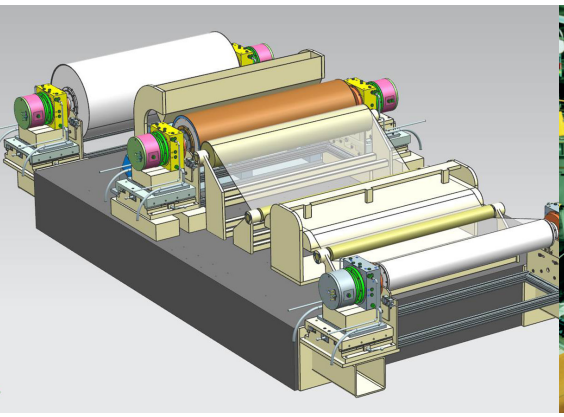
Cranfield UNIVERSITY

UK manufacturing growth and its economic contribution

A White Paper by Cranfield University



25 May 2016

National Manufacturing Debate

Supported by:

The ERA Foundation

Overview

This white paper presents facts about growth in UK manufacturing, identifies inhibitors and enablers to that growth, proposes an Extended Manufacturing Growth Index, and reports the Manufacturing Well-Being Profile for 2016.

Part 1:
Research Methodology and Data Sources

Examines where and how relevant data have been prepared for this study.

This section concerns a structured approach and methodology for collecting and analysing 25-years of growth data and for finding main enablers and inhibitors.

To gain a good perspective of how manufacturing growth has changed in the UK, a wide range of articles over 25-years were read and analysed. All articles come from the Factiva database. In total 900 articles were collected and 250 were relevant for this study. These articles are different types of documents such as newspaper articles, economic reviews, financial reports, and government reports. Using Nvivo software we analysed all 250 articles in detail. This allowed us to make an analysis of the inhibitors and enablers of manufacturing growth in the UK over the last 25-years. Nvivo allowed us to define the frequency of each factor from all 250 articles.

All the data comes from specific, reputable economic websites, including:

- Office for National Statistics
- OECD
- World Bank
- U.S. Bureau of Labour Statistics
- Companies House in UK

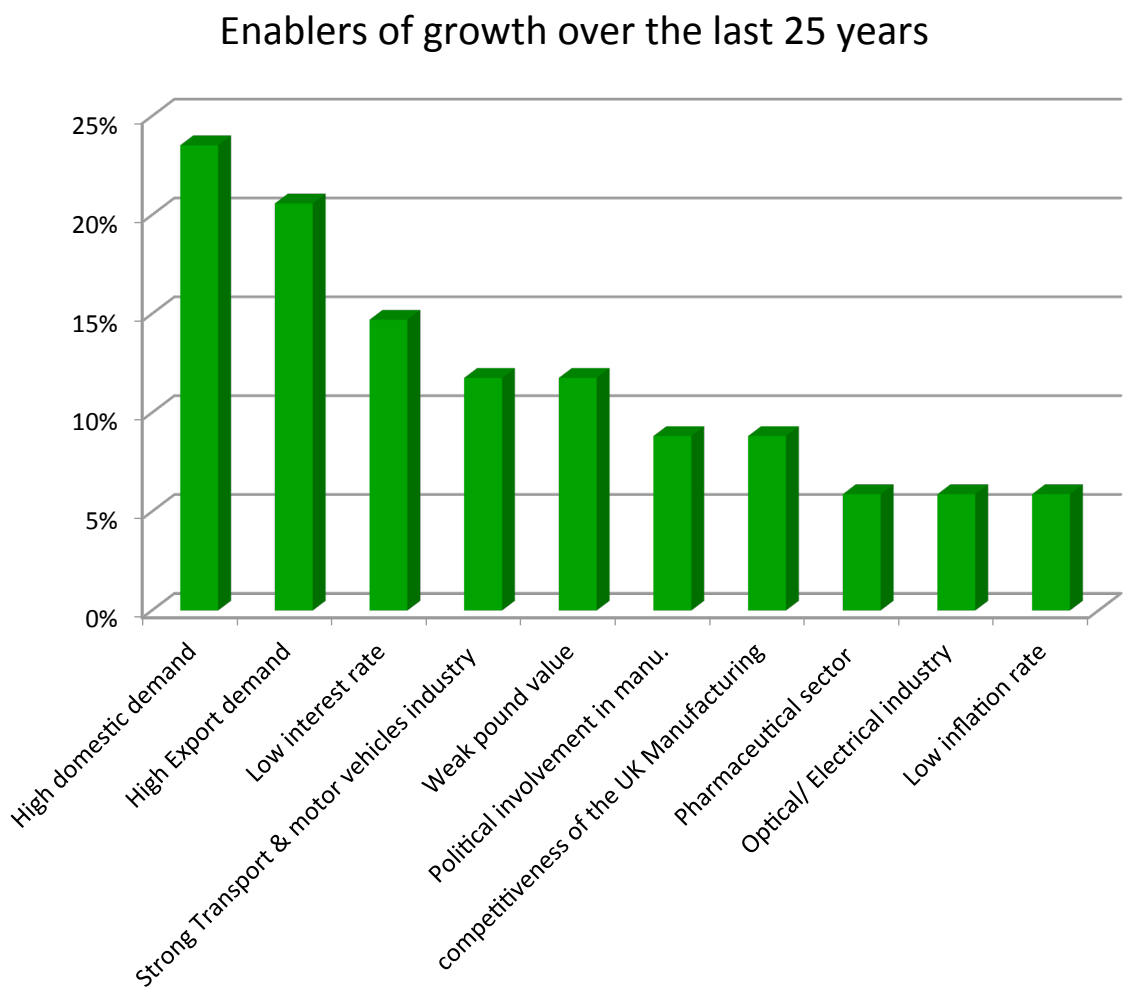
The development of the Extended Manufacturing Growth Index (EMGi) is based on UK Standard Industrial Classification (SIC) codes 2007. The SIC codes covers all sectors within manufacturing and each company has one or more SIC code. SIC codes are used by ONS and also Companies House. All the index workings and the methodology of the EMGi were supported by CBI experts and validated by manufacturing experts and an economist from EEF, the manufacturers' organisation.

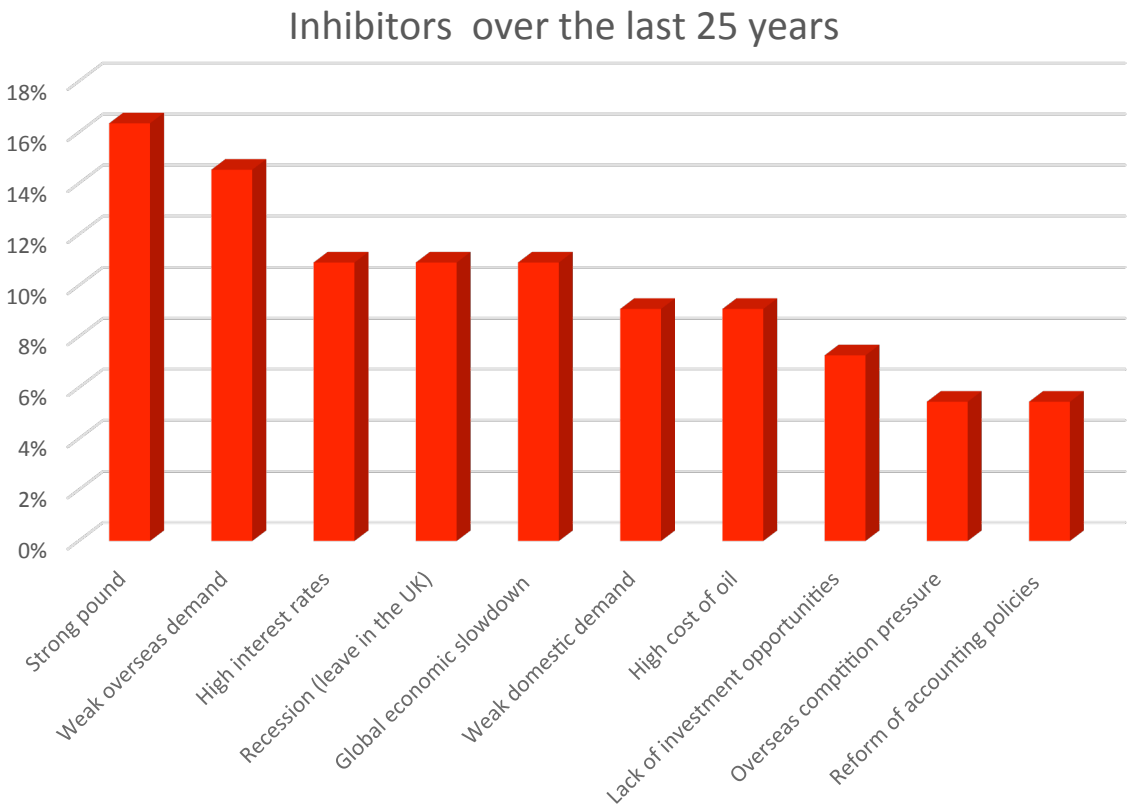
Part 2:
Inhibitors and Enablers of UK Manufacturing Growth

