

Skill shortages, skills utilisation and firm growth in the UK

Geoff Mason

National Institute of Economic and Social
Research, London

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Overview

- Conceptual and definitional issues
- UK survey data on different kinds of skills mismatch
- Do skills mismatches of different kinds constrain firms' choice of product strategy?
(Work carried out for UK Commission for Employment and Skills)
- Do skills mismatches limit firm growth?
- Do skills mismatches intensify as firms seek to move up-market and/or experience rapid growth?
(Work in progress for NESTA, National Endowment for Science, Technology and the Arts; in collaboration with Catherine Robinson and Chiara Rosazza Bondibene)

Can ‘skill shortages’ exist? Why might they persist?

- Economists have traditionally been suspicious of concept of ‘skill shortages’ since they may just reflect some employers’ unwillingness to pay prevailing market wages
- Arrow and Capron (1959): increased demand for skilled workers could produce ‘dynamic shortage’ if firms delay responding to skill shortages with salary increases or are reluctant to incur higher salary costs for existing workers
- Freeman (1971, 1976): even if salaries increase in response to shortages, it may take a long time to educate and train some types of skilled worker
- Haskel and Martin (1993): Many firms respond to skill shortages in other ways apart from raising salaries (eg, increased overtime for existing employees, increased use of subcontractors)
- Valid questions for empirical investigation:
 - Do skill shortages persist over time?
 - How and when do firms respond to them?
 - What are their effects (if any) on firm performance?

Potential skills mismatches at firm level

- Gaps between:
 - Skills sought through recruitment and skills available on external labour market (‘skill-shortage vacancies’)
 - Current skills of workforce and skills required to meet strategic objectives (‘internal skill gaps’)
 - Current skills of workforce and extent of skills utilisation

(Some skills may be under-utilised if firms adopt low-skill product and/or low-skill modes of work organisation)

Survey evidence varies according to the questions that are asked

- Confederation of British Industry (CBI) Industrial Trends Survey asks if ‘constraints on skilled labour’ are likely to limit output in the next four months
- Follow-up investigations show 60% of respondents interpret this question as asking about skilled recruitment difficulties
- Most of remainder interpret it as asking about gaps in skills of existing employees
- National Employers Skill Surveys differentiate clearly between these two types of skill deficiency but choose to ask about firms’ experiences at a single point in time, not over any length of time

NESS evidence on skills mismatches

- 2003-2009: about 3-6% of establishments report skill-shortage vacancies (= hard-to-fill vacancies which are attributable to lack of skills, qualifications and/or work experience)
- 2003-2009: 15-20% of establishments report internal skill gaps (defined as having one or more employees who are not fully proficient in their jobs)
- 2009: Almost 70% of establishments report skill updating needs (defined as at least some of their staff needing to acquire new skills or knowledge over the next 12 months)

Main factors contributing to skill updating needs: private sector establishments with five or more employees, NESS 2009 (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

Investigating the relationship between skills mismatches and product strategy choices

- Summary measure of product strategy derived through factor analysis of indicators of:
 - product quality
 - innovation leadership
 - non-dependence on low prices for competitive success
- This measure of product strategy is strongly positively correlated with skill levels and with exposure to national and foreign markets (as compared to local and regional markets)
- In multivariate analysis, the dependent variable = 1 if establishment is in the upper quartile on product strategy for its own sector; = 0 otherwise
- All else being equal, this indicator of product strategy is found to be positively and significantly related to presence of skill-shortage vacancies and skill updating needs....
- But it is negatively and significantly related to presence of internal skill gaps

Determinants of the probability of being in own-sector upper quartile for product strategy: private sector establishments with five or more employees, NESS 2009 (population-weighted) – Marginal effects (evaluated at sample means)

	(1)	(2)	(3)	(4)	(5)
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]

Controls in place for sector, employment size, geographical market focus, region and single establishment status

Are product strategy choices constrained by skills mismatches?

- Product strategies are restricted to some extent by internal skill gaps
- But skill-shortage vacancies and skills updating needs do not seem to 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
- But what effect do skill levels themselves have on product strategy choices?
- Theory points to a two-way relationship between product strategies and skills:
 - product strategy choices may help dictate future skill requirements
 - BUT product strategy choices may themselves be partly constrained by current availability of skills

Since the relationship between product strategies and skill levels is potentially interdependent, we estimate the following simultaneous equations:

$$(1) \quad Skills_i = \beta_0 + \beta_1 PS_i + \beta_2 Training_i + \beta_3 \sum_k X_{ki} + \varepsilon_1$$

$$(2) \quad PS_i = \beta_0 + \beta_1 Skills_i + \beta_2 \sum_j Mkt_{ji} + \beta_3 \sum_j SkillCon_{ji} + \beta_4 \sum_k X_{ki} + \varepsilon_2$$

