Tata Steel

Understanding the economic contribution of the Foundation Industries

January 2014

Final report

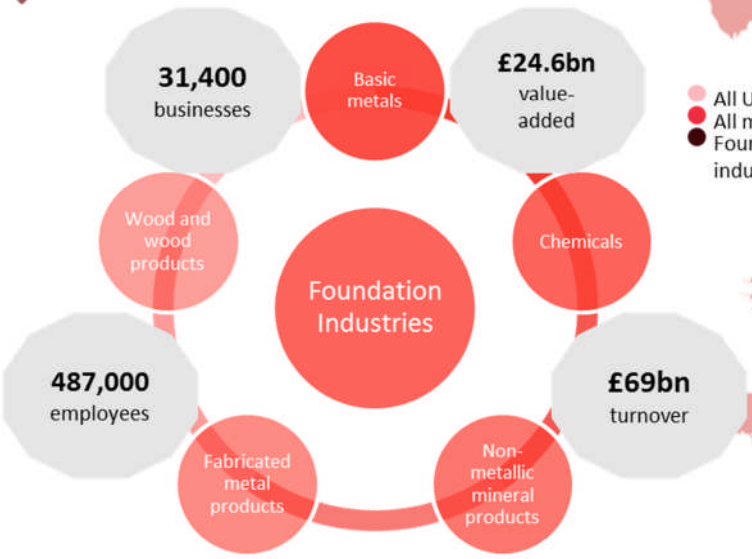
pwc

Contents

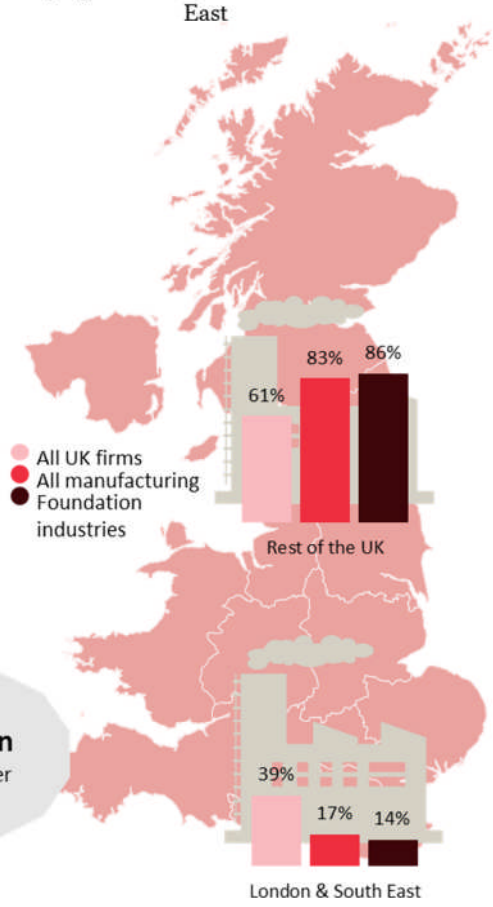
The Foundation Industries are a distinctive group of sectors which supply materials to multiple, strategic manufacturing and construction supply chains

An important part of the UK manufacturing sector

- **25%** of manufacturing businesses
- **17%** of manufacturing value added
- About **30%** of UK trade in goods
- Productivity **136%** of UK average



Particularly significant outside London and the South East



Supporting the UK's 'industrial commons'

- Invest £1,277 per employee in R&D
- 51% of R&D is applied research
- 17% of manufacturing capital expenditure
- 323,000 employees trained
- £3,634 investment in skills development per employee

Strong supply chain linkages with each other and strategic sectors

33% of purchases from other Foundation Industries

Multiplier effect 2-4 times value added

28% of purchases by motor vehicles

27% of purchases by aerospace

17% of purchases by construction

Executive summary

Background

Tata Steel UK Limited commissioned PricewaterhouseCoopers LLP (PwC) to assess the current and potential future economic contribution of the Foundation Industries to the UK economy. The scope of this work is set out in our engagement letter dated 23rd October 2013.

Our analysis has drawn on three primary data sources:

- The latest data from National Statistics;
- Various other official publications; and
- Other published reports.

PwC has not undertaken any assurance or audit of the underlying data that have been used.

What are the Foundation Industries?

The Foundation Industries are distinctive because they supply materials to multiple, strategic manufacturing and construction supply chains. Our evidence-based approach to identifying them filters all 106 sectors of the economy[1] based on four criteria, namely whether they:

- Are part of the manufacturing sector;
- Sell a higher than average proportion of their output for intermediate consumption (i.e. as business inputs);
- Sell a lower than average proportion of their output for final consumption (i.e. to households or to the public sector); and
- Sell more than three quarters of their output to the manufacturing or construction industries.

On this basis, we have defined the Foundation Industries as the manufacture of:

- Basic metals;
- Chemicals and chemical products;
- Other non-metallic mineral products (which includes glass and cement);
- Fabricated metal products (except machinery and equipment); and
- Wood and products of wood and cork (except furniture).

In practice, not all the sub-sectors within these (2-digit) level sectors share the same distinctive characteristics. For example, some sell a high proportion of their output for final consumption. We have, therefore, reviewed the sub-sectors to identify those which are less typical of the Foundation Industries and have excluded them from the analysis where the data permit.

Current contribution

Direct contribution

In 2012, nearly 31,400 businesses employing 487,000 people formed the Foundation Industries in the UK. These employees represented 20% of total UK manufacturing employment. Together, the turnover of these businesses was close to £69bn and they generated Gross Value Added (GVA) worth £24.6bn, which was 17% of GVA arising from manufacturing and 3% of the UK economy as a whole. GVA per employee was 36% higher than the UK as a whole (excluding financial services).

[1] These sectors are defined largely at 2-digit level based on the 2007 Standard Industrial Classification.

On average, businesses in the Foundation Industries are smaller than those in manufacturing. This, however, masks important difference between the sub-sectors: businesses in both the chemicals and metals sectors are, on average, much larger.

The Foundation Industries are present across the UK but make a proportionally larger direct economic contribution outside London and the South East relative to other sectors.

Contribution to supply chains

The Foundation Industries have strong supply chain linkages with each other as well as several sectors which are the focus of the Government's Industrial Strategy. In 2011, they supplied significant shares of the purchases:

- 28% of purchases by manufacturers of motor vehicles;
- 27% of purchases by manufacturers of aerospace; and
- 17% of purchases by the construction sector.

The Foundation Industries also have a significant multiplier impact on the UK economy through their local supply chains. The scale of these impacts differs significantly between sub-sectors but is 2-4 times the direct contribution in terms of GVA and 2-6 times in terms of employment.

Contribution to the UK's 'industrial commons'[2]

The Foundation Industries make a strong contribution to the embedded knowledge and technology that enhances the efficiency and productivity of capital in the UK. There are two key aspects:

- R&D and innovation: More businesses in the Foundation Industries are engaged in innovation activities than across the UK economy as a whole (and on a par with knowledge intensive service industries). In 2011, the Foundation Industries contributed 6% of the UK's total Business Expenditure on Research and Development (BERD) and invested proportionately more of their capital expenditure in R&D than the manufacturing sector as a whole.
- Skills: In 2011, the average Foundation Industry firm provided more training days to each employee it trained.

Our case studies also demonstrate how firms in the Foundation Industries are improving the UK's environmental sustainability, both in the use of their products and their process efficiencies.

Recent economic performance

Following the onset of the global economic crisis in 2007, the Foundation Industries in the UK initially suffered a sharper fall in GVA than manufacturing (23% compared with 12% between 2008 and 2009) but both have seen a broadly similar rate of recovery in the period 2009-2012: nevertheless, in 2012, the GVA of the Foundation Industries remained lower than in 2008.

The products of the Foundation Industries made up around 30% of total UK exports and imports in 2012.

The changing economic and policy landscape

Businesses in the Foundation Industries face a rapidly changing business environment due to developments in industrial policy, both nationally and in the European Union (EU), and four 'global megatrends' that are reshaping the world economy. Some of these are particularly important for the Foundation Industries given their position within strategic supply chains and a highly global business context. All present both opportunities and challenges for the Foundation Industries to increase their significant contribution to the UK.

[2] The term 'Industrial commons' was coined by Pisano and Shih to describe geographically rooted "collective R&D, engineering and manufacturing capabilities that sustain innovation." Restoring American Competitiveness, Harvard Business Review, July-August 2009.

Structural reform in the UK

The Government's 'Plan for Growth'[3] set out a programme of structural reforms intended to remove barriers to growth for businesses and enable UK businesses to compete successfully in a 'global race'. At the same time, the Government is looking to 'rebalance' the UK economy by reducing dependence on the public sector and ensure that "success and prosperity are spread more evenly across regions and industries"[4] .

The Government's Industrial Strategy[5] focuses on three groups of sectors – advanced manufacturing, knowledge based and enabling – where it believes it can make the biggest difference. It does not focus on the Foundation Industries.

EU policy

The EU has also developed a proactive approach to industrial policy which has some important similarities with that of the UK Government, but also some significant differences; for example, the EU's policy sets a target for manufacturing's share of the economy.

Shifts in global economic power

Economic power is expected to continue to shift away from the developed economies to the emerging ones. This should create increased export opportunities for UK businesses that can supply goods and services to these emerging markets competitively, although European and North American markets are expected to remain important. It will, however, increase international competition from suppliers based in the emerging economies as they move up the value chain into higher value activities and industries. Potentially, this may fragment the value chain. Whilst, this could put pressure on lower skill activities undertaken in the UK[6] it may lead some firms to "repatriate" supply chains back to the UK because of rising labour, energy and transport costs in low cost/emerging economies as well as concerns about (poor) quality control, supply chain risks and advantages associated with co-locating R&D and production.

Technological breakthroughs

Diverse new technologies will continue to transform the landscape. Whilst the cost of their development will vary across technologies and between sectors, the pace of their development is expected to be rapid and success will depend on effective collaboration. For businesses in the Foundation Industries, as in other sectors, the ability to innovate successfully will be the key to growth if they are to differentiate themselves from their competitors in emerging economies. They will need to find ways to keep at the forefront of ongoing technological developments (for example, through greater exposure to international markets)[7] and exploit (any) first mover advantage.

Resource scarcity & climate change

Environmental factors such as climate change, increasing volatility in the supply of energy and raw materials and growing consumer demand for more environmentally attractive products are expected to continue to reshape industries. They will have a direct impact on firms in the Foundation Industries as they result in:

- Greater competition for resources;
- Disruption of international supply chains;
- Increased pressure for transparency; and

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[3] Department for Business & Innovation & Skills and HM Treasury, The Plan for Growth, 2011.
[4] Speech by the Prime Minister on Coalition Strategy for Growth, May 2010 (see https://www.gov.uk/government/speeches/transforming-the-british-economy-coalition-strategy-for-economic-growth).
[5] Speech by Secretary of State for Business, Innovation & Skills on Industrial Strategy: Cable outlines vision for future of British industry, 2012 (see http://www.ubmfuturecities.com/author.asp?section_id=242&doc_id=525953).
[6] Department for Business, Innovation & Skills, Industrial Strategy: UK Sector Analysis, BIS Economics Paper No. 18, 2012.
[7] Department for Business, Innovation & Skills, Manufacturing in the UK: An economic analysis of the sector. BIS Occasional Paper No. 10A, 2010.

- More environmental regulation (including pricing of ecosystem services)[8] .

Demographic shifts

The ageing of the UK workforce expected in the coming years is predicted to lead to significant workforce shortages in the period to 2020 and beyond as businesses need to replace (or retain) their retiring workers. The manufacturing sector as a whole is particularly vulnerable, with two of the most vulnerable sub-sectors being within the Foundation Industries: basic metals and fabricated metal products[9] .

Summary of strengths and weaknesses and opportunities and threats

The table below summarises our assessment of the current strengths and weaknesses of the Foundation Industries in the UK together with the key opportunities and threats they face.

Strengths and weaknesses of the Foundation Industries

Theme	***Strengths***	***Weaknesses***
Size & structure	• Significant proportion of manufacturing industry • Geographically dispersed, especially outside London and the South East	• Smaller than those in manufacturing
Performance	• Higher productivity than the economy as a whole • Responsible for around one fifth of manufacturing investment • Compete effectively in international markets • Invest in more training days per employee than other parts of manufacturing	• Less productive than manufacturing as a whole
Links with rest of economy	• Closely linked to each other: around a third of purchases are from other Foundation Industries • Closely linked to sectors which are the focus of BIS' Industry Strategy (i.e. the automotive, aerospace and construction industries)	
	Opportunities	***Threats***
Shifts in global economic power	• Rapid growth in BRICs and other emerging markets • Rising costs in emerging economies reduce competitive threat	• Competition from lower cost producers • Competition for funds for investment
Technological breakthroughs	• Emergence of new materials • Decentralised/distributed production	• More rapid and effective innovation by (new) competitors

[8] The Government Office for Science/Foresight, The Future of Manufacturing: A new era of opportunity and challenge for the UK: Summary Report, 2013.

[9] Department for Business, Innovation & Skills, Manufacturing in the UK: An Economic Analysis of the Sector, 2010.

	Opportunities	*Threats*
Resource scarcity & climate change	• Improved competitiveness from greater resource efficiency • Resource efficient applications of products	• Higher cost of materials • Vulnerability of supply chains • Enhanced environmental regulation
Demographic shifts	• Experience of opportunities and challenges of ageing workforce	• Age profile adds pressure on replacing workers with the right combination of technical and commercial skills

Implications

How successful Foundation Industries can contribute to UK success

The Foundation Industries exhibit some of the characteristics that the Government has identified as indicative of an ability to contribute to economic success through their value added and productivity based on their use of technology, innovation, investment and a UK-wide footprint.

The Foundation Industries potentially have a significant role to play in enabling the UK to succeed in the global race and achieving economic rebalancing. Their ability to do so depends on being able to build on their strengths to realise the opportunities whilst addressing the threats they face.

The final part of our report considers what businesses in the Foundation Industries need to do and what policy makers can do to support them.

How businesses in the Foundation Industries can deliver success

Businesses in the Foundation Industries are already taking steps to ensure that they can compete successfully on the global stage and support rebalancing the economy as our case studies illustrate:

- Tata Steel is working closely with its partners in the automotive sector to support innovation and the development of a low carbon economy;
- Pilkington has invested in the most technically advanced glass coater in the UK in order to manufacture high performance energy efficient glass; and
- The chemical industries have developed the Gold Standards Skills Framework to support skills development across the sector.

How policy makers can support the Foundation Industries

Working alone, the Foundation Industries are unlikely to succeed because of important market failures, for example externalities (e.g. in relation to skills, the spillovers from technological advances and developing a low carbon economy) and information failures (e.g. in relation to trade). Moreover, as various recent reports on the role of industrial policy have noted, there is an increasing need for policy to be systems based with government working in partnership with business to achieve the necessary co-ordination.

Government policies can help the Foundation Industries to realise the opportunities and respond to the threats in five broad ways:

- Supporting the strengthening of supply chains, including through strategic approaches to public sector procurement.
- Creating a level playing field which enables businesses in the Foundation Industries to compete effectively in global markets and makes the UK an attractive location for inward investment.
- Providing effective support for exporters and attracting inward investment.
- Developing the 'industrial commons' by working in partnership with business to encourage innovation along the value chain, resource efficiency and skills development.
- Promoting a co-ordinated, holistic approach to policy support.

Effective joint action could bring benefits to:

- The Foundation Industries directly and their suppliers, particularly given their proportionately greater influence outside London and the South East.
- The customers of the Foundation Industries which include businesses in sectors at the heart of the current Industrial Strategy.
- The UK as a whole by strengthening the UK's 'industrial commons' by sustaining innovation and skills development.

Introduction

Background

Tata Steel UK Limited commissioned PricewaterhouseCoopers LLP (PwC) to assess the current and potential future contribution of the Foundation Industries to the UK economy. The scope of this work is set out in our engagement letter dated 23rd October 2013.

Scope of analysis

The focus of the analysis is on the economic contribution of the Foundation Industries. Although the Foundation Industries have not been formally defined previously, they are distinctive because they supply materials to multiple, strategic supply chains (e.g. automotive, aerospace and construction). As such, they play an important role in enabling the UK to develop and sustain a modern manufacturing sector.

This analysis considers the economic contribution of the Foundation Industries in terms of their:

1. Direct economic contributions – including the direct Gross Value Added (GVA)[10] and employment they generate, and the investment in research and development (R&D) and skills development they fund.