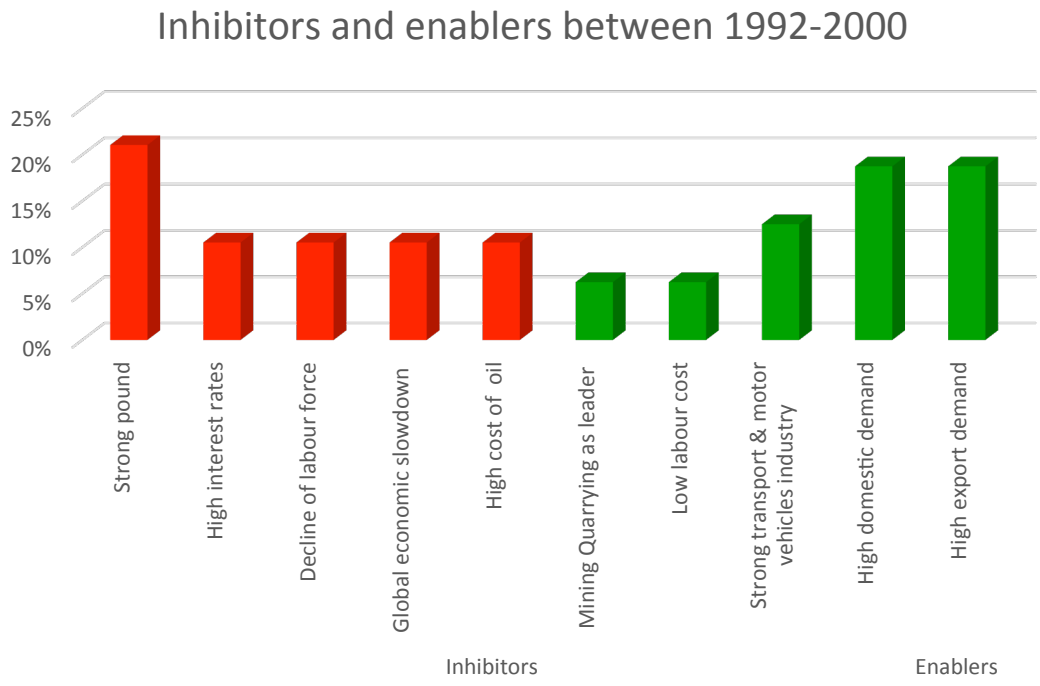
Identification of drivers and inhibitors of UK manufacturing growth over the last 25 years

The collation and reading of 250 articles from the Factiva database provides an extended source of data of manufacturing growth in the UK over the last 25-years. Growth enablers and inhibitors have been identified and their frequency of occurrence within the articles is displayed below.

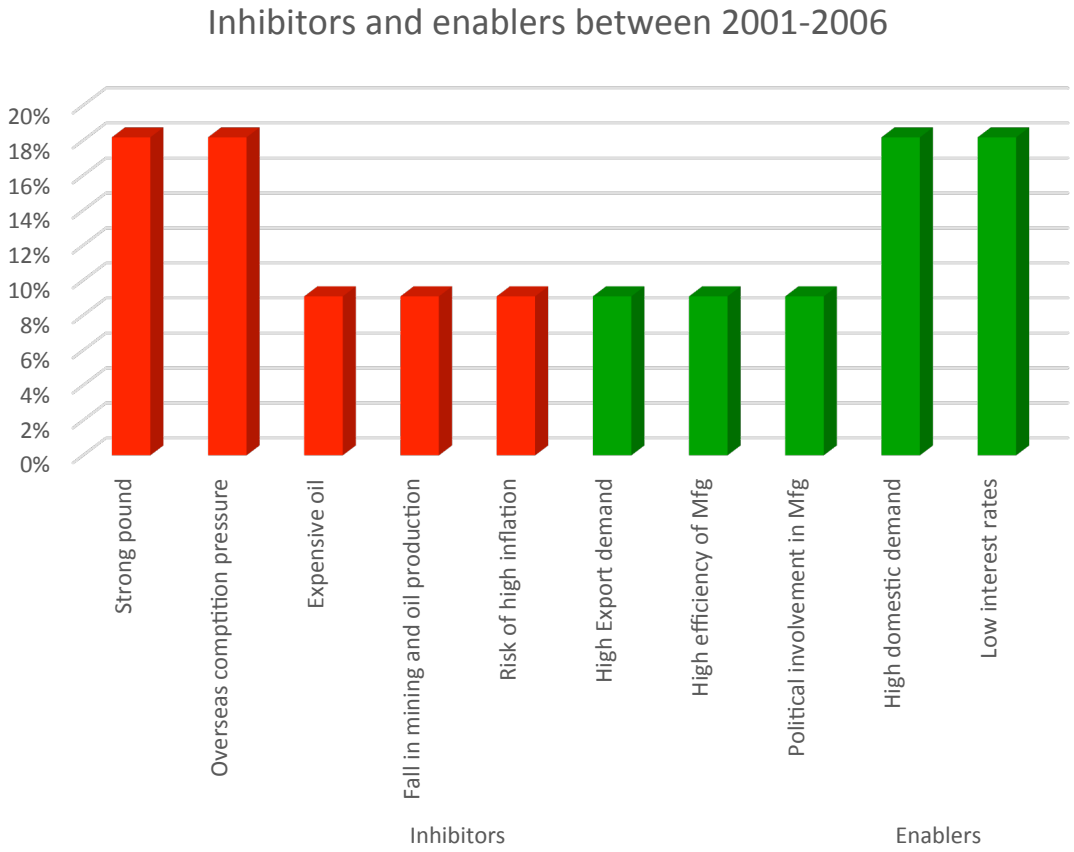
This study also separated these factors into periods of five years, to show how the frequency of each factor changes over time.