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

Three-stage least squares estimates of the determinants of product strategy and skills indices: private sector establishments with five or more employees, NESS 2009, (population-weighted)

	(1A)	(1B)	(2A)	(2B)
Dependent variable:	Product strategy	Skills	Product strategy	Skills
	(Model 1)	(Model 1)	(Model 2)	(Model 2)
Product strategy index		0.1701***		0.1665***
		[0.008]		[0.007]
Skills index	4.3799***		3.5256***	
	[0.517]		[0.542]	
Off- and on-the-job training		0.0094***		0.0136***
		[0.003]		[0.003]
Off-the-job training only		0.0021*		0.0021
		[0.001]		[0.002]
On-the-job training only		0.0017		0.0012
		[0.001]		[0.001]
Regional market focus	0.0222**		0.0362***	
	[0.010]		[0.011]	
National market focus	0.0654***		0.1064***	
	[0.025]		[0.026]	
International market focus	0.1368***		0.2233***	
	[0.052]		[0.054]	
Internal skill gaps			-0.0272***	
			[0.007]	
Skills updating needs			0.0506***	
			[0.013]	

Business strategies and skills utilisation

- Skill *levels* not the same as skill *utilisation*
- Even firms with similar levels of skills may make different choices about how to deploy them
- Product market strategy is only one component of each firm's wider business strategy and its efforts to secure competitive advantage
- Many decisions about product market strategy contribute to overall business strategy along with decisions relating to technology, work organisation and skills utilisation

Investigating the relationship between skills mismatches and firm growth

Preliminary estimates: not for citation or quotation

- NESS 2007 and NESS 2009 data matched separately against Business Structure Database (BSD) 1998-2010 data on firm employment and sales
- In order to carry out regression analyses at firm level, NESS establishments which are part of multi-establishment firms are weighted by their shares of total firm employment in each matched sample
- Assumes that establishments are representative of the firms to which they belong

Product strategies, skills, markets and firm growth

Weighted probit regressions								
Dependent variable: Whether HGF in 2007-10 (Average annual employment growth = 20%+)								
	NESS 09	NESS 09						
Innovation leadership	0.0169***							
	[0.006]							
Product strategy (summary measure)		0.0074**						
		[0.003]						
Skills index	0.0400***	0.0378**						
	[0.015]	[0.015]						
Regional market focus	0.0308***	0.0264**						
	[0.011]	[0.011]						
National market focus	0.0357***	0.0350***						
	[0.009]	[0.009]						
International market focus	0.0215**	0.0222**						
	[0.010]	[0.010]						
Observations	8410	8077						
Log likelihood	-2350	-2240						
Pseudo R sqd	0.09	0.10						
Wald Chi2	462.98	444.59						
Robust standard errors in brackets corrected for clustering on enterprise.								
*** p<0.01, ** p<0.05, * p<0.1								
Models include controls for single-site enterprises, employment size, firm age, sector and region								

How much do skills mismatches constrain firm growth?

- Apparently confined to cross-sectional analysis of matched BSD-NESS data due to lack of information which could enable matching of establishments between NESS 07 and NESS 09
- How to take advantage of BSD time series data on employment and sales?
- Combine Coad (2010) reduced form vector auto-regression (VAR) models with Black and Lynch (2001) two-stage estimation methodology:
 - (1) Estimate relationship between employment (sales) growth and lagged sales (employment) growth between 2007-10, taking account of firm fixed effects (unobserved time-invariant heterogeneity)
 - (2) Regress residuals from these equations on 2007 skills mismatch measures from matched BSD-NESS07 and BSD-NESS09 datasets

Do skill deficiencies restrict firm growth performance?

- Skill-shortage vacancies (SSVs): whether have at least one hard-to-fill vacancy attributable to lack of skills, qualifications and/or work experience
- Internal skill gaps (ISGs): whether have one or more employees who are not fully proficient in their jobs
- For NESS 07 cross-sectional estimates suggest that faster-growing firms are more likely than slower-growing firms to experience SSVs in both 2007 and 2009 ==> fast-growing firms (heavy recruiters) are not held back by SSVs
- No sign of ISGs in faster-growing firms at beginning of period under examination but they start to appear by 2009 ==> do they reflect changing skill requirements as a result of adjustment to rapid growth?
- Two-stage estimates controlling for firm fixed effects support these inferences in relation to SSVs but not in relation to ISGs

Skill-shortage vacancies, internal skill gaps and firm growth (cross-sectional estimates)