2. Indirect economic contributions – the contribution of the Foundation Industries in terms of the GVA and employment generated by their suppliers.

3. Induced economic contributions – the contribution of spending on goods and services by employees working in the Foundation Industries and their suppliers which can also be measured and expressed in terms of GVA and employment.

4. Wider economic contributions through the benefits they bring to their customers and to society more generally.

The analysis covers the gross rather than the net contribution. It assesses the overall economic contribution attributable to the Foundation Industries.

The primary data sources for this analysis are the latest data from national statistics, various other official publications and other published reports. PwC has not undertaken assurance or audit of any of the underlying data that have been used.

Report structure

The rest of this report is structured in four further sections as follows:

- Section 2 defines the Foundation Industries;
- Section 3 examines the recent contribution of the Foundation Industries to the UK economy;
- Section 4 explores the future role and challenges faced by the Foundation Industries in the UK; and
- Section 5 considers the implications of the findings.

An appendix provides further supporting detail on the methodology used to define the Foundation Industries.

[10] Gross Value Added (GVA) measures the value of goods and services produced via the activity of firms, sectors or whole economies

What are the Foundation Industries?

Summary

The Foundation Industries are manufacturing sectors which serve multiple strategic manufacturing and construction supply chains.

They are defined as those sectors that sell a higher than average proportion of their output as business inputs and less for final consumption; they sell more than three quarters of their output to the manufacturing or construction industries.

They are manufacturers of metals, chemicals, non-metallic mineral products, metal fabrications and wood products.

One of the distinctive features of the Foundation Industries is that they sit at the base of multiple, diverse manufacturing and construction supply chains. We have used an evidence based approach to identify each of them based on National Statistics' latest Supply and Use Tables for 2011[11] which provide data showing where 106 sectors in the UK economy buy their inputs and sell their outputs[12] .

Effectively, we have filtered the sectors of the economy on the basis of four criteria, namely whether they:

- Are part of the manufacturing sector;
- Sell a higher than average proportion of their output for intermediate consumption (i.e. as business inputs);
- Sell a lower than average proportion of their output for final consumption (i.e. to households or to the public sector); and
- Sell more than three quarters of their output to the manufacturing or construction industries.

On this basis, we have defined the Foundation Industries as the manufacture of:

- Basic metals (SIC 24);
- Chemicals and chemical products (SIC 20);
- Other non-metallic mineral products (including glass and cement) (SIC 23);
- Fabricated metal products; except machinery and equipment (SIC 25); and
- Wood and products of wood and cork (except furniture) (SIC 16).

In practice, not all the sub-sectors within these 2-digit level sectors share the same characteristics. For example, some sell more of their output for final consumption. We have, therefore, reviewed the sub-sectors at the 4 and 5-digit level to identify those which are less typical of the Foundation Industries. The results of this assessment are summarised in Appendix 1 which also provides further details of our approach to identifying the Foundation Industries.

[11] National Statistics, 'Supply and Use Tables 1997-2011', 2013.

[12] These sectors are defined largely at the 2-digit level based on the 2007 Standard Industrial Classification.

Current economic contribution

Introduction

This Section profiles the Foundation Industries by describing:

- Their current scale and structure;
- Their recent economic performance;
- Their economic linkages with the rest of the UK economy; and
- Their strengths and weaknesses.

Summary

The Foundation Industries comprise nearly 31,400 firms employing 487,000 people and generating 17% of manufacturing GVA.

Their productivity is greater than that of the UK economy as a whole, but they are less productive than other manufacturing sectors.

The Foundation Industries were responsible for 17% of manufacturing investment in 2012; their investment in research and development (R&D) is higher than the UK average, but lower than the average for manufacturing firms.

They provide more training days per employee than other sectors and their investment in skills development is broadly the same per trained employee.

The products of the Foundation Industries made up around 30% of total UK exports and imports of goods in 2012.

The Foundation Industries are present across the UK but employment is particularly concentrated in Yorkshire and the Humber and the West Midlands.

The Foundation Industries have strong supply chain linkages with each other as well as several sectors identified in the Government's Industrial Strategy (e.g. construction, automotive and aerospace).

Scale

In 2012, nearly 31,400 businesses employing 487,000 people formed the Foundation Industries. Together, their turnover was close to £69bn and they generated GVA worth £24.6bn, which was 17% of the GVA arising from manufacturing and 3% of that for the UK economy as a whole (see Table 1).

Table 1: Contribution of the Foundation Industries to manufacturing and the UK economy (2012)

	Foundation Industries	Foundation Industries as % of Manufacturing	Foundation Industries as % of UK economy
Number of enterprises	31,398	25%	2%
Employment	487,000	20%	2%
GVA	£24.6bn	17%	3%
Turnover	£69.1bn	13%	2%

Source: National Statistics, Annual Business Survey, 2012

Note: The Foundation Industries are defined at the 4 digit SIC level (2007)

Structure

Table 2 compares the average size of businesses in the Foundation Industries with that of manufacturing as a whole in 2012. On average, businesses in the Foundation Industries are smaller than their counterparts in manufacturing in terms of the number of employees, GVA and turnover. This, however, masks important differences between the sub-sectors which make up the Foundation Industries: businesses in both the chemicals and metals sectors are, on average, much larger than those in manufacturing as a whole, whereas those involved in wood and wood products and metal fabrication are significantly smaller.

Table 2: Structure of the Foundation Industries and all manufacturing (2012)

	Employees per enterprise	GVA per enterprise (£m)	Turnover per enterprise (£m)
Wood and wood products	9	0.4	1.0
Basic chemicals	52	5.5	19.2
Other non-metallic minerals	44	1.6	5.5
Basic metals	54	2.9	11.0
Fabricated metal products	11	0.5	1.2
Foundation Industries	16	0.8	2.2
All manufacturing	20	1.2	4.2
Foundation Industries as a % of manufacturing	80%	66%	53%

Source: National Statistics, Annual Business Survey – Section C: Manufacturing, 2012

Note: The Foundation Industries are defined at the 4 digit SIC level (2007)

Analysis of the Foundation Industries by business size shows that the overall profile is broadly the same as that of manufacturing industry (see Table 3): about two thirds of businesses are micro-businesses (with less than 10 employees) and less than 10% have 50 or more employees. More businesses in the Foundation Industries, however, are small (with 10-49 employees) than in the economy as a whole, where there are more micro-businesses.

Important differences exist, however, between the sub-sectors:

- A smaller proportion of micro-businesses is engaged in the manufacture of basic chemicals and metals;
- The highest proportion of large businesses is in the basic chemicals sector; and
- Over 95% of businesses involved in the manufacture of wood and wood products are micro- or small-businesses.

Table 3: Analysis of business size in the Foundation Industries, manufacturing and the UK economy (% of businesses, 2013)

	Micro (1-9 employees)	***Small (10-49 employees)***	***Medium (50-249 employees)***	***Large (250 or more employees)***
Wood and wood products	76%	20%	3%	0%
Basic chemicals	41%	35%	19%	5%
Other non-metallic minerals	60%	29%	8%	2%
Basic metals	47%	35%	15%	3%
Fabricated metal products	66%	29%	5%	0%
Foundation Industries	67%	27%	6%	1%
All manufacturing	67%	25%	7%	1%
UK	82%	15%	3%	1%

Source: Department for Business, Innovation & Skills, Population Estimates for the UK and Regions, 2013

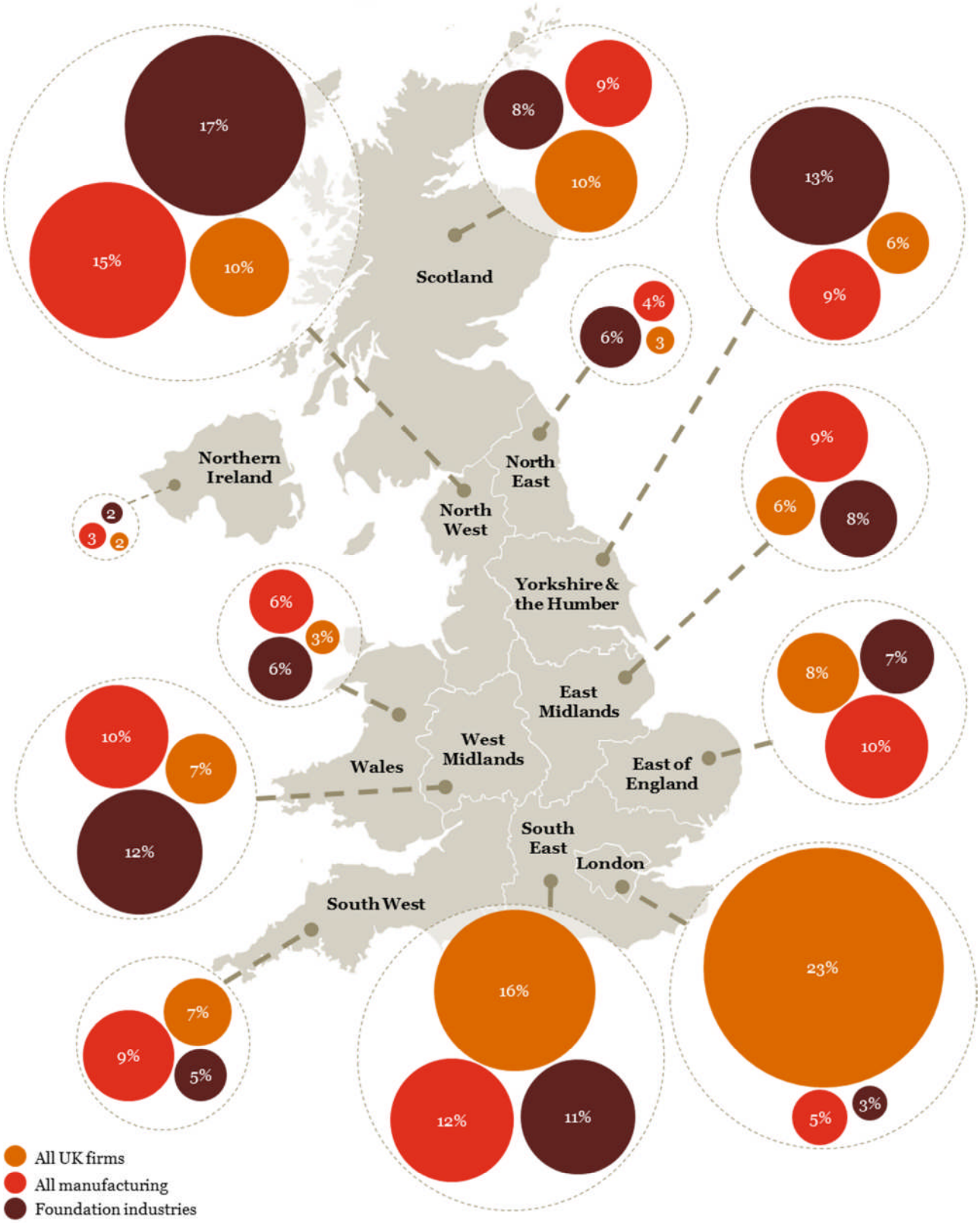
Note 1: The Foundation Industries are defined at the 3 digit SIC level (2007)

Note 2: Totals may not sum to 100% due to rounding.

Figure 1 shows the regional distribution of GVA arising from the Foundation Industries compared with manufacturing and the economy as a whole in 2011 (the latest year for which data are available). The Foundation Industries are most heavily concentrated in the North West, Yorkshire and the Humber and the West Midlands, and are least prevalent in Northern Ireland[13] .

[13] National Statistics, Annual Business Survey – Regional Results, 2011. The regional results for 2012 were not available at the time of writing this report.

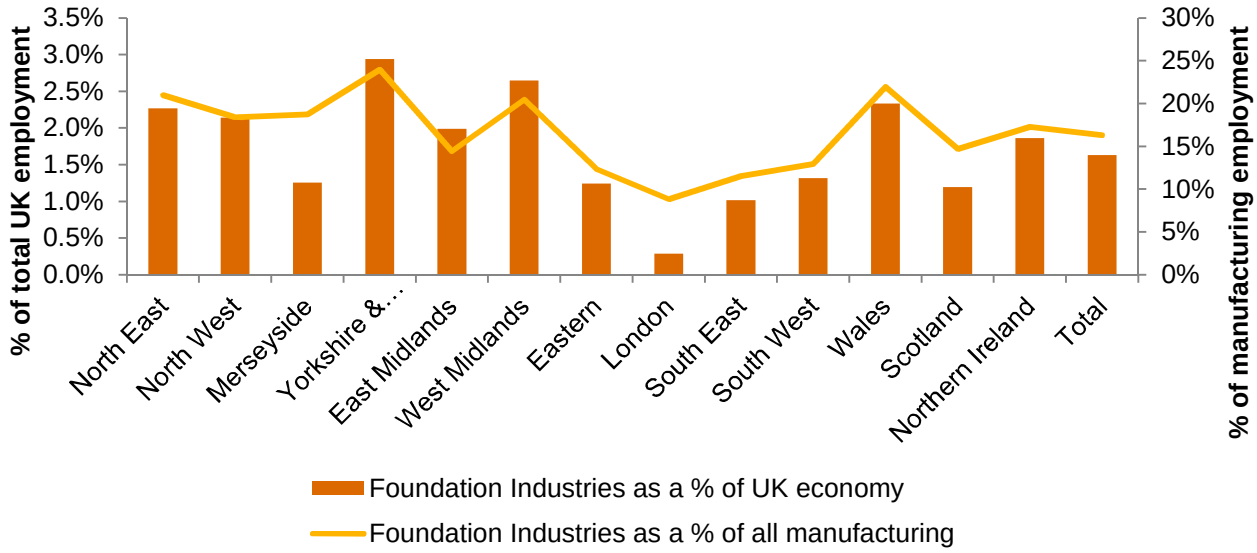
Figure 1: Share of GVA of the Foundation Industries, manufacturing and UK economy by region (2011)



Source: National Statistics, Annual Business Survey Regional Results, 2011
Note 1: The Foundation Industries are defined at the 2 digit SIC level (2007)
Note 2: Some 2011 regional level information has been suppressed to avoid disclosure (i.e. data for all manufacturing in the East and South East of England). The most recent year for which GVA data are available for these regions is 2008 when the East accounted for 10% of total manufacturing GVA and the South East accounted for 12%. We have, therefore, assumed that the share of GVA generated in these regions has not changed since 2008.

Figure 2 shows that the proportion of the total workforce employed in the Foundation Industries in 2012 was highest in Yorkshire and the Humber, the West Midlands and Wales (supporting 3%, 3% and 2% of total employment respectively).

Figure 2: Share of employment in the Foundation Industries by region (2012)



Source: National Statistics, Annual Population Survey 2012

Note: The Foundation Industries are defined at the 3 digit SIC level (2007)

Geographical distribution of the Foundation Industries

Recent analysis for the Energy Intensive Users Group and the Trades Union Congress describes the geographical distribution of some of the sub-sectors which make up the Foundation Industries. It highlights the influence of proximity to markets on location (because of transport costs) and identifies important concentrations of Foundation Industries:

- Clay quarries for the ceramics industry are concentrated in the South Downs, East Midlands, West Midlands and Yorkshire.
- Yorkshire is a centre for refractory manufacturers.
- Major concentrations of chemicals manufacturers can be found in the South West, North East, Yorkshire and Humberside and Scotland.
- Much of the mass production of glass is undertaken in Yorkshire and the North West.
- The steel industry is concentrated in the North East and Wales: Scunthorpe, Port Talbot and Teesside are the three integrated steelmaking sites on the UK map with secondary steelmaking at Sheffield, Rotherham, Cardiff, Sheerness and Newport.
- Non-ferrous metal manufacturing sites are located predominantly in the Midlands, North West, North East and South Wales.

Source: Orion, Building our low carbon industries: Economic, employment and fiscal benefits of securing the energy intensive industries in the UK, 2012

Recent performance

In this part of the Section, we assess the recent economic performance of the Foundation Industries.

