grossed- up n =	Unweighted n =
	<i>% of establishments in sector</i>											
Local	3	4	9	4	6	12	10	16	36	100	121515	8081
Regional	5	4	9	5	5	11	15	13	32	100	55349	4226
National	7	6	10	8	6	12	14	13	24	100	115079	9104
International	14	8	11	11	7	10	13	9	16	100	67776	5699
Total	7	6	10	7	6	11	13	13	28	100	359719	27110

List of previous publications

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Evidence Report 28

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Evidence Report 29

Defining and Measuring Training Activity

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