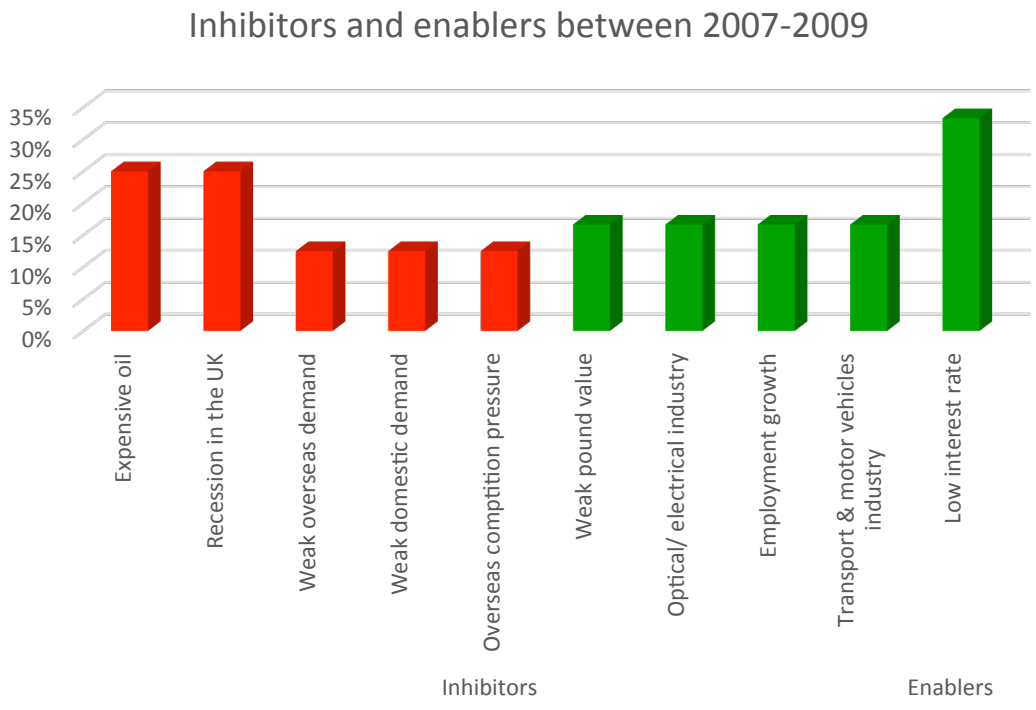


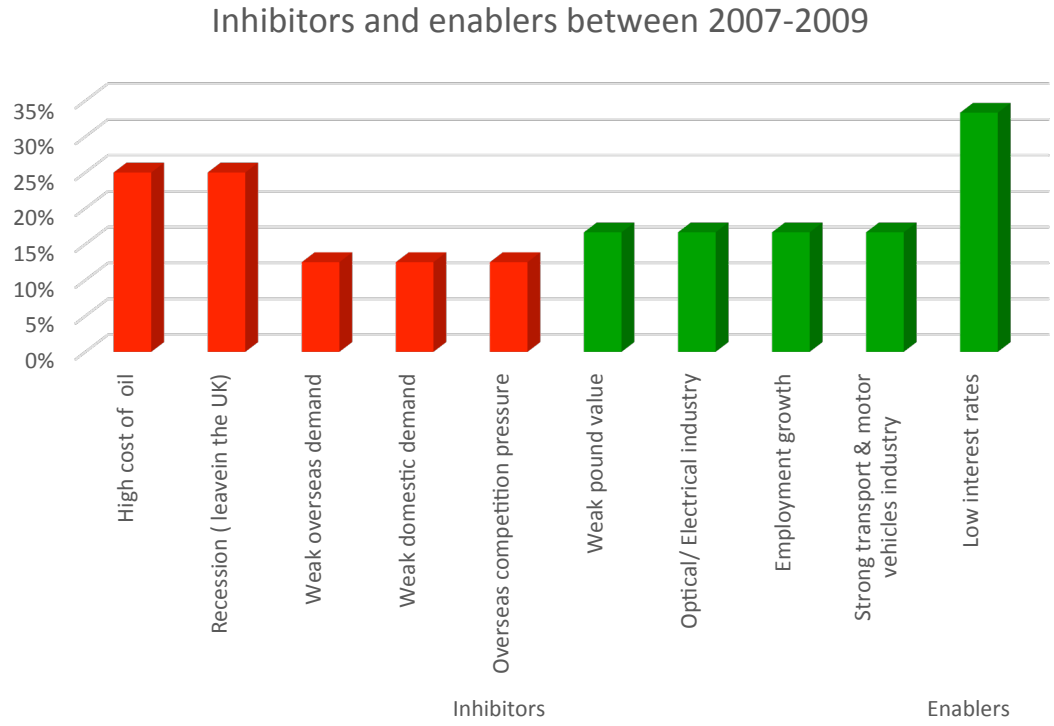


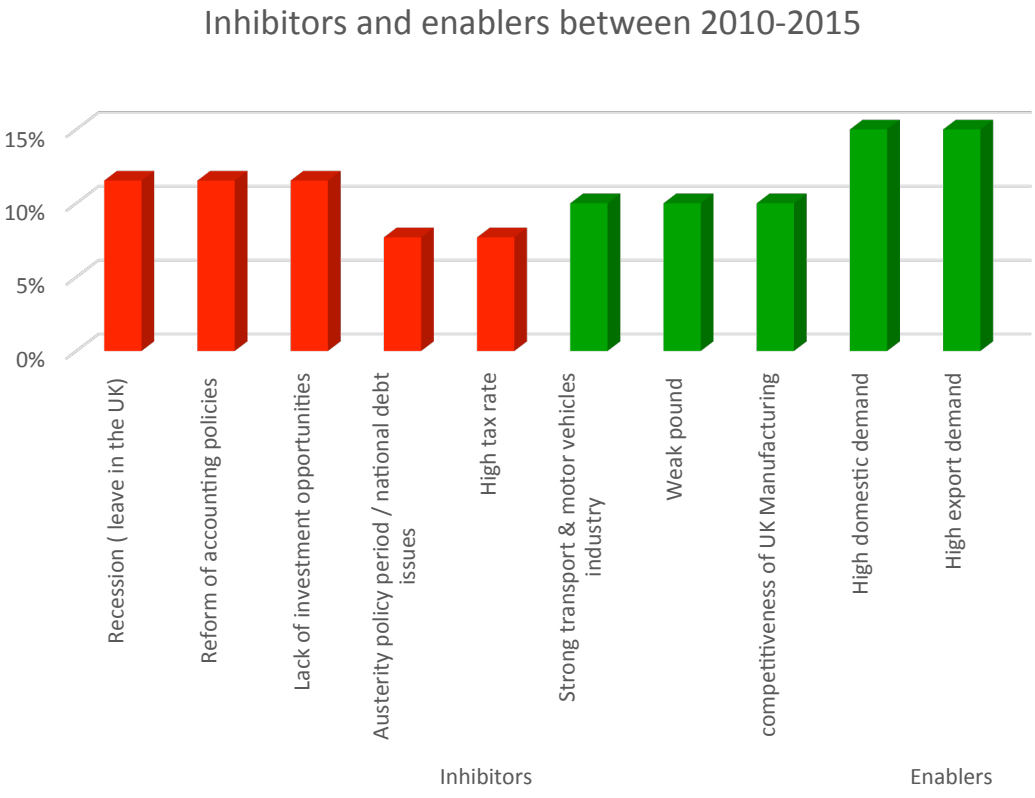


The Mining quarrying label here means because of the high mining activity, the cost of raw materials is lower.


Inhibitors and enablers between 2001-2006
20%
18%
16%
14%
12%
10%
8%
6%
4%
2%
0%
Strong pound
Overseas comptition pressure
Expensive oil
Fall in mining and oil production
Risk of high inflation
High Export demand
High efficiency of Mfg
Political involvement in Mfg
High domestic demand
Low interest rates
Inhibitors
Enablers


Inhibitors and enablers between 2007-2009
35%
30%
25%
20%
15%
10%
5%
0%
Expensive oil
Recession in the UK
Weak overseas demand
Weak domestic demand
Overseas comptition pressure
Weak pound value
Optical/ electrical industry
Employment growth
Transport & motor vehicles industry
Low interest rate
Inhibitors
Enablers

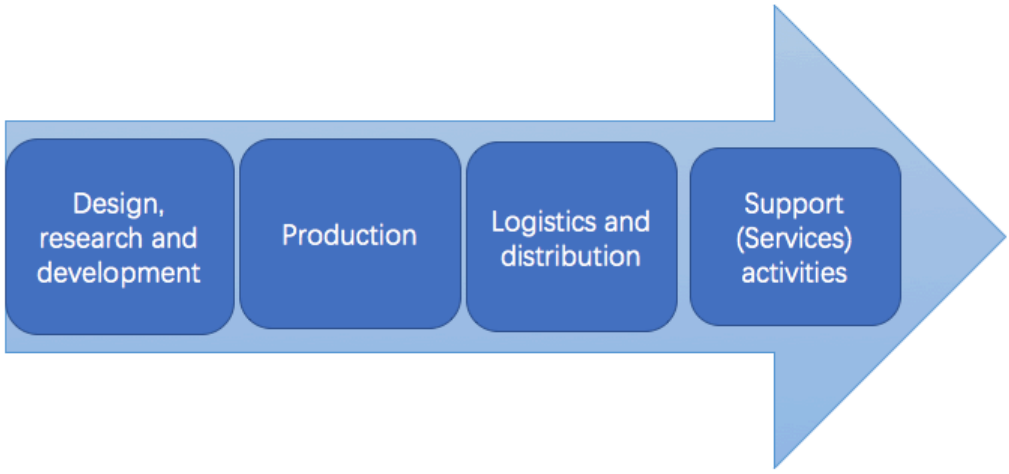

Inhibitors and enablers between 2007-2009
35%
30%
25%
20%
15%
10%
5%
0%
High cost of oil
Recession (leavein the UK)
Weak overseas demand
Weak domestic demand
Overseas competition pressure
Weak pound value
Optical/ Electrical industry
Employment growth
Strong transport & motor vehicles industry
Low interest rates
Inhibitors
Enablers