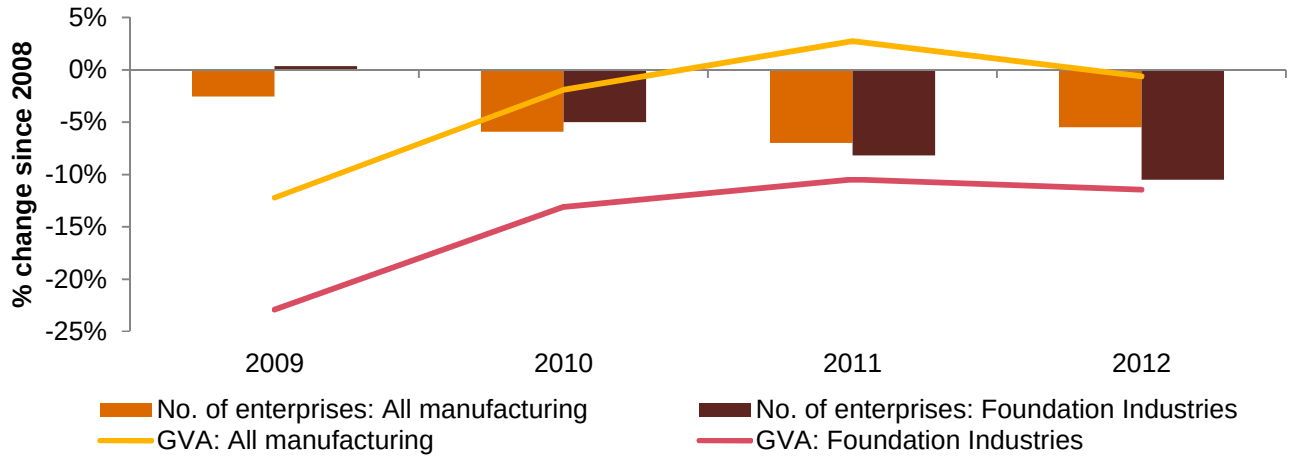
Value added and number of enterprises

Figure 4 compares the performance of the Foundation Industries with that of manufacturing as a whole in terms of GVA and the number of enterprises in the period since the start of the recession in 2008:

- The Foundation Industries initially suffered a sharper fall in GVA than manufacturing (23% compared with 12% between 2008 and 2009). Their subsequent recovery has been slower than that of manufacturing as a whole: in 2012, the GVA of the Foundation Industries remained lower than in 2008.
- Although the number of enterprises in the Foundation Industries increased between 2008 and 2009, it has declined on a similar trajectory to that of manufacturing as a whole since then.

Before 2008 UK GVA increased from £623bn in 2000 to £879bn in 2007[14] . During the same period, the GVA of the Foundation Industries was relatively stable: it increased from £38bn in 2000 to £42bn in 2007)[1516]. During the same period manufacturing GVA fluctuated significantly dropping from £426bn in 2000 to £352bn in 2001, then experiencing another peak at £399bn in 2002 before falling back to £331bn in 2003. From 2003 to 2007 manufacturing GVA continued to rise from £331bn to £452bn (i.e. slightly above its 2000 value)[17] .

Figure 3: Cumulative change in GVA and the number of enterprises in the Foundation Industries and manufacturing (2008-2012)



Source: National Statistics, Annual Business Survey – Section C: Manufacturing, 2012

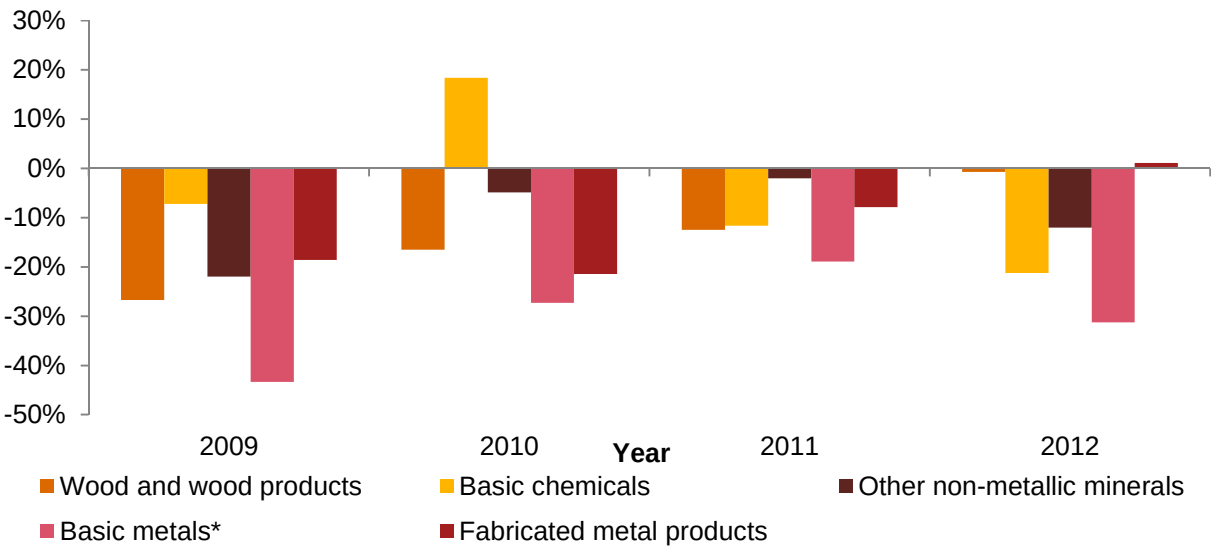
Source: National Statistics, Business Demography, 2012

Note: The Foundation Industries are defined at the 5 digit SIC level (2007).

Analysis of the change in GVA by sub-sector (see Figure 4) reveals that some sub-sectors have been hit harder by the recession than others: the basic metals sub-sector suffered the largest fall in GVA amongst the Foundation Industries.

[14] National Statistics, Annual Business Inquiry Country and Government Office Region by Division (1998-2007), 2010.
[15] The Foundation Industries are described here to the 2 digit SIC based on the previous (2003) SIC.
[16] Care should be taken when comparing data for 2008 onwards with data up to and including 2007 because pre 2008 data are based on SIC (2003) whereas from 2008 onwards data are based on SIC (2007).
[17] National Statistics, Annual Business Inquiry Country and Government Office Region by Division (1998-2007), 2010.

Figure 4: Cumulative change in GVA for the Foundation Industries by sub-sector (2008-2012)



Source: National Statistics, Annual Business Survey – Section C: Manufacturing, 2012

Note 1: The Foundation Industries and individual sub-sectors are defined at the 4 digit SIC code level.
*Note 2: *Data for basic metals includes 24.46 processing nuclear fuel due to suppression issues*

Table 4 compares business births and deaths in the Foundation Industries, all manufacturing industry and the economy as a whole. The Foundation Industries have seen the greatest fall in active firms (23%). This has been driven by 40% fewer births in the Foundation Industries compared to 2008 and 44% more business deaths.

Table 4: Business births and deaths in the Foundation Industries, manufacturing and the UK as a whole (2008-2012)

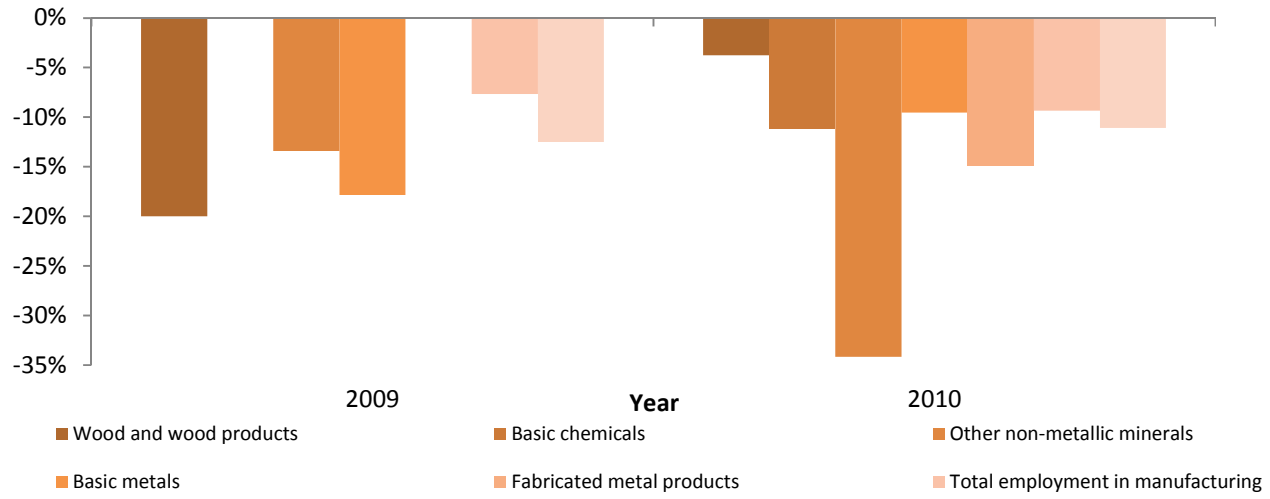
	2008	*2012*	*% change (2008 – 2012)*
Births			
Foundation Industries	2,965	1,790	-40%
All manufacturing	10,595	11,985	13%
UK	267,445	269,565	1%
Deaths			
Foundation Industries	2,145	3,095	44%
All manufacturing	23,480	11,965	-49%
UK	222,555	254,885	15%
Net births			
Foundation Industries	820	-1,305	-259%
All manufacturing	-12,885	20	100%
UK	44,890	14,680	-67%
Active firms			
Foundation Industries	48,620	37,580	-23%
All manufacturing	147,475	142,930	-3%
UK	2,325,770	2,372,960	2%

Source: National Statistics, Business Demography, 2012
Note: The Foundation Industries are defined at the 3 digit SIC level (2007)

Employment

Figure 5 shows the decline in employment since the recession within the Foundation Industries and across manufacturing. Overall, the Foundation Industries experienced a steeper decline in employment from 2008 to 2010 (11%) than manufacturing as a whole (9%). This masks considerable variation between sub-sectors: other non-metallic minerals experienced the largest decline (34%) whilst wood and wood products suffered the smallest decline (4%). Changes to the treatment of working owners in the 2011 Business Register and Employment Survey (BRES) have created a discontinuity in the employment estimates between 2010 and 2011. This means that consistent later data are not available.

Figure 5: Change in employment in the Foundation Industries by sub-sector and manufacturing (2008-2010)



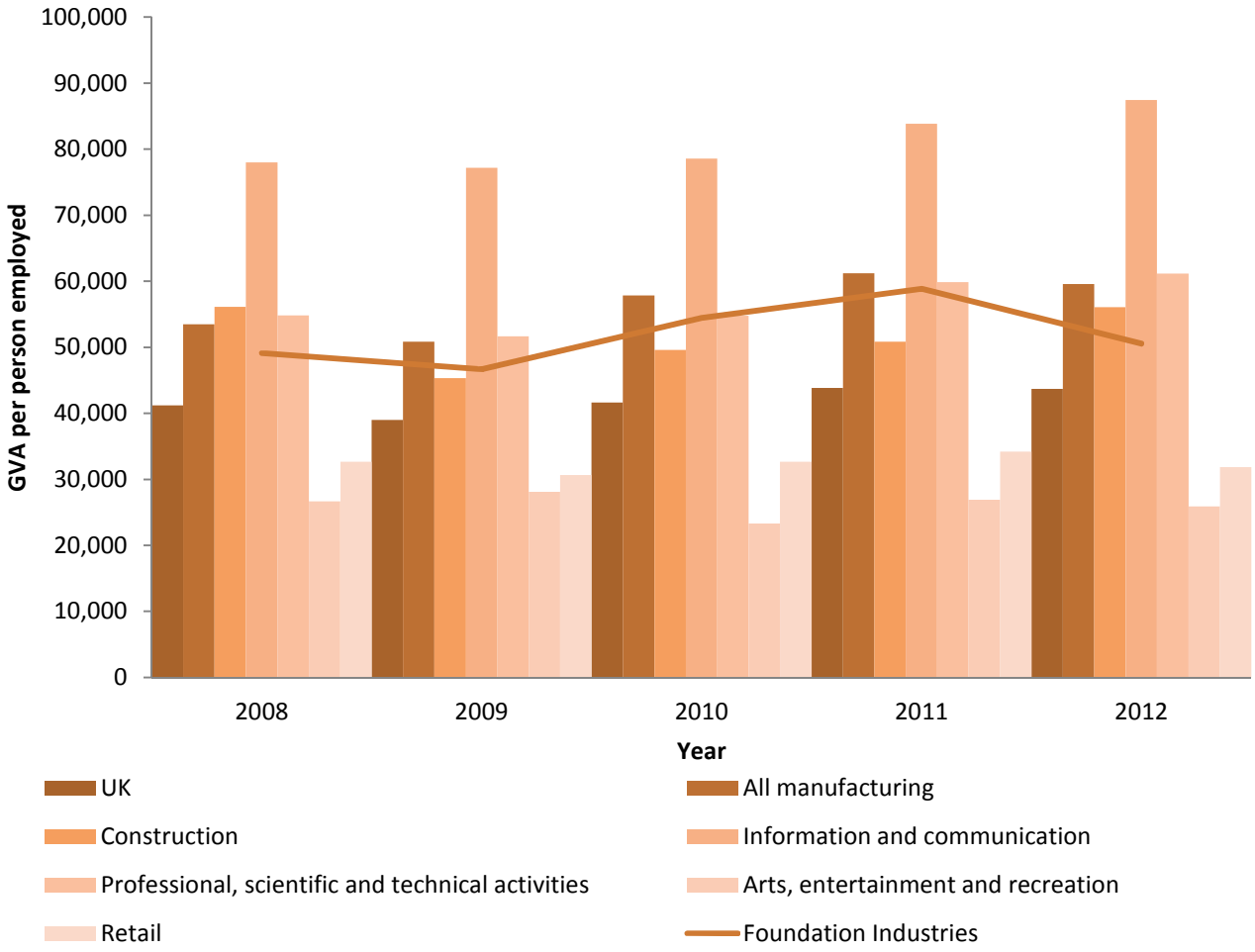
Source: National Statistics, Annual Business Survey – Section C: Manufacturing, 2011

Note 1: The Foundation Industries and individual sub-sectors are defined at the 4 digit SIC code level
Note 2: Total employment – point in time – and Total employment – average during the year – are from the Business Register and Employment Survey (BRES).
Note 3: Data not available for basic chemicals in 2009
Note 4: There was no change in employment in fabricated metal products from 2008 to 2009

Productivity

Figure 6 shows that the productivity of the Foundation Industries (as measured by GVA per person employed) has been consistently higher than the UK average, but less than that of manufacturing as a whole. Although this gap narrowed from 8% in 2008 to 4% in 2011, it widened again to 15% in 2012. Figure 7 also compares the productivity of the Foundation Industries with other sectors of the economy in the UK: it shows the broad spectrum of productivity achieved in different sectors of the economy.

Figure 6: Estimated GVA per person employed (2008-2012)



Source: National Statistics, Annual Business Survey – Section C: Manufacturing, 2012

Note: The Foundation Industries are defined at the 5 digit SIC code level.

Trade

The products of the Foundation Industries made up around 30% of total UK exports and imports of goods in 2012[18].

Table 5 shows the latest estimated import penetration and export to sales ratios for different parts of the manufacturing sector (for 2010). These ratios illustrate the importance of international competitors and markets to businesses in the Foundation industries. In 2010, most Foundation Industry sub-sectors had lower import penetration ratios than manufacturing as a whole (73.7%). They also exported a smaller percentage of their output than manufacturing as a whole although this tells only part of the story since the Foundation Industries are important suppliers of inputs to other manufacturing sectors which have much higher than average ratios (e.g. motor vehicles, trailers and semi-trailers and machinery and equipment) (see *Linkages* below).

Table 5: Import penetration and export sales ratios for UK Manufacturing, (2010)

	Imports/home demand (%)	***Export sales (%)***
Wood and products of wood and cork, except furniture;	37.2	5.5

[18] Extracted from HM Revenue & Customs, UK Trade Info- Statistics-Build your own tables https://www.uktradeinfo.com/Statistics/BuildYourOwnTables/Pages/Table.aspx.