Weighted quantile regressions				
Dependent variable: Average annual employment growth rate, 2007-10				
	NESS 07			
	25th percentile	50th percentile	75th percentile	95th percentile
Skill-shortage vacancies	1.1364***	0.5332***	1.4492***	4.3474*
	[0.401]	[0.195]	[0.416]	[1.744]
Internal skill gaps	0.8852***	0.3933***	0.1230	-0.0714
	[0.269]	[0.130]	[0.277]	[1.160]
Training (summary measure)	0.9272***	0.2977***	0.7956***	1.4422***
	[0.126]	[0.061]	[0.130]	[0.561]
	NESS 09			
	25th percentile	50th percentile	75th percentile	95th percentile
Skill-shortage vacancies	1.4895*	1.4167***	1.5627**	7.3233**
	[0.790]	[0.429]	[0.718]	[2.897]
Internal skill gaps	0.5278	0.5010***	0.9058***	2.8132**
	[0.334]	[0.179]	[0.297]	[1.194]
Training (summary measure)	0.8630***	0.6096***	1.2752***	1.5033**
	[0.162]	[0.087]	[0.144]	[0.585]
Robust standard errors in brackets corrected for clustering on enterprise.				
*** p<0.01, ** p<0.05, * p<0.1				
Models include controls for single-site enterprises, employment size, firm age, sector ar				

Skill-shortage vacancies, internal skill gaps and firm growth (controlling for firm fixed effects) – NESS 07

Weighted two-stage OLS regression estimates						
	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable:	Employment growth rate	Sales growth rate	Residuals from (1)	Residuals from (2)	Residuals from (1)	Residuals from (2)
	BSD 2007-10	BSD 2007-10	NESS 07	NESS 07	NESS 07	NESS 07
Employment growth (t-1)	-0.0172***	0.1632***				
	[0.004]	[0.005]				
Sales growth (t-1)	0.0674***	-0.1734***				
	[0.003]	[0.004]				
Employment growth (t-2)	-0.0218***	0.1003***				
	[0.004]	[0.005]				
Sales growth (t-2)	0.0460***	-0.0936***				
	[0.003]	[0.004]				
Skill-shortage vacancy			0.0119**	0.0166**	0.0101*	0.0118
			[0.005]	[0.007]	[0.006]	[0.007]
Internal skills gap			-0.0006	0.0021	-0.0018	0.0005
			[0.003]	[0.005]	[0.004]	[0.005]
Training provision (summary measure)					0.0065***	0.0091***
					[0.002]	[0.002]
Observations	60,688	60,688	58,495	58,464	54,117	54,087
Adj R2	0.0103	0.0412	0.005	0.0091	0.0052	0.0095
SEE	0.3324	0.4417	0.3305	0.4393	0.3278	0.4378
Robust standard errors in brackets corrected for clustering on enterprise.						
*** p<0.01, ** p<0.05, * p<0.1						
Second-stage models include controls for single-site enterprises, employment size, firm age, sector and region						

Skill-shortage vacancies, internal skill gaps and firm growth (controlling for firm fixed effects) – NESS 09

Weighted two-stage OLS regression estimates						
	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable:	Employment growth rate	Sales growth rate	Residuals from (1)	Residuals from (2)	Residuals from (1)	Residuals from (2)
	BSD 2007-10	BSD 2007-10	NESS 09	NESS 09	NESS 09	NESS 09
Employment growth (t-1)	-0.0237***	0.1955***				
	[0.004]	[0.005]				
Sales growth (t-1)	0.0694***	-0.1886***				
	[0.003]	[0.004]				
Employment growth (t-2)	-0.0236***	0.1117***				
	[0.004]	[0.005]				
Sales growth (t-2)	0.0388***	-0.1000***				
	[0.003]	[0.004]				
Skill-shortage vacancy			0.0153*	0.0206	0.0149*	0.0201
			[0.009]	[0.013]	[0.009]	[0.013]
Internal skills gap			0.0045	0.0062	0.0034	0.005
			[0.004]	[0.004]	[0.004]	[0.004]
Training provision (summary measure)					0.0040**	0.0039*
					[0.002]	[0.002]
Observations	54,526	54,526	52,657	52,640	52,280	52,263
Adj R2	0.0102	0.0543	0.0092	0.0126	0.0093	0.0126
SEE	0.3187	0.4176	0.3183	0.4152	0.3185	0.4157
Robust standard errors in brackets corrected for clustering on enterprise.						
*** p<0.01, ** p<0.05, * p<0.1						
Second-stage models include controls for single-site enterprises, employment size, firm age, sector and region						

Summary and assessment

- Fast-growing firms are more likely than slower-growing firms to be pursuing ‘high-end’ skill- and innovation-intensive product strategies
- Fast-growing firms achieve rapid growth in spite of being more likely (as heavy recruiters) to experience skill shortage vacancies
- No solid evidence of firm growth being restricted by internal skill gaps (though internal skill gaps do restrict product strategy choices to some extent)
- Reported skill updating needs are signs of dynamic approach to skills resourcing rather than constraints on growth