Inhibitors and enablers between 2010-2015
15%
10%
5%
0%
Recession (leave in the UK)
Reform of accounting policies
Lack of investment opportunities
Austerity policy period / national debt issues
High tax rate
Strong transport & motor vehicles industry
Weak pound
competitiveness of UK Manufacturing
High domestic demand
High export demand
Inhibitors
Enablers

Part 3:
Extended Manufacturing Growth Index

Detailed development of the EMG index to cover design and support services. The new EMG index is developed by Cranfield University.

The value chain of manufacturing



As can be clearly seen in the value chain of manufacturing, production is only one aspect of manufacturing, it also comprises of design, research, support (services) activities. However, the current Manufacturing Growth Index examines mainly production. This study aims to measure design-make-support based manufacturing companies across all economic activities in UK and to develop a new simple index for manufacturing growth.

3.1 SIC code selection methodology

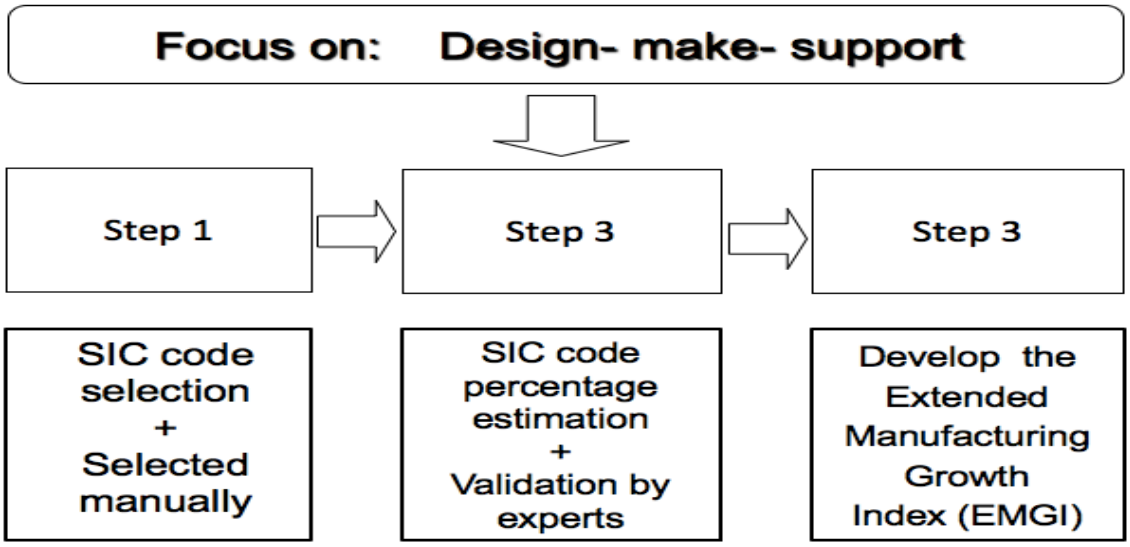
Methodology

The starting point of this study is Section C – Manufacturing, in UK SIC code 2007.

Through manually selected SIC codes outside the traditional SIC codes for manufacturing (SIC code 2007, codes 10-33) to include content mainly related to design and support in the whole manufacturing value chain. A suggested list and "estimated list" of activities that may have an element of manufacturing-related design and support were proposed.

Validation: For the estimated manufacturing activities including design and services as a % of the total SIC codes, we interviewed several experts in manufacturing and at the Office for National Statistics (ONS) to finally decide the correct percentage and create a new basket of activities to represent today's manufacturing sector.

This study followed the three steps as shown in the table below:



Finally, the study has a broader SIC code spreadsheet with manufacturing content including design and support services. Our estimate of manufacturing activities that include design and services as a percentage of the total SIC Code was validated by several experts in manufacturing data analysis.

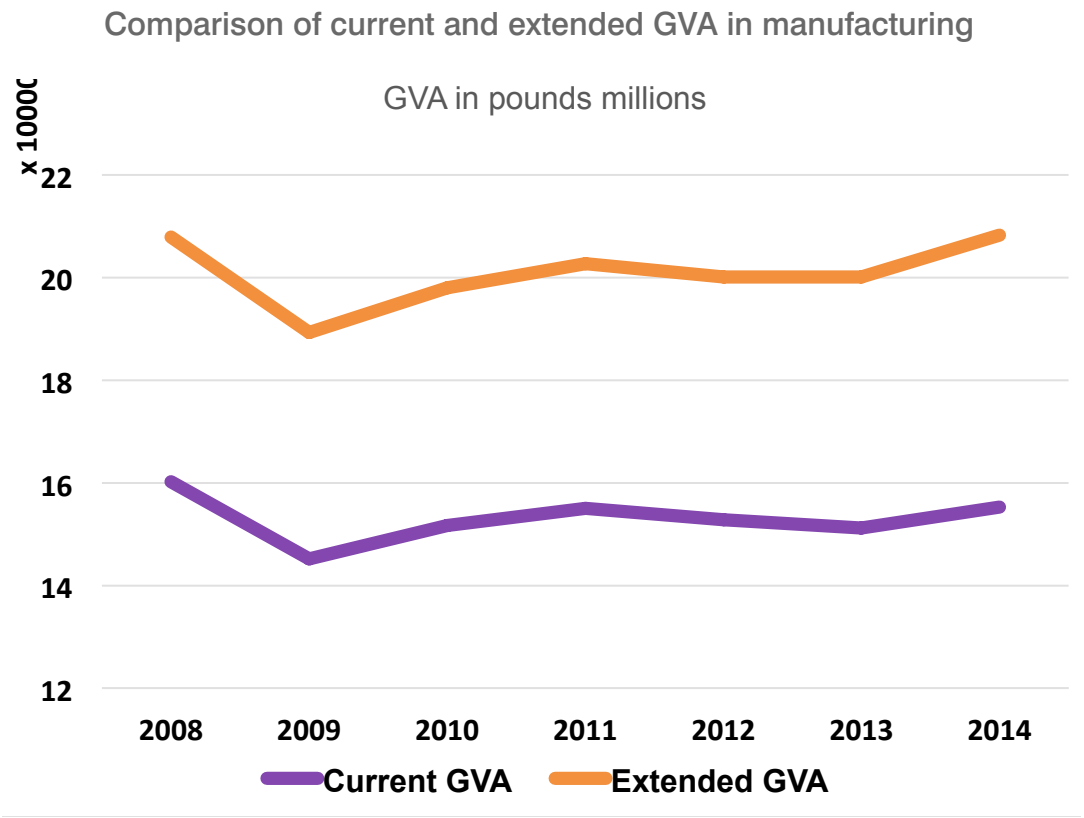
Extended manufacturing basket

	Contents	Sic code	details	Estimate of manufacturing activities including design and services as a% of total
Section C	**Manufacturing**	**10-33**	**Manufacturing**	100%
Section D	**Electricity,gas,steam and air conditioning activities**	35.10	Electric power generation, transmission and distribution	10%
		35.20	Manufacture of gas; distribution of gaseous fuels through mains	20%
Section F	**Construction(build environment)**	**41**	**Construction of buildings**	25%
		42	**Civil engineering**	25%
		43	**Specialised construction activities**	25%
Setion G	**Wholesale and retail trade;repair of motor vehicles and motorcycles**	45.20	Maintenance and repair of motor vehicles	50%
		45.40	Sale, maintenance and repair of motorcycles and related parts and accessories	10%
Section J	**Information and communication**	**61**	**Telecommunications**	10%
		63	**Information service activities**	10%
Section M	**Professional, scientific and echnicl activities**	71.12	Engineering activities and related technical consultancy	50%
		71.20	Technical testing and analysis	20%
		72.11	Research and experimental development on biotechnology	50%
		72.19	Other research and experimental development on natural sciences and engineering	50%
		74.10	Specialised design activities	50%
Section N	**Admistrative and support service activities**	82.99	Other business support service activities n.e.c.	20%
Section S	**Other service activities**	**95**	**Repair of computers and personal and household goods**	50%