	Imports/home demand (%)	*Export sales (%)*
articles of straw and plaiting materials		
Chemicals and chemical products	94.0	93.4
Other non-metallic mineral products	31.5	20.4
Basic metals	134.2	151.8
Fabricated metal products, except machinery and equipment	39.4	19.8
Food products	28.1	13.1
Beverages	43.4	47.8
Tobacco products	26.0	20.5
Textiles	71.2	56.2
Wearing apparel	114.5	212.9
Leather and related products	117.7	232.0
Paper and paper products	48.7	25.8
Printing and reproduction of recorded media	3.0	0.4
Basic pharmaceutical products and pharmaceutical preparations	229.5	167.9
Rubber and plastic products	46.1	34.3
Computer, electronic and optical products	130.3	168.4
Electrical equipment	86.4	80.1
Machinery and equipment n.e.c.	99.7	99.7
Motor vehicles, trailers and semi-trailers	72.0	63.6
Other transport equipment	94.4	91.3
Furniture	47.2	13.0
Other manufacturing	145.9	178.3
Total	**73.7**	**57.2**

Source: National Statistics, PRODCOM Survey Special Analysis, August 2013 & December 2013

Note 1: Most of these data were produced in response to an ad hoc request in August 2013 for the Annual Abstract of Statistics. Division 07 (Mining of metal ores), Division 19 (manufacture of coke and refined petroleum products) and Division 24 (Manufacture of basic metals) do not form part of this additional analysis. As part of this study, however, we received all available data for Division 24 (Manufacture of basic metals) although some sub-sectors are excluded to avoid disclosure of individual firm level data (24.1 Manufacture of basic iron and steel and ferro-alloys, 24.53 Casting of light metals and 24.54 Casting of other non-ferrous alloys).
Note 2: The Foundation Industries are defined at the 2 digit SIC level.

Investment

In 2012, the Foundation Industries were responsible for 17% of total net capital expenditure by manufacturing industry. On average, businesses in the Foundation Industries invested less per employee than manufacturing or, indeed, the economy as a whole. This reflects the sharp decline in their capital expenditure between 2011 and 2012. Nonetheless, significant differences exist between sub-sectors:

- The average investment per employee in basic chemicals was three times the average for both manufacturing and the economy as a whole; and
- Investment per employee in basic metals was 30% above the UK average.

Table 6: Capital expenditure by the Foundation Industries, manufacturing and UK economy (2012)

Industry	Capital expenditure (£m)	Capital expenditure/ employee (£)	Capital expenditure/GVA (%)
Wood and wood products	106	1,767	4%
Basic chemicals	595	16,528	16%
Other non-metallic mineral products	254	2,920	8%
Basic metals	460	6,479	12%
Fabricated metal products	719	3,086	6%
Foundation Industries	2,134	4,382	9%
Manufacturing	12,777	5,127	9%
UK	108,535	5,007	11%

Source: National Statistics, Annual Business Survey, 2012

Note: The Foundation Industries are defined at the 5 digit SIC code level (2007)

R&D and innovation

In 2011, the Foundation Industries were responsible for 8% of Business Expenditure on Research and Development (BERD) by the manufacturing sector and 6% across the economy as a whole.[19] These proportions have remained fairly stable since 2000. Analysis of the investment in BERD as a proportion of capital expenditure, per employee and as a proportion of GVA shows that the Foundation Industries' invest more than the UK average, but less than the average for manufacturing as a whole (see Table 7). There is, however, significant variation across the sub-sectors: the ferrous metals sector invests more in R&D per employee than manufacturing as a whole. For some sectors, BERD exceeds their capital expenditure because not all R&D expenditure is capitalised.

Table 7: Business expenditure on R&D (2011)

SIC code	Industry	BERD as % of capital expenditure	BERD per employee (£)	BERD as % of GVA
16-18	Pulp, paper and paper products; printing; wood and straw products	3%	86	0%
20	Chemicals and chemical products	39%	5,889	7%
23	Other non-metallic mineral products	18%	625	1%
24510 & 24520	Casting of iron and steel	169%	5,500	12%
244	Non-ferrous metals	93%	3,080	3%
25	Fabricated metal products except	13%	394	1%

[19] National Statistics, Research and Development in UK Businesses, 2011 – Datasets.

SIC code	Industry	BERD as % of capital expenditure	BERD per employee (£)	BERD as % of GVA
	machinery and equipment			
	Foundation Industries	26%	1,277	2%
10-32	Manufacturing	101%	5,000	8%
	UK	16%	815	2%

Source: National Statistics, UK Business Enterprise Research and Development 2011 and National Statistics, Annual Business Survey 2012

Note 1: The Foundation Industries are defined at SIC (2007) as shown in Table 7 including paper products and printing.
Note 2: 2011 employment data are suppressed for casting of iron and steel so we use an average of 2010 and 2012 figures.

The Foundation Industries focus more of their R&D spending on applied research (rather than basic or experimental research) than all manufacturing and the economy as a whole (see Table 8).[20]

Table 8: Type of R&D activity (2011)

SIC code	Industry	Basic research	Applied research	Experimental development	Total
16-18	Pulp, paper and paper products; printing; wood and straw products	*	30%	70%	100%
20	Chemicals and chemical products	3%	50%	47%	100%
23	Other non-metallic mineral products	7%	30%	63%	100%
24510 & 24520	Casting of iron and steel	*	100%	*	100%
244	Non-ferrous metals	+	+	50%	50%
25	Fabricated metal products except machinery and equipment	1%	86%	13%	100%
	Foundation Industries	2%	51%	43%	96%
10-32	Manufacturing	4%	45%	49%	98%
	UK	4%	47%	49%	100%

Source: National Statistics, UK Business Enterprise Research & Development, 2011

Note 1: The Foundation Industries are defined at the 2 digit SIC code (2007) including paper products and printing.
*Note 2: * Denotes nil, figures unavailable or too small to display.*
Note 3: + Denotes disclosive figures.
Note 4: The Foundation Industries are defined at the 2 digit SIC code level (2007).

[20] The OECD defines three different types of research:

- *Basic research* is experimental or theoretical work undertaken primarily to acquire new knowledge of the underlying foundations of phenomena and observable facts, without any particular application or use in view.
- *Applied research* is original investigation undertaken in order to acquire new knowledge. It is, however, directed primarily towards a specific practical aim or objective.
- *Experimental development* is systematic work, drawing on existing knowledge gained from research and/or practical experience, that is directed to producing new materials, products or devices; to installing new processes, systems and services; or to improving substantially those already produced or installed.

Although the UK Innovation Survey (UKIS) does not provide a breakdown of innovation activity for every UK business sector, analysis of those sectors most relevant to the Foundation Industries[21] suggests that businesses are slightly more likely to engage in innovation activity (48% of firms) than those in other manufacturing sectors (45%) and the economy as a whole (37%) (see Table 9).

Table 9: Enterprises engaging in innovation activity by sector (2008-2010)

Sector	***Innovation active (% of firms)***
Foundation Industries: Manufacture of fuels, chemicals, plastic, metals and minerals	48%
Primary sector	52%
Engineering-based manufacturing	59%
Other manufacturing	45%
Construction	31%
Retail & distribution	35%
Knowledge intensive services	46%
Other services	32%
All	37%

Source: Department for Business, Innovation & Skills, UKIS, 2011

[21] The manufacture of fuels, chemicals, plastic, metals and minerals.

Skills

The occupational breakdown of the Foundation Industries is broadly similar to that of manufacturing industry and the UK as a whole (see Table 10).

Table 10: Comparison of occupational breakdown of the Foundation Industries, manufacturing industry and UK economy (2009)

Occupation	***Sector Skills Councils covering the Foundation Industries***	***All manufacturing***	***UK***
Managers and senior officials	19%	20%	16%
Professional occupations	14%	9%	14%
Associate professional and technical	10%	11%	15%
Administrative and secretarial	9%	8%	11%
Skilled trades occupations	23%	22%	11%
Personal service occupations	0%	0%	9%
Sales and customer service occupations	2%	1%	7%
Process, plant and machine operatives	17%	20%	7%
Elementary occupations	7%	9%	11%
Total	100%	100%	100%

Source: UK Commission for Employment and Skills: UK Employment and Skills Almanac 2010.

Note: Data on occupation by industry beyond broad groups (i.e. Sections A-S) are not public available. We have, therefore, used data from the Sector Skills Councils which are most relevant to the Foundation Industries (i.e. Cogent, Proskills and SEMTA).

The Employer Skills Survey (ESS) undertaken by UK Commission for Employment & Skills shows that the average firm in the Foundation Industries provided more training days per employee trained (see Table 11). It also shows that the Foundation Industries invested a broadly similar amount per employee to UK firms more generally and manufacturing as a whole[22]. The Foundation Industries invested relatively more in on-the-job training, but less in off-the-job training than the UK average. Although the data are limited, the ESS suggests significant variations between sub-sectors within the Foundation Industries.

Table 11: Investment in education and training in 2011

Type of investment	***Foundation Industries***	***All manufacturing***	***UK***
No. of employees trained (employees)	10.3	13.2	9.6
Average no. of training days per participant (days)	10.8	7.3	6.7

[22] Including, as appropriate, fees, cost of training centres, equipment and materials, training staff salary costs, travel and subsistence payments, traveling time payments, training organisation levy payments (e.g. to SSCs or Industry Training Boards), equivalent salary cost of staff receiving training (i.e. multiply number of hours spent on training by hourly wage).

Type of investment	*Foundation Industries*	*All manufacturing*	*UK*
Investment per employee trained (£)	3,468	3,634	3,748

Source: UKCES, ESS, 2011

Note 1: The Foundation Industries are defined at the 4 digit SIC code level.
Note 2: The 2011 ESS did not include responses from any firms within the following Foundation Industry sub-sectors: industrial gases (2011); dyes and pigments (2012); other organic basic chemicals (2014); and, of cement, lime and plaster (235).

Table 12 compares the level of formal qualifications held by employees in the Foundation Industries to that of all manufacturing employees and the UK workforce as a whole. Fewer businesses in the Foundation Industries have more than 80% of their total workforce educated to Level 3 (than other parts of manufacturing and the economy as a whole) but more have more than 80% of their workforce educated to Level 4.

Table 12: Proportion of staff with at least Level 3 or 4 qualifications (2011)

Industry	*<20%*	*20-80%*	*>80%*
Proportion of staff with at least a Level 3 qualification (e.g. A Level/ AS Level)			
Foundation Industries	27%	57%	16%
All manufacturing	28%	51%	22%
UK	16%	50%	35%
Proportion of staff with at least a Level 4 qualification (e.g. a Professional Diploma/ Certificate of Higher Education)			
Foundation Industries	55%	26%	19%
All manufacturing	49%	39%	12%
UK	41%	46%	13%

Source: UKCES, ESS 2011

Note 1: Totals may not sum to 100% due to rounding
Note 2: The Foundation Industries are defined at the 4 digit SIC code level.
Note 3: The 2011 ESS did not include responses from any firms within the following Foundation Industry sub-sectors: industrial gases (2011); dyes and pigments (2012); other organic basic chemicals (2014); and cement, lime and plaster (235).

Apprenticeship programmes are a key element of training and skills development for Foundation Industry employees. Analysis of Skills Funding Agency data on apprenticeship programme starts and achievements by sector frameworks shows that frameworks directly related to the Foundation Industries[23] accounted for around 3% of the total number of new starts and around 1% of the total number of apprenticeships achieved in 2011/12 and 2012/13. This is broadly in line with the Foundation Industries' share of the UK economy as a whole. It does not, however, include role specific frameworks which are also of potential relevance to businesses in the sectors (for example, supply chain management, recruitment or marketing etc.).

[23] These include wood and timber processing and merchants industry; trees and timber; polymer processing and signmaking; polymer processing operations; extractive(s) and mineral processing occupations; glass industry; glass industry occupations; metals processing; engineering manufacture (craft and technician); engineering manufacture (operator and semi-skilled); manufacturing; process technology.

The Foundation Industries' linkages with other parts of the UK economy

The Foundation Industries have important upstream and downstream linkages within the UK economy: their upstream linkages are with their suppliers and their downstream linkages are with their customers. We consider each in turn below.

Upstream linkages

In 2011, the Foundation Industries made 13% of all purchases of goods, materials and services by firms in the manufacturing sector[24] and more than 2% of all purchases of goods, materials and services in the economy as a whole[25].

The Foundation Industries are closely linked with each other: in 2011, around one third of their purchases were from other Foundation Industries firms and, for many of the sectors that make up the Foundation Industries, the three most important sources of supply were other sectors in the Foundation Industries (see Table 15).

Total intermediate purchases by the Foundation Industries in 2011 were £67.2bn (5% of total UK intermediate consumption). Table 15 shows the top suppliers to the Foundation Industries: they include the financial services sector, coke and refined petroleum products and the gas industry[26].

Purchases by the Foundation Industries have knock- on effects through the UK economy. Some indication of the scale of these effects can be gained by looking at the value added (or the jobs) generated by suppliers elsewhere in the UK economy for every £ of value added largely directly generated. This is reflected in the multipliers which have been estimated based on the most recent input-output tables published by National Statistics for the UK[27].

Two different sets of multipliers are shown in Table 13:

- The Type 1 multiplier reflects the value added (or jobs) created elsewhere in the supply chain for every £ of value added (or jobs); and
- The Type 2 multiplier also reflects the impact of spending by all those employed in the supply chain in terms of value added (or jobs).

The strongest (and most economically significant) linkages exist between the chemicals and iron and steel sectors: for example, every £1 of value added directly in the chemicals sector leads to a total impact on value added of £3,11 (and £4.03 if the effect of spending by all those employed in the supply chain is included).

Table 13: Estimated multipliers for the Foundation Industries (2005)

Sector		***GVA***		***Employment***	
		Type 1	Type 2	Type 1	Type 2
31	Wood and wood products	1.64	2.19	1.37	1.67
36	Industrial gases and dyes	1.80	2.33	1.71	2.29
37-38	Inorganic chemicals, organic chemicals	3.11	4.03	4.46	6.19
39-41	Fertilisers, plastics & synthetic resins etc., pesticides	2.10	2.77	2.16	2.96

[24] National Statistics, Annual Business Survey – Section C: Manufacturing, 2012.
[25] National Statistics, Annual Business Survey Sections A-S – UK Business Economy, Year by Employment Size band, 2012.
[26] Sales within the same sector have been removed for illustrative purposes.
[27] National Statistics, UK Input-Output Tables, 2005 (http://www.ons.gov.uk/ons/rel/input-output/input-output-analytical-tables/2005/index.html).

Sector		GVA		Employment	
		Type 1	Type 2	Type 1	Type 2
45-46	Other chemical products, man-made fibres	1.68	2.28	1.66	2.28
49	Glass and glass products	1.79	2.07	1.50	1.93
50	Ceramic goods	1.56	2.19	1.30	1.67
51-52	Structural clay products, cement, lime and plaster	1.83	2.39	1.67	2.17
53	Articles of concrete, stone etc.	2.10	2.84	1.85	2.43
54-56	Iron and steel, non-ferrous metals, metal castings	2.53	3.42	1.98	2.64
57	Structural metal products	1.93	2.64	1.75	2.28

Source: National Statistics, UK Input-Output Tables 2005 and PwC calculations

Downstream linkages

The Foundation Industries also have important downstream linkages in the UK economy. Table 14 shows the sectors that are most dependent on Foundation Industry products. As noted previously there is a significant amount supply chain activity within and between the Foundation Industries themselves.

Table 16 shows that total demand for the Foundation Industry products was £111bn in 2011 (or 8% of total UK demand). Analysis of the largest buyers of Foundation Industry products shows that three of the key sectors identified in the 2012 Department for Business, Innovation & Skills Industrial Strategy (i.e. the construction, automotive and aerospace industries) are among the top buyers of Foundation Industry products. [28]

Table 14: Sectors most dependent on Foundation Industries' products (2011)

Code	Sector	% of intermediate consumption attributed to the Foundation Industries' products
20B	Petrochemicals	75.5%
25OTHER	Fabricated metal products (excluding weapons & ammunition)	64.2%
24.4-5	Other basic metals and casting	61.4%
16	Wood & products of wood & cork (except furniture); articles of straw	58.5%
20.3	Paints, varnishes and similar coatings, printing ink and mastics	48.1%
24.1-3	Basic iron and steel	47.3%
22	Rubber and plastic products	46.5%
20A	Industrial gases, inorganics and fertilisers (inorganic chemicals)	45.9%
31	Furniture	35.8%
23OTHER	Glass, refractory, clay, porcelain, ceramic, stone	35.3%

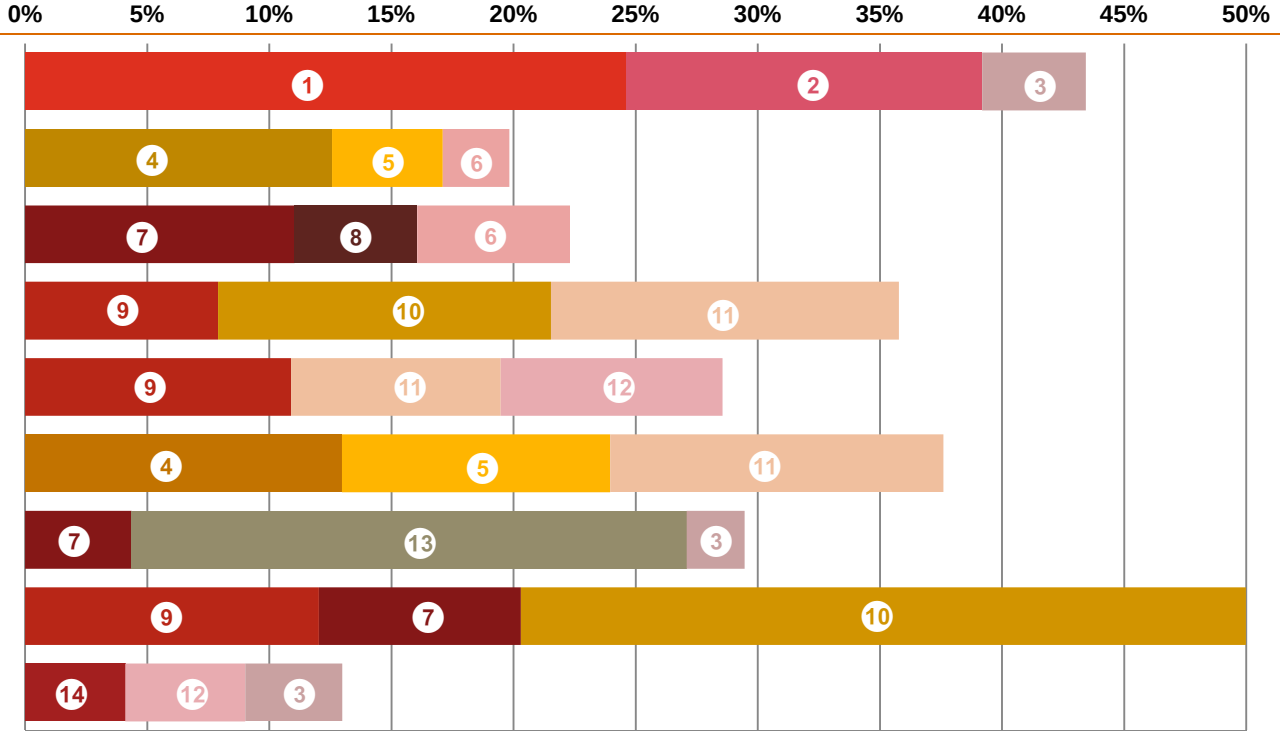
Source: PwC calculations based on National Statistics, Supply and Use Tables, 1997 – 2011

[28] Sales within the same sector have been removed for illustrative purposes.

Table 15: Top suppliers to the Foundation Industries (2011)

Code	Sector	Total intermediate consumption (£ million)
25OTHER	Fabricated metal products, excluding weapons & ammunition	14,066
24.4-5	Other basic metals and casting	8,404
24.1-3	Basic iron and steel	8,426
23OTHER	Glass, refractory, clay, porcelain, ceramic, stone products	4,621
23.5-6	Cement, lime, plaster and articles of concrete, cement and plaster	5,485
20C	Dyestuffs, agro-chemicals	1,920
20B	Petrochemical	16,883
20A	Industrial gases, inorganics and fertilisers (inorganic chemicals)	3,143
16	Wood and products of wood and cork, except furniture; manuf. of articles of straw	4,291
	Total consumption by the Foundation Industries	67,239
	% of the total UK intermediate consumption	5%

Largest three suppliers to each Foundation Industry sub-sector



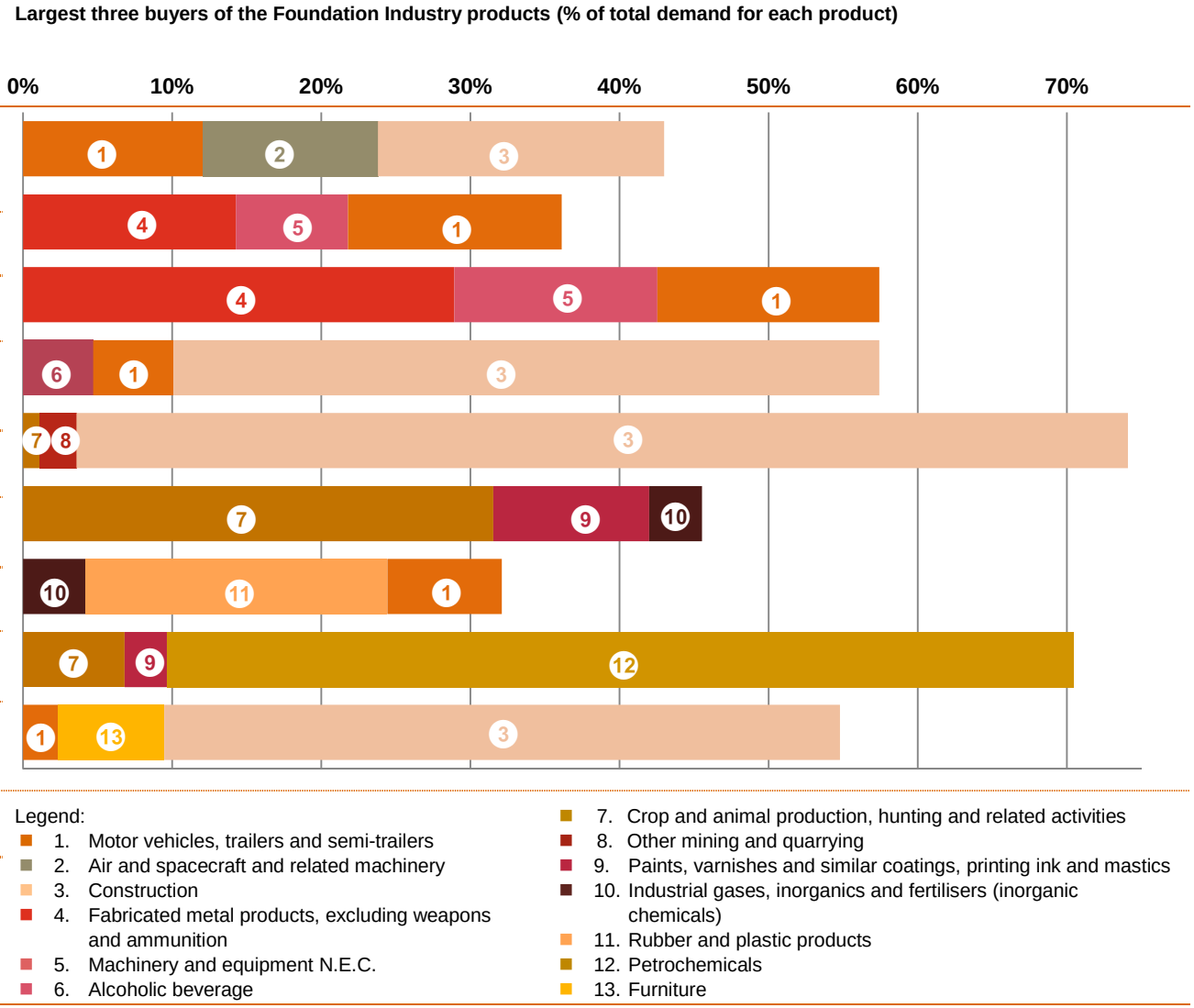
Legend:

1. Basic iron and steel
2. Other basic metals and casting
3. Financial services, except insurance and pension funding
4. Crude Petroleum And Natural Gas & Metal Ores
5. Electricity, transmission and distribution
6. Waste collection, treatment and disposal services; materials recovery services
7. Coke and refined petroleum products
8. Machinery and equipment N.E.C
9. Other mining and quarrying products
10. Petrochemicals
11. Gas; distribution of gaseous fuels through mains; steam and air conditioning supply
12. Land transport services and transport services via pipelines, excluding rail transport
13. Industrial gases, inorganics and fertilisers (all inorganic chemicals)
14. Fabricated metal products, excl. machinery and equipment and weapons and ammunition

Source: National Statistics, Supply and Use Tables, 1997 – 2011

Table 16: Top buyers of Foundation Industry products (2011)

Code	Sector	Total intermediate consumption (£ million)
25OTHER	Fabricated metal products, excl. machinery and equipment and weapons & ammunition	28,042
24.4-5	Other basic metals and casting	14,346
24.1-3	Basic iron and steel	11,972
23OTHER	Glass, refractory, clay, other porcelain and ceramic, stone and abrasive products	9,586
23.5-6	Cement, lime, plaster and articles of concrete, cement and plaster	8,059
20C	Dyestuffs, agro-chemicals	1,915
20B	Petrochemicals	22,160
20A	Industrial gases, inorganics and fertilisers (all inorganic chemicals)	6,308
16	Wood and products of wood and cork, except furniture; articles of straw and plaiting materials	8,349
	Total demand for the Foundation Industries products	110,737
	% of the Total UK Demand for Products	8%



Source: National Statistics, Supply and Use Tables, 1997 – 2011

Strengths and weaknesses

Table 17 summarises our assessment of the current strengths and weaknesses of the Foundation Industries in the UK.

Table 17: Strengths and weaknesses of the Foundation Industries

Theme	Strengths	Weaknesses
Size	• The Foundation Industries represent a significant proportion of manufacturing industry (both in terms of the number of firms and total employment)	
Structure	• The Foundation Industries are geographically dispersed although Yorkshire and the Humber and the West Midlands are particularly important regions (in terms of their contribution to GVA and employment)	• Businesses in the Foundation Industries are, on average, smaller than those in manufacturing in terms of employees, GVA and turnover
Performance	• Productivity in the Foundation Industries is greater than in the economy as a whole • The Foundation Industries are responsible for around one fifth of manufacturing investment • The Foundation Industries compete effectively in international markets • There is significant variation in skill levels across the sub-sectors that make up the Foundation Industries	• The Foundation Industries are less productive than manufacturing as a whole (in terms of GVA per employee) • On average, businesses in the Foundation Industries invest less per employee than manufacturing or the economy as a whole
Links with rest of economy	• The Foundation Industries are closely linked to each other: in 2011, around a third of their total purchases were from other Foundation Industries • The Foundation Industries are important suppliers of inputs to three of the sectors which are the focus of Department for Business, Innovation & Skills' Industry Strategy are important buyers of Foundation Industry products (i.e. the automotive, aerospace and construction industries)	

Future role & challenges

Introduction

This Section builds on the analysis of the strengths and weaknesses of the Foundation Industries in the UK in the previous section by:

- Summarising key elements of the policy landscape which are shaping the business environment – we focus on the Government's economic and industrial policy but also consider wider European Union (EU) policy too;
- Considering the implications of the key forces for change, the 'global megatrends', that will potentially shape the future development of the Foundation Industries in the UK; and
- Assessing the opportunities and threats these forces for change present for the Foundation Industries.

The next Section considers the implications – what do the key stakeholders need to do to maintain and develop the Foundation Industries' contribution to the UK economy?

Summary

Businesses in the Foundation Industries face a rapidly changing business environment due to developments in industrial policy.

The Government's programme of structural reforms intended to enable UK businesses to compete successfully in a 'global race' and 'rebalance' the UK economy.

Its Industrial Strategy focuses on three groups of sectors – advanced manufacturing, knowledge based and enabling – where it believes it can make the biggest difference. It does not focus on the Foundation Industries.

The EU has also developed a proactive approach to industrial policy.

Economic power is expected to continue to shift to the emerging economies creating both increased export opportunities for UK businesses and enhanced international competition which may fragment the value chain.

Diverse new technologies will continue to transform the business environment and put a premium on being able to innovate successfully through effective collaboration.

Environmental factors such as climate change, increasing volatility in the supply of energy and raw materials and growing consumer demand for more environmentally attractive products are expected to continue to reshape industries by increasing competition for resources, disrupting international supply chains and driving tighter environmental regulation .

The ageing of the UK workforce expected in the coming years is predicted to lead to significant workforce shortages in the period to 2020 and beyond as businesses need to replace (or retain) their retiring workers.

All present both opportunities and challenges for the Foundation Industries to increase their significant contribution to the UK.

The changing policy landscape

At the outset, we summarise how the policy landscape has changed: we focus on the UK economic and industrial policy context but also consider the wider EU policy context.

Structural reform in the UK

The Government's 'Plan for Growth'[29] set out a programme of structural reforms intended to remove barriers to growth for businesses and enable UK businesses to compete in a rapidly changing global economy. These reforms are a key part of the Government's economic strategy alongside fiscal consolidation, monetary activism and reform of the financial system.

The Government sees British businesses as competing in a 'global race' in which their place depends on the UK's ability to attract investment, innovate and train a highly skilled workforce so that they can compete successfully in international markets. At the same time, it is looking to 'rebalance' the UK economy in two ways:

- Reducing dependence on the public sector to provide jobs and increasing the importance of the non-financial services sector, including manufacturing; and
- Looking away from London and the South East to provide growth to ensure that "success and prosperity are spread more evenly across regions and industries" [30].

The structural reforms are designed to achieve the Government's ambitions for growth by:

- Creating the most competitive tax system in the g20;
- Encouraging investment and exports;
- Making the UK the best place in Europe to start, finance and grow a business; and
- Creating a more educated workforce that is the most flexible in Europe.

The Government's Industrial Strategy[31] focuses on three groups of sectors:

- Advanced manufacturing, notably automotive, aerospace and life sciences, ;
- Knowledge intensive traded services including those based on the information economy, the business and professional services and higher and further education; and
- Enabling sectors, specifically energy and construction.

These sectors have been identified because the Government believes it can make a difference to their success:

- Opportunity exists: Demand for their outputs is seen as likely to increase significantly both within the UK and globally;
- Capability exists: The UK has the knowledge and skills needed to exploit new market opportunities both domestically and in export markets; and
- Intervention can help: A sector-based approach has a clear role in supporting them[32].

It does not focus on the Foundation Industries.

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[29] Department for Business & Innovation & Skills and HM Treasury, The Plan for Growth, 2011.
[30] Speech by the Prime Minister on Coalition Strategy for Growth, May 2010 (see https://www.gov.uk/government/speeches/transforming-the-british-economy-coalition-strategy-for-economic-growth).
[31] Speech by Secretary of State for Business, Innovation & Skills on Industrial Strategy: Cable outlines vision for future of British industry, 2012 (see http://www.ubmfuturecities.com/author.asp?section_id=242&doc_id=525953).
[32] Department for Business, Innovation & Skills, Industrial Strategy: UK Sector Analysis, BIS Economics Paper No. 18, 2012.

Why sectors matter

"Businesses often organise themselves in sectors, as evidenced by the range of sector specific trade bodies. This structure arises partly because many businesses face common market conditions relating to the products or services they provide, share similar concerns and have strong vertical and horizontal links with common channels to market. This means that sectors are an essential tool for interaction between business and government, no matter whether the appropriate policy response is national or sector specific."

Source: Department for Business, Innovation & Skills, Industrial Strategy: UK Sector Analysis, 2012

Key elements of the Industrial Strategy and the sector strategies which have been developed around it are:

- The development of effective sector partnerships;
- The strengthening of supply chains;
- The provision of supporting for emerging technologies;
- The development of a skilled workforce; and
- Improvement of access to finance, especially for smaller businesses.

Progress with rebalancing the economy

There is already some evidence that the UK economy is being rebalanced:

- *Analysis by PwC shows that some rebalancing has been achieved from the public to the private sector and across the services industries*[33]
- *The EEF has noted that rebalancing across the manufacturing has been uneven: "there exists a divergence of sector performance, with some areas, notably aerospace and automotive set to lead the race, and electronics and rubber and plastics coming up on the rails"*[34]

EU policy

The EU has also developed a proactive approach to industrial policy involving four main elements:

- Establishing the right framework conditions to stimulate new investments, accelerate the adoption of new technologies and boost resource efficiency;
- Improving the functioning of the Internal Market and opening up international markets to speed up recovery;
- Unlocking the private funds needed to finance investment by EU companies; and
- Accompanying measures to increase investment in human capital and skills to equip the labour force for industrial transformations[35].

The policy has some important similarities with that of the UK Government in that it recognises the importance of manufacturing industry to the wider economy and targets broadly similar sectors. Furthermore, many of the interventions are potentially complementary.

There are, however, some significant differences: for example, the policy sets a target for manufacturing's share of the economy (20%) and some of the sectors targeted differ from those covered by the UK's Industrial Strategy.

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[33] PwC, UK Economic Outlook, November 2013.