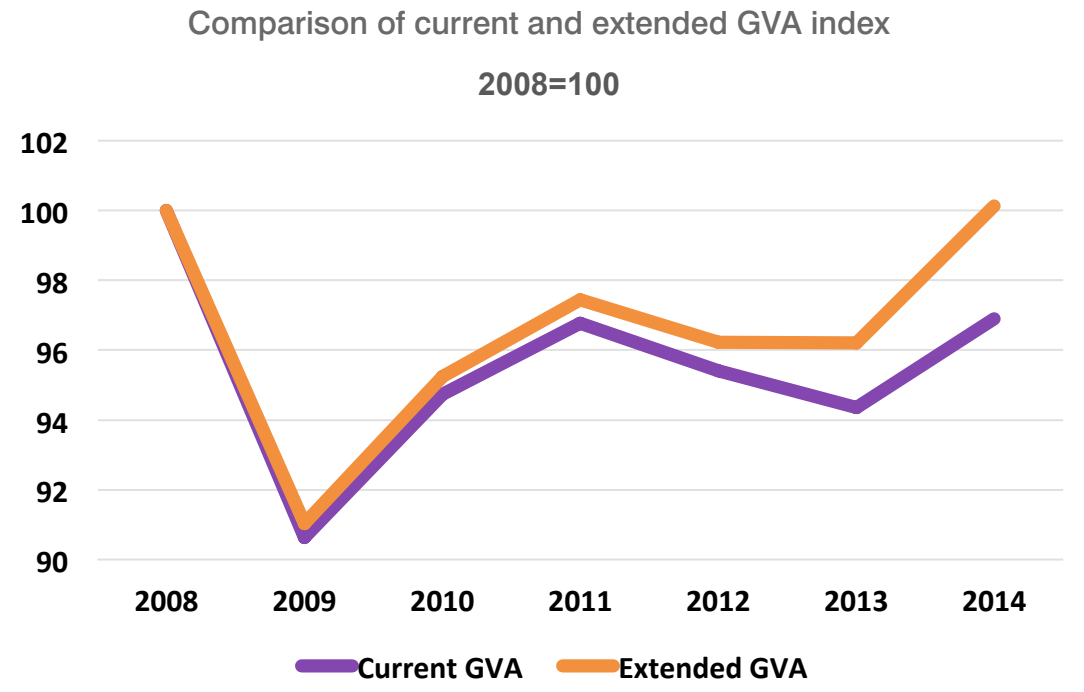
This is based on UK SIC code 2007, this table haven't listed all the SIC code at lowest level (5 digitals level), but it includes all SIC codes below the level listed in the table.

3.2 Develop the extended Manufacturing Growth Index

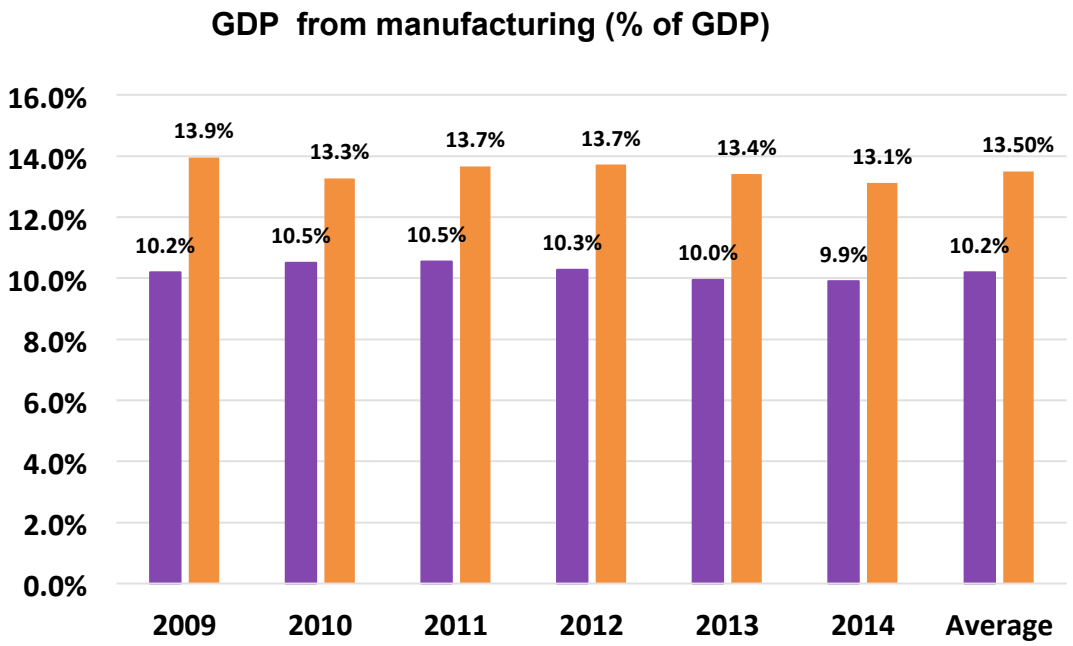
After adding the new SIC codes selected together with the current manufacturing sector (Section C), a new basket for the extended definition of the manufacturing sector was created. In order to measure this extended manufacturing sector easily, we created a new simple index called the Extended Manufacturing Growth Index.



Clearly the there is a large gap between the current and extended definitions of manufacturing activity, represented by GVA in engineering design and support services since 2008. The Extended Manufacturing Growth Index helps us understand total, holistic manufacturing growth more accurately.



And from the chart above, it can be seen that the extended GVA experience a higher growth rate since 2011.



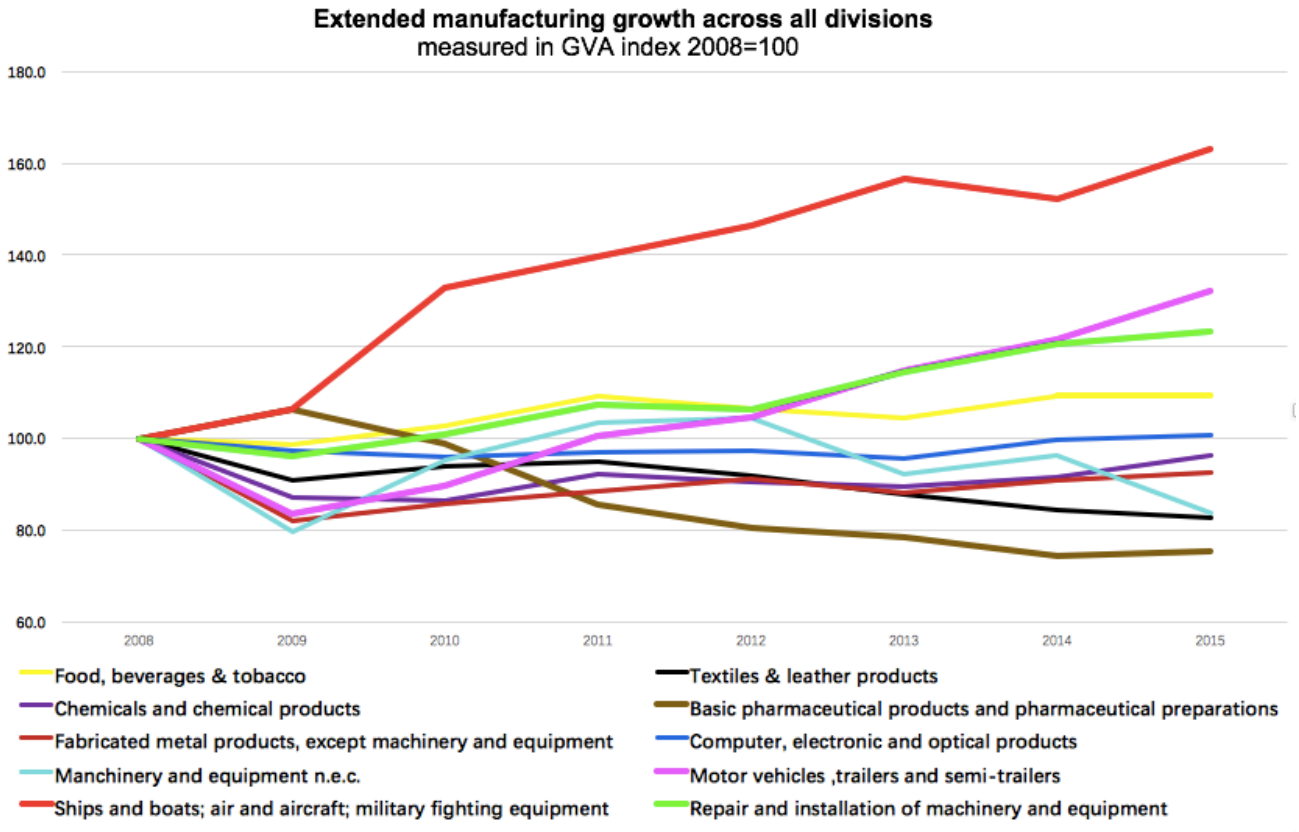
To show the difference between the two definitions of manufacturing, the bar chart above displays how much manufacturing contributes to the total UK economy. Manufacturing GVA under the current SIC definition accounts for 10.2% of total GDP in UK as an average in the last six years, however, the extended manufacturing GVA accounts for 13.5% of the total economy during the period.

In order to measure how manufacturing output changes across all SIC categories, we used the new EMG index and put the SIC code GVA in related divisions.

For example, adding all the SIC codes below 61, 63, 95(listed in the table below) into the 'computer, electronic and optical products' category; we added all SIC codes below 45200, 45400 to 'motor vehicles, trailers and semi-trailers' category; and added SIC code 82990 to 'Repair and installation of machinery equipment' category. Then it can be observed how they affected the total growth trend.

SIC codes below 61, 63, and 95

Sic code	details
61	**Telecommunications**
61100	Wired telecommunications activities
61200	Wireless telecommunications activities
61300	Satellite telecommunications activities
61900	Other telecommunications activities
63	**Information service activities**
63110	Data processing, hosting and related activities
63120	Web portals
63910	News agency activities
63990	Other information service activities n.e.c.
95	**Repair of computers and personal and household goods**
95110	Repair of computers and peripheral equipment
95120	Repair of communication equipment
95210	Repair of consumer electronics
95220	Repair of household appliances and home and garden equipment
95230	Repair of footwear and leather goods
95240	Repair of furniture and home furnishings
95250	Repair of watches, clocks and jewellery
95290	Repair of personal and household goods n.e.c.



This graph shows that the manufacturing of transport equipment (ships and boats; aerospace equipment and aircraft; military fighting equipment) enjoys the most significant growth after 2008, while the manufacturing of pharmaceutical products and pharmaceutical preparations has declined, decreasing rapidly during this period. Beyond aerospace, the growth in the manufacturing of vehicles, trailers and semi-trailers sector is also very high, and while not as obvious as the gain in the transport equipment division, much greater than other categories in the manufacturing sector. Meanwhile, the repair and installation of machinery and equipment category and food & beverages sectors also show a growing trend, while the manufacture of computer, electronic and optical products remains broadly flat.

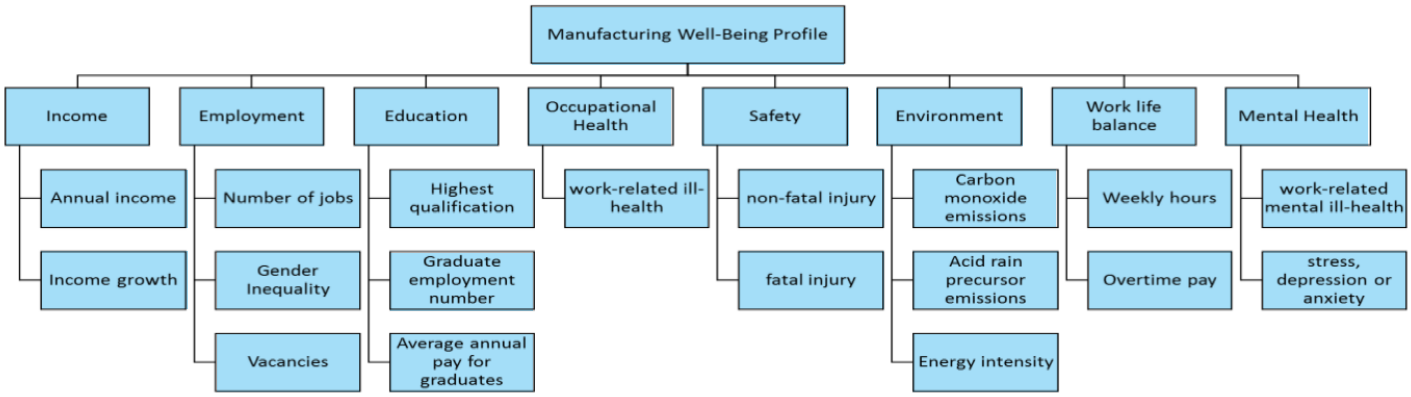
Part 4:
Updated Well-Being Profile for 2016

How can the contribution of manufacturing to the well-being of the nation be measured?

Manufacturing growth not only impacts total economic development, but also the well-being of ordinary people, including its effect on health, relationships, education and employment. Well-being status in the UK is compared with that in the US with regards to income, number of vacancies and education against other sectors.

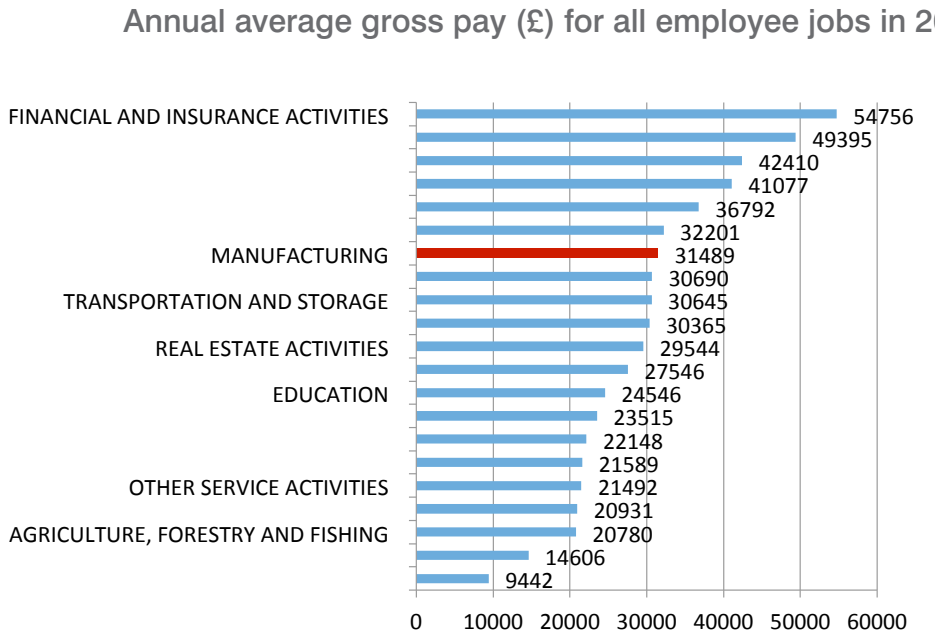
Both the ONS national well-being measurement indicators and OECD well-being index are referenced when the manufacturing profile was constructed. Finally, the most common indicators that affect an individual's life and social well-being were selected: Income, Employment, Education, Occupational Health, Safety, Environment, Work life balance and Mental Health.