[34] Terry Scuoler, EEF, 'The economy is recovering but it's not yet rebalancing', (see http://www.theengineer.co.uk/home/blog/guest-blog/the-economy-is-recovering-but-its-not-yet-rebalancing/1017266.article?cmpdate=Friday%20Blog:%20Why%20I'm%20calling%20time%20on%20Minority%20Report&cmpid=tenews_16799).

[35] European Commission, 'A Stronger European Industry for Growth and Economic Recovery, COM(2012)582, 2012.

Action Plan for a competitive and sustainable steel industry in Europe

The European Commission sees a strong and competitive steel sector as important for Europe's industrial base for economic, social and environmental reasons as well as for security of supply. It recognises that the EU industry is under pressure to restructure and reduce production capacity. It proposes to address the main challenges affecting the competitiveness of the EU steel industry[36]*:*

- *By establishing a regulatory framework which drives innovation, for example by developing European standards that promote sustainable production of steel construction products;*
- *By boosting demand for steel by continuing to promote the key steel-using sectors;*
- *By working to establish a level playing field at international level, for example by using trade policy to ensure that European steel producers have access to third country markets;*
- *By adapting energy, climate, resource and energy efficiency policies to boost competitiveness;*
- *By supporting innovation, for example by funding R&D, demonstration and pilot projects for new, cleaner, more resource and energy-efficient technologies under the Horizon 2020 programme; and*
- *By supporting the social dimension of restructuring and changing skill needs, for example by promoting the employment of young people in the sector through the reinforcement of apprenticeship schemes and encouraging European collaboration on skills development and employment.*

[36] European Commission, Action Plan for a competitive and sustainable steel industry in Europe, COM(2013) 407, 2013.

Global megatrends

We have identified four key megatrends that will shape the future opportunities and challenges facing the Foundation Industries in the UK. They provide a useful context for understanding how the Foundation Industries can contribute towards enhancing the UK's global economic role and rebalancing the economy. We briefly discuss each and consider their implications.

Shifts in global economic power

Economic power is expected to continue to shift away from the developed economies to the emerging ones as the latter experience faster economic growth (see Table 18). This is expected to drive faster growth in demand for the products of the Foundation Industries in these economies.

Table 18: Actual and projected top 10 economies ranked based on GDP in PPP terms

	2011		2030	
Rank	**Country**	**GDP at PPP (2011 US$bn)**	**Country**	**Projected GDP at PPP (2011 US$bn)**
1	US	15,094	China	30,634
2	China	11,347	US	23,376
3	India	4,531	India	13,716
4	Japan	4,381	Japan	5,842
5	Germany	3,221	Russia	5,308
6	Russia	3,031	Brazil	4,685
7	Brazil	2,305	Germany	4,118
8	France	2,303	Mexico	3,662
9	UK	2,287	UK	3,499
10	Italy	1,979	France	3,427

Source: World in 2050, PwC, 2013

This growth in demand in emerging economies will create increased export opportunities for UK businesses that can supply goods and services competitively where demand growth is expected, for example in the automotive industry and aerospace sector. At the same time, Europe and North America are expected to remain important markets for manufacturing products. The challenge for businesses in the Foundation Industries will be to maintain and, possibly, enhance their international competitiveness but they will need to balance realising new opportunities in the emerging countries with sustaining their position in European and North American markets.

UK businesses in the Foundation Industries face the threat of increased international competition from suppliers based in the emerging economies which are "steadily moving up the value chain into higher value activities and industries"[37]. This will contribute to greater fragmentation of the value chain and will put pressure on lower skill activities undertaken in the UK[38]. UK manufacturing firms that engage in higher value activities will be better placed to respond to increasing international competition.

Some firms may seek to repatriate supply chains back to the UK because of rising labour, energy and transport costs in low cost/emerging economies as well as concerns about (poor) quality control, supply chain risks and advantages associated with co-locating R&D and production. This may provide an opportunity for businesses in the Foundation Industries if they can use their presence in the UK to confer benefits to their downstream customers by offering them a competitive source of supply of materials.

[37] Department for Business, Innovation & Skills, Manufacturing in the UK: An economic analysis of the sector. BIS Occasional Paper No. 10A, 2010.

[38] Department for Business, Innovation & Skills, Industrial Strategy: UK Sector Analysis, BIS Economics Paper No. 18, 2012.

Increasing foreign ownership of manufacturing firms in the UK could also contribute to improved performance of the UK's largest manufacturing firms depending on the investment and production strategies of multi-national corporations[39]. But it could also create risks if competing locations are more attractive.

Technological breakthroughs

Diverse new technologies will continue to transform the landscape. Whilst the cost of their development will vary across technologies and between sectors, the pace of their development is expected to be rapid and success will depend on effective collaboration.

The Government's Industrial Strategy focuses support on eight key technologies:

- *Big data and energy-efficient computing;*
- *Satellites and commercial applications of space;*
- *Robotics and autonomous systems;*
- *Synthetic biology;*
- *Regenerative medicine;*
- *Agri-science;*
- *Advanced materials and nanotechnology; and*
- *Energy and its storage.*

For businesses in the Foundation Industries, as in other sectors, the ability to innovate successfully will be the key to growth if they are to differentiate themselves from their competitors in emerging economies. They will need to find ways to keep at the forefront of ongoing technological developments (for example, through greater exposure to international markets)[40] and exploit (any) first mover advantage.[41].

Resource scarcity & climate change

Environmental factors such as climate change, increasing volatility in the supply of energy and raw materials and growing consumer demand for more environmentally attractive products are set to continue to reshape industries. They will have a direct impact on manufacturers, including those in the Foundation Industries[42]. They will bring:

- Greater competition for resources;
- Disruption of international supply chains;
- Increased pressure for transparency; and
- Greater use of environmental regulation (including pricing of ecosystem services).

They present potential opportunities as well as threats. They heighten the importance of sustainable manufacturing. They emphasises the value of (and scope for) more efficient use of resources. They will drive innovation designed to foster improved product and process efficiency. They will also encourage new business models, for example the 'circular economy' as the case study below illustrates.

[39] The Government Office for Science/Foresight, The Future of Manufacturing: A new era of opportunity and challenge for the UK: Summary Report, 2013.
[40] Department for Business, Innovation & Skills, *Manufacturing in the* UK*: An economic analysis of the sector*. BIS Occasional Paper No. 10A, 2010.
[41] Department for Business, Innovation & Skills, *Manufacturing in the* UK*: An economic analysis of the sector*. BIS Occasional Paper No. 10A, 2010.
[42] The Government Office for Science/Foresight, The Future of Manufacturing: A New Era of Opportunity and Challenge for the UK: Summary Report, 2013.

The UK's most technically-advanced glass coater

After 12 months of intensive construction, involving 16,000 man-hours of training, NSG Group's first ever UK jumbo-size glass coating plant opened in November 2012. The £36m investment is one of the most advanced facilities of its type in the world.

The new coater enables Pilkington to meet the growing demand for its range of high–performance energy-efficient and solar control products, including toughenable Pilkington Suncool™, from the UK. This will provide several important benefits:

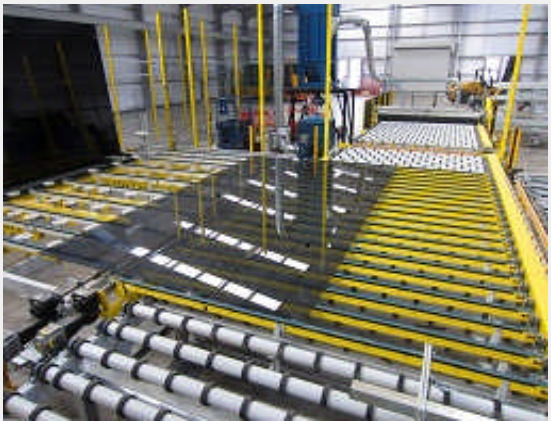
- *Reduced embodied energy and CO_2;*
- *Improved lead times;*
- *Increased manufacturing flexibility; and*
- *Lower distribution costs.*

As new buildings become increasingly energy-efficient, their main environmental impact will be based on a complete life-cycle approach which takes account of the impact of manufacturing the building materials and the construction and demolition phases. It will no longer be considered simply in terms of their energy consumption.

In this respect, glass generates minimal environmental impact, making it a product of choice for sustainable buildings. For example, the total CO_2 equivalent emitted by manufacturing an energy-efficient double glazed unit is offset on average within only 3 to 10 months by the energy savings realised, when compared to the same building installed with inefficient glazing.

Key facts:

- *The line has a capacity in excess of 10 million m² per annum*
- *Can coat glass up to 3210m x 6000m*
- *The ability to coat standard float, low-iron and laminated glass*
- *Advanced process control and quality monitoring systems*
- *The latest glass washing, drying and on-load/off-load machinery*
- *Latest design from the world's leading manufacturer*



Firms embracing the 'circular economy'

Caterpillar Inc is a US manufacturer of construction and mining equipment, diesel and natural gas engines, industrial gas turbines and diesel-electric trains, with a strong presence in the UK. It runs Cat Reman, a remanufacturing programme that returns end of life products to same-as-new condition. The programme seeks new ways to reduce, reuse, recycle, and reclaim materials which would previously have been considered as waste. During 2012, Cat Reman took back over 2.2 million end of life units for remanufacturing.

JC Bamford Excavators Ltd is a UK based manufacturer of construction equipment. Its Service Exchange provides a comprehensive range of around 1,650 remanufactured parts for all its machines. The parts are remanufactured to original equipment manufacturer standards and protected by the same warranty conditions as new parts, but cost 40-50% less than the equivalent new part. Remanufactured parts are also upgraded to incorporate the latest technology.

Source: The Government Office for Science/Foresight, The Future of Manufacturing: A New Era of Opportunity and Challenge for the UK: Summary Report, 2013

Demographic shifts

The ageing UK workforce expected in the coming years is predicted to lead to significant workforce shortages in the period to 2020 and beyond as businesses need to replace their retiring workers. The manufacturing sector as a whole is particularly vulnerable because of its relatively old workforce compared to other parts of the economy. Two of the most vulnerable sub-sectors are part of the Foundation Industries: basic metals and fabricated metal products[43].

This trend means that businesses in the Foundation Industries will need to do more either to accommodate older workers or to recruit new workers with the right skills, particularly in those sectors with the oldest age profiles. A key challenge will be what the Foundation Industries can do to improve the perception of young people and women of the sectors (67% of girls aged 7-11 years indicated that they would not like a job in manufacturing compared to 44% of boys)[44].

Demographic change could also create opportunities, for example through its effect on the pattern of demand in the economy (e.g. housing). This would have direct and, in particular, indirect effects on the Foundation Industries[45].

[43] Department for Business, Innovation & Skills, Manufacturing in the UK: An Economic Analysis of the Sector, 2010.
[44] The Government Office for Science/Foresight, The Future of Manufacturing: A New Era of Opportunity and Challenge for the UK: Summary Report, 2013.
[45] Department for Business, Innovation & Skills, Industrial Strategy: UK Sector Analysis, BIS Economics Paper No. 18, 2012.

Upskilling the chemical industries

The chemicals industry has always provided a high level of workforce training reflecting its needs for highly skilled staff and of course to meet the demands of stringent health and safety regulation.

Following in depth research, Cogent, the national skills organisation for the science industries, found that the industry lacked a consistent approach to skills and training, had no commonality around job titles or job role profiles and lacked clear standards for contractors. In addition, manufacturing roles are becoming more complex. Boundaries between process operations and engineering maintenance are blurring, and organisational de-layering has led to the devolvement of responsibilities; the operator-technician is now common in the industry. In addition, process technicians are increasingly required to become more customer and business oriented. Using resources more efficiently is also an imperative.

In response, working with businesses in the sector, Cogent developed the Gold Standard Skills Framework, a competency framework for individuals in science based industries. It sets an industry standard for expected levels of on-the-job performance and supports individual continuing professional development, setting out the skills required for world class performance in key job roles. It does this across both technical competencies and less obvious skills in management and leadership.

This approach to skills development is now being taken up by more and more leading chemicals employers. Pentagon Chemicals is one company that has used the Gold Standard Skills Framework. Its research shows that for every £1 spent on Gold Standard training, there was a return of £9.53.

Allan Laing, Chief Executive Officer of Pentagon Chemicals said:

"We see training and competence as a key element of a sustainable business. We have been working with the National Skills Academy to review all aspects of operation to identify areas where we can make the business even more effective and increase competence to achieve the Gold Standard."

Following the ongoing success of Gold Standard, companies are now joining forces to develop the new Science Industry Partnership, a skills plan which is intended to boost UK growth and competitiveness. So far over 100 companies across the science-based economy have signed up including GSK, Sembcorp Utilities and Lotte Chemical UK. The Gold Standard will be a key strand in the programme – supporting industry's desire to see wider take-up across the sector.

George Ritchie, Sembcorp Industries Senior Vice President for Human Resources said:

"For UK chemical companies to compete on the global stage, they need a highly-skilled workforce that can meet the challenges of the future. I would encourage all sizes of business to sign up to this new employer-led skills partnership, which will be creating new apprenticeship programmes, specialist training programmes and beyond."

Opportunities and threats facing the Foundation Industries

These global megatrends have the potential to influence the UK's position in the economic global race against the new rising countries in the south and the east of the world, notably China and India. They will also influence how the Foundation Industries can contribute to the Government's objective of rebalancing the economy. Consideration of their implication will inform the potential contribution of the Foundation Industries to enhancing the UK's role, enabling UK based businesses to compete successfully in the global race, particularly in terms of exports and attraction of inward investment.

Table 19 summarises the key opportunities and threats facing the Foundation Industries over the coming years.

Table 19: Opportunities and threats facing the Foundation Industries

	Opportunities	***Threats***
Shifts in global economic power	• Rapid growth in BRICs and other emerging markets • Rising costs in emerging economies reduce competitive threat	• Competition from lower cost producers • Competition for funds for investment
Technological breakthroughs	• Emergence of new materials • Decentralised/distributed production	• More rapid and effective innovation by (new) competitors
Resource scarcity & climate change	• Improved competitiveness from greater resource efficiency • Use of Foundation Industry products within resource efficient applications	• Higher cost of materials • Vulnerability of supply chains • Enhanced environmental regulation
Demographic shifts	• Experience of opportunities and challenges of ageing workforce	• Age profile adds pressure on replacing workers with the right combination of technical and commercial skills

Implications - how successful Foundation Industries can contribute to UK success

Introduction

The Foundation Industries exhibit some of the characteristics that the Government has identified as indicative of a sector's ability to contribute to economic success through their value added and productivity based on use of technology, innovation, investment and a UK-wide footprint.

They potentially have a significant role to play in enabling the UK to succeed in the global race and achieving economic rebalancing. Their ability to do so depends on being able to build on their strengths to realise the opportunities whilst addressing the threats they face.

The final part of our report considers what businesses in the Foundation Industries are doing to achieve success and what policy makers can do to support them.

Summary

The Foundation Industries share some of the characteristics that the Government has identified as indicative of an ability to contribute to economic success.

They potentially have a significant role to play in enabling the UK to succeed in the global race and achieving economic rebalancing if they can build on their strengths to realise the opportunities and address the threats they face.

Businesses in the Foundation Industries are already taking steps to ensure that they can compete successfully on the global stage and support rebalancing the economy.

The Foundation Industries face important market failures, for example externalities and information failures.

Without the support of policy makers to address these failures the UK is unlikely to capture the full potential of its Foundation Industries and their current economic contribution will erode.

Improving the competitiveness of Foundation Industries could potentially have a positive effect along several important supply chains: likewise, if they lack the support needed for their development, this could threaten the competitiveness of their UK based customers.

Government policy can help the Foundation Industries in five broad ways:

- *Supporting the strengthening of supply chains.*
- *Creating a level playing field.*
- *Providing effective support for exporters and attracting inward investment.*
- *Developing the 'industrial commons'.*
- *Promoting a co-ordinated, holistic approach to policy support.*

Effective joint action could bring benefits to:

- *The Foundation Industries directly and their suppliers;*
- *The customers of the Foundation Industries; and*
- *The UK as a whole by strengthening the UK's 'industrial commons'.*

How businesses in the Foundation Industries are delivering success

Businesses in the Foundation Industries are already taking steps to ensure that they can compete successfully on the global stage and support rebalancing the economy as our case studies illustrate:

- Tata Steel is working closely with its partners in the automotive sector to support innovation and the development of a low carbon economy;
- Pilkington has invested in the most technically advanced glass coater in the UK in order to manufacture high performance energy efficient glass; and
- The chemical industries have developed the Gold Standards Skills Framework to support skills development across the sector.

Proving Factory

Tata Steel is innovating to support the development of a low carbon economy in the UK in several ways. The company has recognised, alongside a number of industry partners, the wealth of technologies under development to support the increasing efficiency of electric vehicles, for example in powertrain and driveline applications. Together with partners Productiv Ltd and six expert technology providers, Tata Steel has set up the Proving Factory, which also has support from the Government's Advanced Manufacturing Supply Chain Initiative (AMSCI).

The Proving Factory has begun to apply the same characteristics of strength, versatility in design and lightweighting to innovations which are struggling to overcome the barriers to successful commercialisation of new concepts. The aim is to enable new concepts to reach their full potential as mainstream automotive systems in a scaled-up manufacturing environment capable of producing thousands of units. Tata Steel's role is to provide steel design, application and supply chain thinking to improve the efficiency of production and delivery, whilst the expert technology providers ensure there is no compromise to function or performance. Over the next five years, the Proving Factory is expected to:

- *Invest over £10m in machine tools and assembly fixtures;*
- *Manufacture over 4 million components;*
- *Deliver more than 135,000 low carbon technologies to OEMs in the automotive and transport sectors;*
- *Employ 270 people of whom 100 will be apprentices; and*
- *Generate incremental UK sector revenues in excess of £285m.*

Tata Steel is doing all it can to enable the UK's strong technology base and the resurgent UK automotive industry to realise their potential. It continues to support the work of the Automotive Council, for example by responding to the Automotive Industry Strategy report, Driving Success[46], and supporting activity which furthers the report's contribution to the development of a low carbon economy.

How policy makers can support the Foundation Industries

Working alone, the Foundation Industries are less likely to succeed because of important market failures, for example externalities (e.g. in relation to skills, the spillovers from technological advances and the development of the low carbon economy) and information failures (e.g. in relation to trade). Moreover, as various recent reports on the role of industrial policy have noted, there is an increasing need for policy to be systems based with government working in partnership with business to achieve the necessary co-ordination[47].

Government policy can help the Foundation Industries to realise the opportunities and respond to the threats in five broad ways:

[46] Automotive Council UK, Driving Success – a strategy for growth and sustainability in the UK automotive sector, 2013.

[47] See, for example, the Government Office for Science/Foresight, The Future of Manufacturing: A New Era of Opportunity and Challenge for the UK: Summary Report, 2013.

- Supporting the strengthening of supply chains, including through strategic approaches to public sector procurement;
- Creating a level playing field which enables businesses in the Foundation Industries to compete effectively in global markets and makes the UK an attractive location for inward investment;
- Supporting exporting and attracting inward investment;
- Developing the 'industrial commons' by working in partnership with business to encourage innovation across value chains, resource efficiency and skills development; and
- Promoting a co-ordinated, holistic, systems based approach to policy support.

Strengthening supply chains

Supply chain development

Both the recent Foresight[48] and CBI[49] reports highlight the importance of the Government promoting a more collaborative approach to supply chain development so that supply chain partners become more aligned and integrated in their response to customers' changing requirements. The CBI, for example, has called for incentives to encourage greater supply chain collaboration on issues including skills, innovation and exporting. It has also argued for the need to raise awareness of existing supply chain support and share best practice on sector specific initiatives.

The Government's Industrial Strategy advocates a co-ordinated or systems approach to intervention across sectors where supply chain interdependencies exist[50]. Its support focuses on the key sectors set out in the Industrial Strategy (e.g. energy, construction, aerospace, automotive and life sciences).

Both the Advanced Manufacturing Supply Chain Initiative and the Regional Growth Fund have had a positive impact already, and have benefitted the Foundation Industries. But more could be done.

The benefits of supply chain development

- *According to Driving Success – A Strategy for Growth and Sustainability in the UK Automotive Sector the domestic supply chain is relatively weak. On average only a third of the parts that go into a vehicle manufactured in the UK are sourced from within the UK. Strengthening the automotive supply chain could potentially create opportunities for the Foundation Industries: the Government and Automotive Council UK estimate the total value of these opportunities to be £3bn. For example, Tata Steel estimates the potential exists to access a steel forging supply chain opportunity worth around £210m per year*[51]
- *Government policy can influence the development of the aerospace supply chain (which includes the Foundation Industries) through its procurement and by addressing innovation market failures (which are particularly significant). This has the potential for very important local economy and rebalancing effects, not least because of their knowledge and innovation spillovers* [52]

As we have shown in Section 3, the Foundation Industries are distinctive because they serve multiple strategic supply chains within the UK. Improving their competitiveness could potentially have a positive effect along several important supply chains: likewise, if they lack the support needed for their development, this could threaten the competitiveness of their (UK based) customers.

[48] The Government Office for Science/Foresight, The Future of Manufacturing: A New Era of Opportunity and Challenge for the UK: Summary Report, 2013.
[49] CBI, Raising the Bar: Business Priorities for Industrial Strategy One Year On, 2013.
[50] Department for Business, Innovation & Skills, Industrial Strategy: UK Sector Analysis, BIS Economics Paper No. 18, 2012.
[51] Automotive Council UK, Driving Success – a strategy for growth and sustainability in the UK automotive sector, 2013.
[52] Department for Business, Innovation & Skills, Industrial Strategy: UK Sector Analysis, BIS Economics Paper No. 18, 2012.

Nissan Leaf

Tata Steel is an active innovator in all the markets it serves whether it be high performance rail products for the most exacting environments, armour products which save lives or the structure at the heart of some of the most iconic building projects around the world.

It supports its customers' commitments to the development of a low carbon economy in which steel has a vital part to play by providing strength for performance, versatility to support eye-catching design and affordable lightweighting in sophisticated, demanding low carbon designs.

When Nissan introduced its Leaf model in Europe, Tata Steel supported the production of the first mainstream full electric vehicle to be built in the UK. Nissan's concept for the Leaf's body design set out with the objective to be a leader in zero carbon cars for everyday use that combined no compromise on safety or performance with a striking appearance.

Tata Steel currently provides most of the material for the Leaf's lightweight (less than 400kg) body structure. Through close work with Nissan's engineering team, Tata Steel developed innovative new steel grades which allowed Nissan to balance weight, performance and cost and resulted in more steel being used in the European production model.

The presence of local supply chains can be critical to the success of high-performing economies. Through close collaboration with established partners supplying award-winning Nissan models such as the Qashqai and the Juke, Tata Steel has ensured that material from its UK-based manufacturing facilities reaches Nissan on time. This shows how a well functioning domestic steel supply chain can contribute to the successful development of a lower-carbon UK manufacturing.

This is particularly relevant because supply chain proximity can have an important bearing on competitiveness, not only because of its impact on transport costs but also because it can foster improved collaboration, for example linked to innovation. It links closely to what policy makers can do to support the development of successful clusters.

"... companies in 'foundation sectors' – including chemicals, steel and electronics – are also constituents of supply chains in a broad range of high value sectors. For example, Tata Steel produces steel for companies in the automotive, oil & gas, nuclear, offshore wind and construction sectors. Therefore, ensuring that UK foundation sectors remain competitive will have a positive impact throughout the supply chains of the priority industrial strategy sectors they serve."

Source: CBI, Raising the Bar, 2013

Strategic public procurement

Government departments and other parts of the public sector have the scope to use their buying power to stimulate supply chain development to realise not only economic goals, for example by encouraging innovation and sustaining local jobs, but also to promote environmental and social development. They are significant purchasers of the outputs in the economy as a whole[53].

Influence of public purchasing

"The public sector has enormous purchasing power. The Government has a crucial role in guiding procurement so as to raise environmental and social standards. It should be encouraging innovation, stimulating markets and promoting new technological solutions for a more sustainable built environment. Whilst the Government has recognised that it must use the procurement process to lead by example, progress has not been uniform. It almost seems that every instance of best practice in public sector construction is matched by a missed opportunity"[54].

The potential impact of public procurement on UK manufacturing is not, however, the same across different sectors. Recent analysis suggests that it is most significant in those sectors which are

[53] PwC calculations based on National Statistics, Supply and Use Tables, 1997 - 2011

[54] Westminster Sustainable Business Forum, Costing the Future: Securing Value for Money through Sustainable Procurement, 2008.

considered strategic and where public procurement dominates spending. This points to key sectors being defence, healthcare, energy and environmental technologies[55].

Potential obstacles to effective public procurement are the need for co-ordination across policy makers and buyers in the public sector and for a more holistic assessment of the impact of alternative procurement options.

Barriers to strategic public procurement

"In the UK at present, policies are often competing rather than co-ordinated or complementary. This presents challenges for public procurement. It also presents challenges for commissioners of goods, works and services. Not least, it presents challenges for the supply side, including (but not limited to) the UK manufacturing base"[56].

"One of the most important barriers to innovative procurement is failure to distinguish between direct purchasing cost and overall cost. The best overall value of procurement is realised through calculating life-cycle cost or even through the contribution of innovation to overall economic growth."

Many stakeholders, including UK based businesses and industry associations, are keen for the Government to adopt procurement strategies that support domestic manufacturers and so encourage innovation and job creation. Such an approach is likely to have a positive impact on the Foundation Industries[57]. It would help to reduce the risk that spending will gravitate towards cheaper foreign suppliers based on short term considerations. It would increase the role of Foundation Industry materials in both the home and international markets.

Potential benefits of strategic procurement

Unite, the UK's largest trade union, has suggested that if government departments and local authorities were to focus on locally sourced procurement, they could boost demand from the UK automotive industry (which is a significant buyer of Foundation Industry products). This would involve buyers being encouraged to take account of the longer term (life-time), wider value of their purchasing decisions, rather than basing them simply on short term financial criteria (within the obligations of the EU's procurement rules).

"It's inconceivable that countries like Germany or France would allow the public sector to buy the majority of vehicle fleets from overseas,"

Tony Burke, Unite General Secretary

Levelling the playing field

Like all sectors, the Foundation Industries face cost pressures. A particular concern is energy costs, but other elements of costs are also relevant, for example business rates where Tata Steel estimates that it pays up to five times as much as it does elsewhere in Europe.

Making energy prices competitive

Energy costs remain a significant element of the costs of the Foundation Industries. This is despite UK energy intensive industries having significantly improved their energy efficiency (sometimes more than many of their global competitors).

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[55] Morton B, Paget G and Mena C, What role does Government procurement play in manufacturing in the UK and internationally and how might this change in the future?, Evidence Paper 24, The Government Office for Science/Foresight, 2013.

[56] Morton B, Paget G and Mena C, What role does Government procurement play in manufacturing in the UK and internationally and how might this change in the future?, Evidence Paper 24, The Government Office for Science/Foresight, 2013.

[57] http://www.castuk.com/recruitment-news/procurement-recruitment-news/trade-union-calls-for-buy-british-procurement-commitment-from-uk-government/801382485, last accessed on 03/12/2013

The effect of costs on competitiveness

"Over the past few decades, persistently strong sterling and low production costs in developing economies have had the effect of weakening UK supply chains with a detrimental impact on the competitiveness of some of our key industries."

Source: CBI, Raising the Bar, September 2013

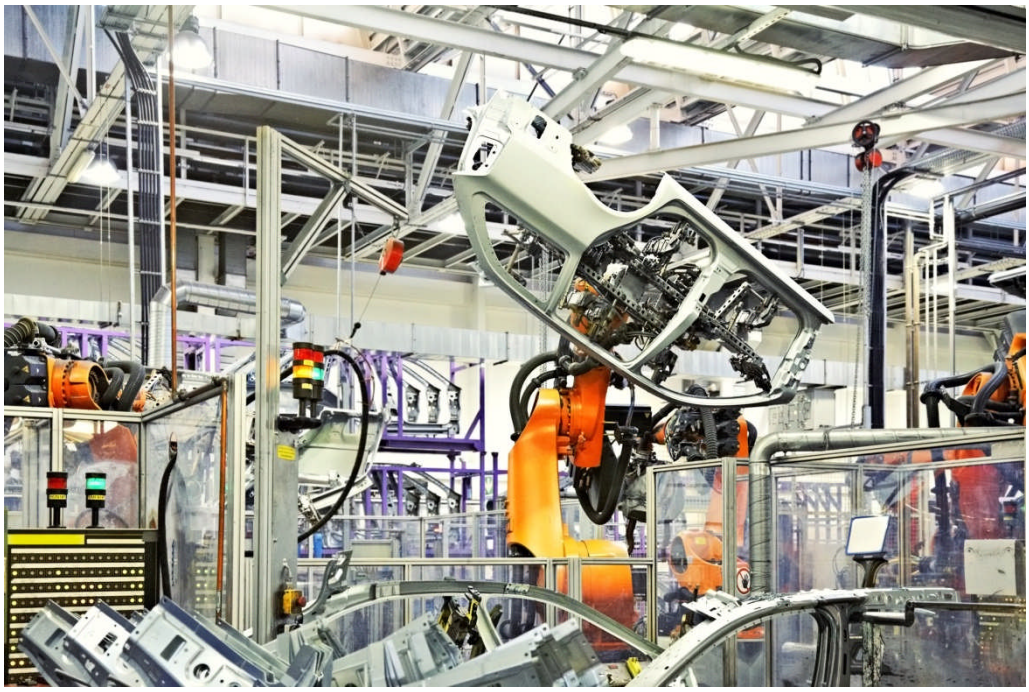
Although international comparisons of differences in energy costs can be difficult to make, there is some evidence that the costs faced by UK firms in the Foundation Industries are higher than those facing competitors operating in other countries. For example, a joint report for the Departments of Energy and Climate Change and Business Innovation & Skills in 2012 concluded that base electricity prices for Energy Intensive Industries in the UK are:

- Higher than in France and Germany but lower than Italy and Denmark); and
- Significantly higher than in Russia and USA, similar to China and India, slightly lower than Turkey and significantly lower than Japan[58].

It also found that price differences between countries reflect several factors including: different supply mixes, different transmission and distribution costs, different non-energy taxes and different market structures.

Government policy in relation to climate change influences energy prices and, therefore, potentially affects the competitiveness of the Foundation Industries[59]. The report also suggested that UK firms could face higher incremental policy costs mainly due to renewable energy costs and the carbon price floor although the analysis was undertaken before taking account of the policy measures announced by the Chancellor of the Exchequer in the 2011 Autumn Statement to reduce the transitional impacts of policy on the costs for the most electricity-intensive industries.

Looking forward, the risk is that relatively high energy costs will adversely affect the competitiveness of Foundation Industries in the UK as well as that of their potential customers. This will impact negatively on UK firms' ability to compete in both domestic and overseas markets and deter foreign investors.



[58] ICF, An international comparison of energy and climate change policies impacting energy intensive industries in selected countries, 2012.

[59] http://www.npower.com/idc/groups/wcms_content/@wcms/@corp/documents/business/ee_latest_report.pdf, July 2013, last accessed on 03/12/2013

Energy costs – a potential tipping point?

A CBI report describes UK energy prices as "disproportionately impacting energy intensive industries at present"[60]

A report produced by the Trade Union Congress and the Energy Intensive Users Group, 'Building Our Low-Carbon Industries', warns that heavy energy users are operating under difficult conditions and, without a policy response, jobs and investment could be lost to overseas competitors[61].

"Cemex UK runs the biggest cement plant in the country, based on the outskirts of Rugby. It is not averse to the idea of a green economy. In recent years it has moved away from dependence on coal alone.

It now also burns chippings from old tyres and a fuel made from minced-up household waste. But the company is worried about the impact of coming green taxes.

...What most concerns Cemex is that other countries will not impose similar new taxes on their cement producers.... [Cemex] prices would then struggle to compete on world markets."

Source: 'Soaring energy prices force UK manufacturers abroad', BBC News website, 4 October 2011

Promoting trade and investment

Supporting exporters

The UK will only succeed in the global race if its businesses can increase their exports by competing successfully in international markets. Although the Foundation Industries already perform strongly and noted in Section 3, more can be done, especially given the expected growth in emerging markets.

Firms looking to export more face several barriers (for example, legal & regulatory, customs, resources, language & cultural and information). Manufacturing firms (including those in the Foundation Industries) are slightly more likely to face at least one of these barriers than firms in the service sector: 70% of manufacturing firms indicated that they had experienced at least one barrier compared to 64% of service sector firms[62]. The barriers also tend to be greater in fast growing emerging markets and innovation active firms. As such, they are particularly relevant to future efforts to increase exports amongst the Foundation Industries.