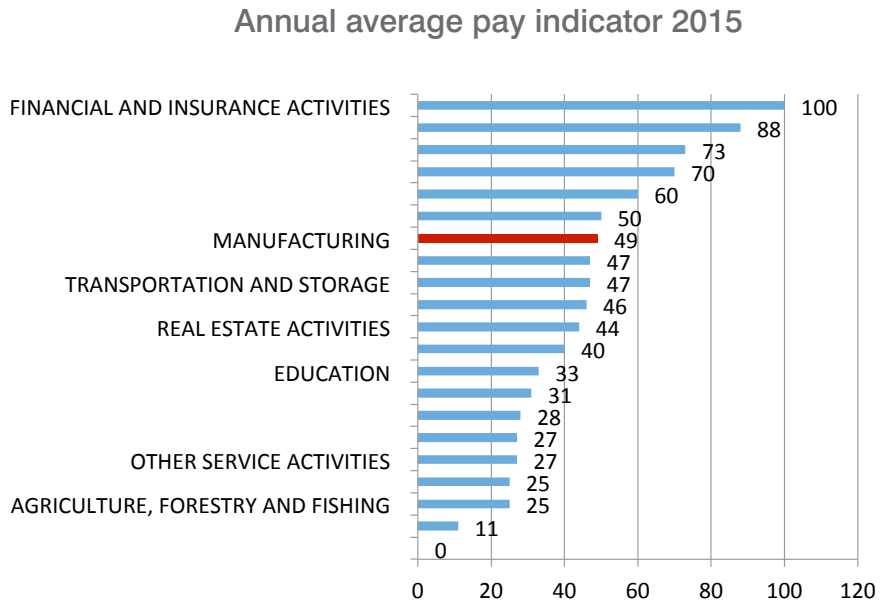
The framework constructed is shown as below:



The UK data is mainly collected from the UK ONS. The US data is collected from the Bureau of Labor Statistics.

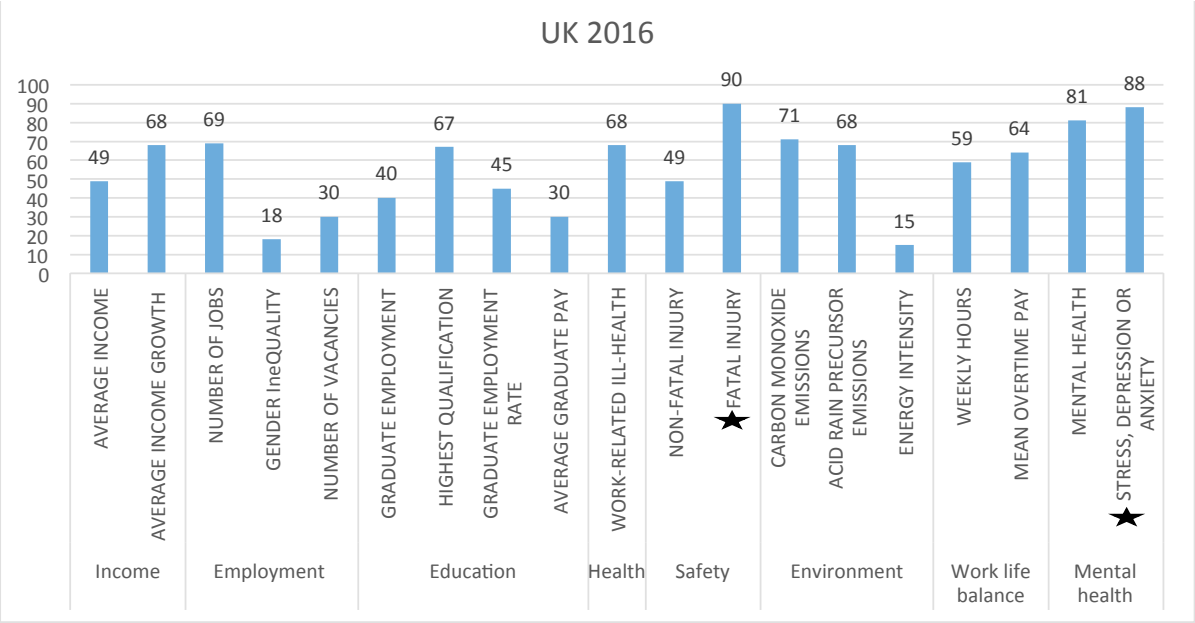
Validation: The two countries adopt data at different levels for some indicators, for example, environmental and education. And for the mental health data, the US maintained the data only up to 1997. So when comparing the US with the UK, our approach was to use only the data under the same sector and level.





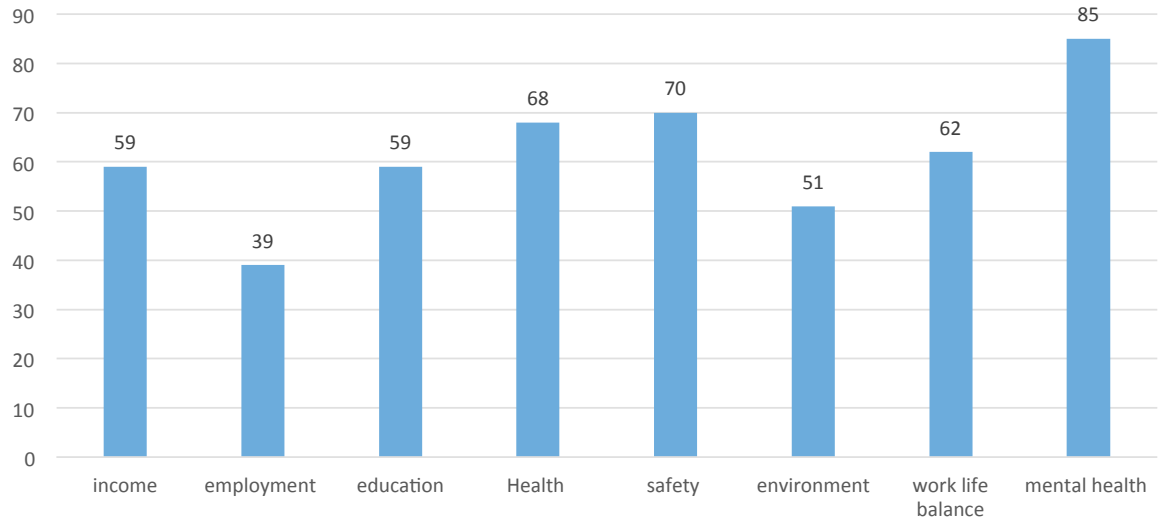
Manufacturing Well-Being Profile 2016

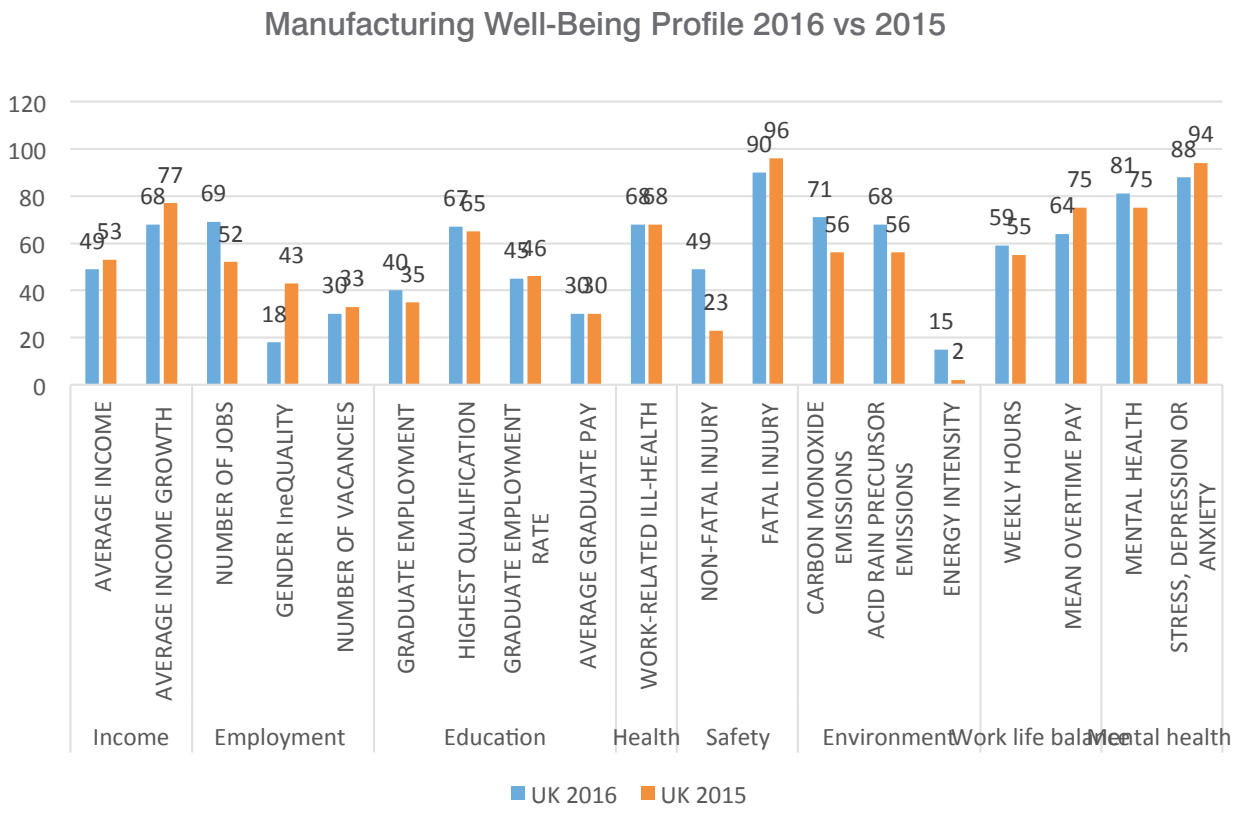
(Based on the manufacturing indicator data against other industrial sectors in 2015)

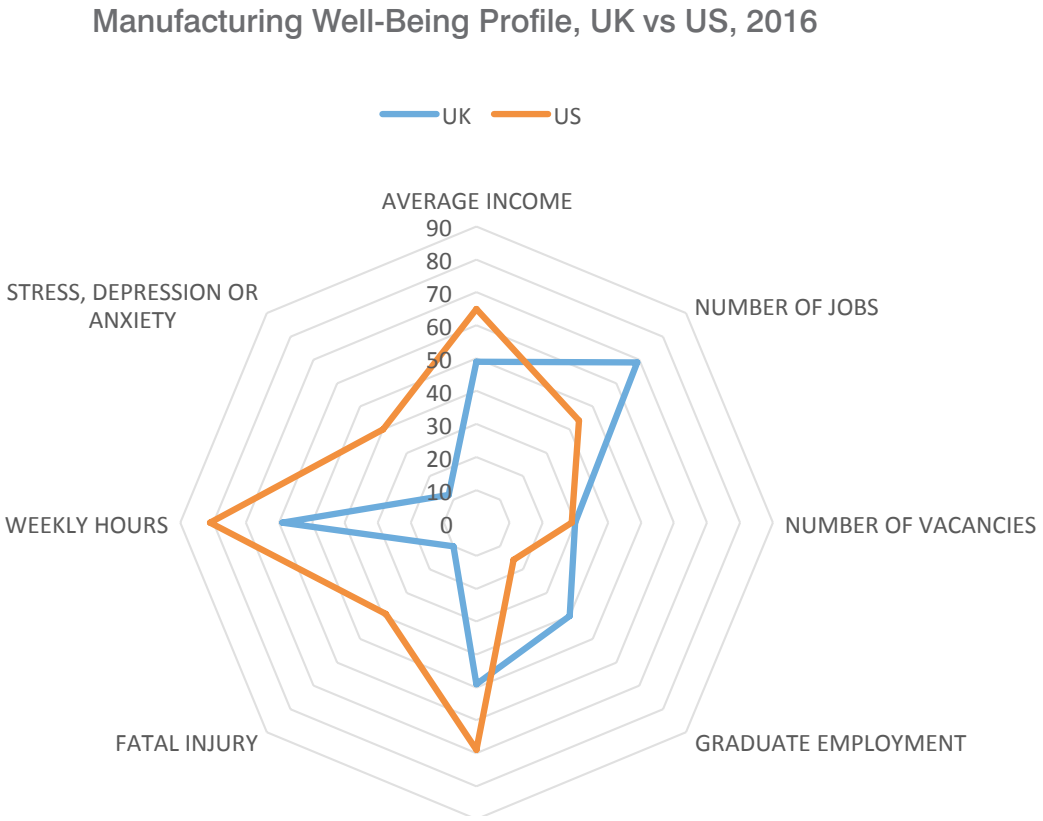


Note: ★ For the following negative measurements, the higher the number, and the better performance for the employees:

1. Fatal Injury
2. Stress, depression or anxiety







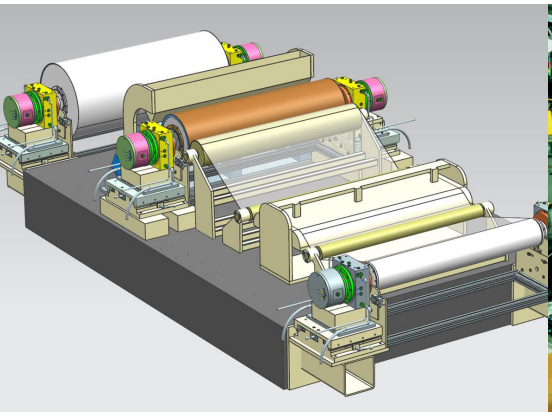
Note: All indicators are based on the normalized numbers compared with other sectors, which are calculated with the Formula: $\alpha = \frac{\text{Vmanufacturing} - \text{Vmin}}{\text{Vmax} - \text{Vmin}}$

For example, the Number of vacancies, the normalized numbers for two countries are compared with other industry sector, and the result is that UK is bigger than US.

Part 5: Conclusions

The key conclusions from this research can be summarised as:

1. Top 5 enablers for the UK manufacturing growth over the last 25 years are high domestic demand, high export demand, low interest rates, strong transport and motor vehicles industry and weak pound.
2. Top 5 inhibitors for the UK manufacturing growth over the last 25 years are strong pound, weak overseas demand, high interest rates, recession in the UK and global economic slowdown.
3. The list of enablers and inhibitors has changed over time. Although export, interest rates and value of pound affect the growth most, there are other factors that have significantly impacted the growth adversely as well: high price of oil, low inflation, lack of investment opportunities and high taxation.
4. UK Manufacturing includes companies providing design, make and support activities. An extended manufacturing index based on the design-make-support framework is proposed to measure modern manufacturing contribution to the national economy.
5. UK Manufacturing economic contribution is currently under valued by around £50 billion per year.
6. Based on the extended manufacturing definition, UK Manufacturing has contributed around £208 billion to the economy in 2014, and that is 13.5% of the UK economy. This is around 3.3% higher than traditional view of manufacturing contribution around 10.2%.
7. The ship, boat and aircraft sector shows the highest growth between 2008 and 2015.
8. Compared to other industrial sectors, the UK Manufacturing has maintained its lead to achieve high score on mental health of employees in the Manufacturing Well-Being profile 2016 (based on 2015 data). It is also observed that the proportion of number of jobs in manufacturing compared to other sectors has increased during this period.
9. On the other hand, the 2016 well-being profile shows increase (compared to 2015 profile) in non-fatal accidents in manufacturing compared to other sectors. Similarly, the environmental impact of manufacturing has increased in the year compared to last year.
10. UK Manufacturing growth should contribute more to the economy along with the well-being of the work force and the environment.



National Manufacturing Debate

Vincent Building, Cranfield University, 25 May 2016

Theme: Accelerating UK Manufacturing Growth

Now in its seventh successful year, the National Manufacturing Debate hosted by Cranfield University brings together manufacturing professionals from a range of sectors to discuss and debate current challenges in the industry. The event is designed to encourage networking and collaboration across the sector to enable continued and long-term growth.

This white paper and collected data are available from:

www.national-manufacturing-debate.org.uk/growth

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