UK Trade and Investment has an important potential role to play in providing advice and market-based intelligence to businesses operating in the Foundation Industries seeking to export to new markets. [63]

Attracting inward investment

The UK has historically done well in attracting inward investment based on its technology and infrastructure, the culture and language and quality of life[64]. But it may need to do more to keep pace in the global race and compete with the best in the world if it is to establish an industrial base from which to sell the solutions to tomorrow's challenges to the rest of the world.

Attracting inward investment into the Foundation Industries in the UK can play a role in strengthening competitiveness. It may involve:

- A more targeted approach to plug gaps in the UK supply chain; and
- Promoting UK supply chain strengths to inward investors.

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[60] CBI, Raising the Bar, September 2013.
[61] Trade Union Congress and Energy Intensive Users Group, Building Our Low-Carbon Industries: The Benefits of Securing the Energy-Intensive Industries in the UK, 2012.
[62] Department for Business, Innovation & Skills, Manufacturing in the UK: An economic analysis of the sector. BIS Occasional Paper No. 10A, 2010.
[63] The Government Office for Science/Foresight, The Future of Manufacturing: A New Era of Opportunity and Challenge for the UK: Summary Report, 2013.
[64] Ernst & Young, 2012 UK attractiveness survey, 2012.

Offshore Wind Investment Organisation – attracting investment into new supply chains

As part of its strategic partnership with industry, the Government is establishing the Offshore Wind Investment Organisation (OWIO) to boost levels of inward investment and to stimulate jobs in the UK offshore wind industry. Creation of a private sector led OWIO was one of the recommendations of the Offshore Wind Industrial Strategy.

The OWIO will add focus, additional resource and a co-ordinating capability to the work of Government, national and sub-national bodies to develop and grow the offshore wind supply chain. It will be informed by assessment of the market demand and UK supply chain capability. Its focus will be areas of the supply chain where there is potential for inward investment. The OWIO will link into UKTI's existing activities to showcase UK companies' manufacturing and engineering capabilities overseas. The success of this approach has been demonstrated by the model developed by Scottish Development International, Scottish Enterprise and Highlands & Islands Enterprise.

The Foundation Industries that have a high degree of foreign ownership are very well placed to advise on how best to continue to attract inward investment.

Developing the 'industrial commons'

Recent thinking on the future of manufacturing has emphasised the importance of developing the 'industrial commons'[65]. These are the embedded knowledge and technology framework that enhances the efficiency and productivity of the proprietary capital and labour that use it. Their development requires an effective working partnership between business and government based on a shared desire for long term competitiveness. There are two key elements:

- Supporting R&D and innovation, including promoting resource efficiency; and
- Developing skills.

Supporting R&D and innovation

The Government's Industrial Strategy focuses support on eight technologies where UK scientific and business capabilities mean that UK businesses are potentially well placed to capture the opportunities because they:

- Are areas in which the UK has world-leading research;
- Have a range of applications across a spectrum of industries; and
- Have the potential for the UK to be at the forefront of commercialisation.

Although none is directly linked to the Foundation Industries, businesses in the sector need to be encouraged to build on areas of strength by sustaining their investment in R&D and innovation, especially where it is of wider value to strategic supply chains. For example, they need to realise the opportunities presented by technological advances which emphasise higher value added products and respond to pressure to improve resource efficiency and address potential resource scarcity.

Potential benefits of supply chain collaboration

Improved supply chain collaboration within the manufacturing industry, particularly in relation to technology development and resource efficiency, could help to create 300,000 new jobs in manufacturing and also help to reduce CO_2 emissions by around 24%.

Source: CBI, Raising the Bar, 2013

Increasing pressure on resources means the need to:

- Encourage continued improvements in product and process efficiency;
- Target R&D that will enable greater resource efficiency and material substitution;

[65] Pisano & Shih, 'Producing prosperity: Why America needs a manufacturing renaissance', 2012.

- Support business models which are based on reuse and remanufacturing; and
- Need to develop joint long term road maps.

Developing skills

The Foundation Industries, like other parts of the manufacturing sector, will face pressure to develop a workforce with the skills needed to succeed. A key challenge will be to enhance the attractiveness of a career in the Foundation Industries to ensure an adequate supply of talent[66]. The Foundation Industries, like other parts of the manufacturing sector, will face pressure to develop a workforce with the skills needed to succeed. This means:

- Enhancing the attractiveness of a career in the Foundation Industries to ensure an adequate supply of talent for the Foundation Industries: the key question is whether the Government needs to increase the scale and ambition of its current programme of initiatives;
- Developing the combination of technical and commercial skills that will be needed; and
- Improving the quality of leadership to improve business performance, for example in export markets

International comparison of management practices in manufacturing

"... the UK currently fares poorly on the quality of its managers: average scores for management practices in surveys of manufacturing in different countries show that Great Britain scores below the US, Japan, Germany, Sweden, and Canada, but is on a par with Australia, Italy and France. Strong leadership teams and distributed leaders in key positions throughout manufacturing businesses will be essential in the future."

Source: The Government Office for Science/Foresight, The Future of Manufacturing: A New Era of Opportunity and Challenge for the UK: Summary Report, 2013

Co-ordinating the policy response

A key conclusion from the recent Foresight report on the Future of Manufacturing in the UK[67] is the importance of having a more integrated view of, and response to, value creation. It implies the need to take a systems based view of the future and the policy response.

At present, the Department for Business, Innovation & Skills is developing strategic partnerships with key sectors it has defined (including energy, construction and advanced manufacturing (i.e. aerospace, automotive and life sciences). But these do not include the Foundation Industries.

Although the Foundation Industries are diverse, they face some common challenges which government policy can help to address. They believe that their role should be recognised through the appointment of a minister with specific responsibility for the Foundation Industries and an accompanying industrial strategy for Foundation Industries.

The potential benefits

Effective joint action could bring benefits to:

- The Foundation Industries directly and their suppliers, particularly given their proportionately greater influence outside London and the South East;
- The customers of the Foundation Industries which include businesses in sectors at the heart of the current Industrial Strategy; and
- The UK as a whole by strengthening the UK's 'industrial commons' by sustaining innovation and skills development.

[66] The Government Office for Science/Foresight, The Future of Manufacturing: A New Era of Opportunity and Challenge for the UK: Summary Report, 2013.

[67] The Government Office for Science/Foresight, The Future of Manufacturing: A New Era of Opportunity and Challenge for the UK: Summary Report, 2013.

Appendices

Appendix 1: Defining the Foundation Industries

This Appendix explains the evidence based approach we have used to identify the Foundation Industries.

One of the distinctive features of the Foundation Industries is that they sit at the base of multiple, diverse manufacturing and construction supply chains. We have used National Statistics' latest Supply and Use Tables for 2011 to segment the various sectors. The Tables describe the flows of goods and services within the UK economy. They provide data for 106 sectors.

Sectors with high levels of intermediate consumption

As the first stage, we identified those sectors within the manufacturing sector that sell:

- A higher than average proportion of their output for intermediate consumption; and
- A lower that average proportion of their output for final consumption (i.e. to households or to the public sector).

Table 20 shows the results of the analysis.

Table 20: Manufacturing sectors with higher than average intermediate consumption and lower than average final consumption (2011)

SIC	Sector	Intermediate consumption	Final consumption expenditure	Gross capital formation	Exports	Final demand
10.4	Vegetable and animal oils and fats	58.8%	28.8%	2.8%	9.5%	100.0%
10.6	Grain mill products, starches and starch products	55.2%	34.9%	0.2%	9.6%	100.0%
16	Wood and products of wood and cork, except furniture; articles of straw and plaiting materials	83.9%	8.9%	3.6%	3.7%	100.0%
17	Paper and paper products	73.3%	16.6%	0.2%	9.9%	100.0%
18	Printing and recording services	88.5%	10.2%	0.7%	0.5%	100.0%
20.3	Paints, varnishes and similar coatings, printing ink and mastics	71.1%	3.2%	1.5%	24.1%	100.0%
20A	Industrial gases, inorganics and fertilisers (all inorganic chemicals) – 20.11/13/15	65.3%	3.8%	2.7%	28.1%	100.0%
20B	Petrochemicals – 20.14/16/17/60	61.6%	0.0%	0.8%	37.7%	100.0%
20C	Dyestuffs, agro-chemicals – 20.12/20	46.9%	6.0%	0.7%	46.5%	100.0%
21	Basic pharmaceutical	45.3%	7.9%	0.0%	46.8%	100.0%

SIC	Sector	Intermediate consumption	Final consumption expenditure	Gross capital formation	Exports	Final demand
	products and pharmaceutical preparations					
22	Rubber and plastic products	67.6%	8.5%	2.0%	21.9%	100.0%
23.5-6	Cement, lime, plaster and articles of concrete, cement and plaster	96.0%	0.2%	1.4%	2.4%	100.0%
23OTHER	Glass, refractory, clay, other porcelain and ceramic, stone and abrasive products – 23.1-4/7-9	64.7%	20.9%	0.4%	14.0%	100.0%
24.1-3	Basic iron and steel	64.4%	0.0%	2.7%	32.9%	100.0%
24.4-5	Other basic metals and casting	58.0%	0.0%	3.2%	38.8%	100.0%
25.4	Weapons and ammunition	89.0%	0.5%	0.8%	9.7%	100.0%
25OTHER	Fabricated metal products, excl. machinery and equipment and weapons & ammunition – 25.1-3/25.5-9	67.1%	9.9%	11.3%	11.7%	100.0%
26	Computer, electronic and optical products	41.7%	18.6%	12.4%	27.2%	100.0%
	UK	**41.2%**	**38.1%**	**6.6%**	**14.1%**	**100.0%**

Source: National Statistics, Supply and Use Tables, 2011

Sectors selling largely to manufacturing and construction

At the second stage, we focused on the sectors identified in Table 20 and analysed what proportion of sales to other business sectors (i.e. intermediate demand) was sold to other manufacturing or construction industries. The results are summarised in Table 21. We have defined the Foundation Industries as those sectors where more than three quarters of (intermediate) demand comes from sales to the manufacturing or construction industries. They are the manufacture of:

- Wood and products of wood and cork (except furniture) (16);
- Chemicals and chemical products (20);
- Other non-metallic mineral products (23);
- Basic metals (24); and
- Fabricated metal products; except machinery and equipment (25).

Table 21: Manufacturing and construction sales as % of intermediate demand for the Foundation Industries (2011)

SIC 2007	Sector	Total intermediate demand (£m)	Total sales to manufacturing and construction (£m)	Total sales to manufacturing and construction (%)
10.4	Vegetable and animal oils and fats	2,485	1,475	59.4%
16	Wood and products of wood and cork, except furniture; articles of straw and	8,349	7,445	89.2%

SIC 2007	Sector	Total intermediate demand (£m)	Total sales to manufacturing and construction (£m)	Total sales to manufacturing and construction (%)
	plaiting materials			
17	Paper and paper products	19 819	11,985	60.5%
20.3	Paints, varnishes and similar coatings, printing ink and mastics	4,030	2,838	70.4%
20A	Industrial gases, inorganics and fertilisers (all inorganic chemicals) – 20.11/13/15	6,308	5,270	83.5%
20B	Petrochemicals – 20.14/16/17/60	22,160	21,396	96.6%
22	Rubber and plastic products	21,727	15,297	70.4%
23.5-6	Cement, lime, plaster and articles of concrete, cement and plaster	8,059	6,744	83.7%
23 OTHER	Glass, refractory, clay, other porcelain and ceramic, stone and abrasive products – 23.1-4/7-9	9,586	7,984	83.3%
24.1-3	Basic iron and steel	11,972	11,551	96.5%
24.4-5	Other basic metals and casting	14,346	13,214	92.1%
25.4	Weapons and ammunition	4,235	1,062	25.1%
25 OTHER	Fabricated metal products, excl. machinery and equipment and weapons & ammunition – 25.1-3/25.5-9	28,042	24,567	87.6%
	UK	**1,436,183**	**425,239**	**29.6%**

Source: National Statistics, Supply and Use Tables, 2011

Scope of the Foundation Industries

Within these five sectors defined by reference to the 2 digit SIC code, we have identified certain sub-sectors which do not share the same characteristics. Table 22 summarises the scale of each sector and how much employment and GVA is included and excluded from the definition of the Foundation Industries.

Table 22: Scope of Foundation Industries (2011)

SIC 2007	Sector	Employment ('000)			GVA (£m)		
		Total	Included	Excluded	Total	Included	Excluded
16	Wood and products of wood and cork; except furniture; articles of straw and plaiting materials	58	53	5	2,461	2,313	148
		100%	91%	9%	100%	94%	6%
20	Chemicals and chemical products	117	40	77	9,438	4,248	5,190
		100%	34%	66%	100%	45%	55%
23	Other non-metallic mineral products	96	71	25	4,472	3,517	955
		100%	74%	26%	100%	79%	21%
24	Basic metals	76	76	0	4,571	3,504	1,067
		100%	100%	0%	100%	77%	23%
25	Fabricated metal products except	301	253	48	13,280	10,085	3,195
		100%	84%	16%	100%	76%	24%

SIC 2007	Sector	Employment ('000)			GVA (£m)		
		Total	Included	Excluded	Total	Included	Excluded
	machinery and equipment						
	Foundation Industries	572	417	155	29,651	20,163	9,488
		100%	73%	27%	100%	68%	32%

Source: National Statistics, Annual Business Survey, 2011

Table 23 provides details of the sub-sectors which we have included and excluded from our definition of the Foundation Industries at the 3 and 4 digit level. The numbers in brackets refer to the sector code in the SIC (2007).

Table 23: Sub-sectors included and excluded from Foundation Industries (2011)

	Included	Excluded
Wood and products of wood and cork (except furniture); articles of straw and plaiting materials (16)	Sawmilling and planing of wood (161) Products of wood; cork; straw and plaiting materials (162) • Veneer sheets and wood-based panels (16210) • Other builders' carpentry and joinery (16230) • Other products of wood; manufacture of articles of cork; straw and plaiting materials (16290)	• Assembled parquet floors (16220) • Wooden containers (16240)
Chemicals and chemical products (20)	Basic chemicals; fertilisers and nitrogen compounds; plastics and synthetic rubber in primary forms (201) • Industrial gases (20110) • Dyes and pigments (20120) • Other inorganic basic chemicals (20130) • Other organic basic chemicals (20140) • Plastics in primary forms (20160) • Synthetic rubber in primary forms (20170)	• Fertilisers and nitrogen compounds (20150) Pesticides and other agrochemical products (202) Paints; varnishes and similar coatings; printing ink and mastics (203) Soap and detergents; cleaning and polishing preparations; perfumes and toilet preparations (204) Other chemical products (205) Man-made fibres (206)
Other non-metallic mineral products (23)	Glass and glass products (231) • Flat glass (23110) • Shaping and processing of flat glass (23120) • Hollow glass (23130) • Glass fibres (23140) • Other glass; including technical glassware (23190) Refractory products (232) Clay building materials (233) Cement; lime and plaster (235) • Cement (23510) • Lime and plaster (23520) Articles of concrete; cement and plaster (236)	Other porcelain and ceramic products (234) Cutting; shaping and finishing of stone (237) Abrasive products and non-metallic mineral products n.e.c. (239)
Basic metals (24)	Basic iron and steel and of ferro-alloys (241)	• Processing of nuclear fuel (24460)

	Included	*Excluded*
	Tubes; pipes; hollow profiles and related fittings; of steel (242) Other products of first processing of steel (243) • Cold drawing of bars (24310) • Cold rolling of narrow strip (24320) • Cold forming or folding (24330) • Cold drawing of wire (24340) Basic precious and other non-ferrous metals (244) • Precious metals production (24410) • Aluminum production (24420) • Lead; zinc and tin production (24430) • Copper production (24440) • Other non-ferrous metal production (24450) Casting of metals (245) • Casting of iron (24510) • Casting of steel (24520) • Casting of light metals (24530) • Casting of other non-ferrous metals (24540)	
Fabricated metal products; except machinery and equipment (25)	Structural metal products (251) • Metal structures and parts of structures (25110) Forging; pressing; stamping and roll-forming of metal; powder metallurgy (255) Treatment and coating of metals; machining (256) • Treatment and coating of metals (25610) • Machining (25620) Other fabricated metal products (259) • Steel drums and similar containers (25910) • Light metal packaging (25920) • Wire products; chain and springs (25930) • Fasteners and screw machine products (25940) • Other fabricated metal products n.e.c. (25990)	• Doors and windows of metal (25120) Tanks; reservoirs and containers of metal (252) Steam generators; except central heating hot water boilers (253) Weapons and ammunition (254) Cutlery; tools and general hardware (257)

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