

What is a manufacturing job?

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Abstract

Policy initiatives in the UK targeting manufacturing industries have for a number of years been driven by a perceived importance of this sector to the economy. In order to target such policies, it is important to establish the true size of this sector and to accurately quantify its decline. This, as well as many other economic analyses, relies upon classification of businesses into exclusive industrial categories. This paper considers whether standard methods of enterprise classification may mask the numbers and true activity of workers who are employed by so-called ‘manufacturers’.

Calculating the extent of this effect, we estimate that the number of manufacturing jobs ‘hidden’ within the service sector is more than offset by service sector jobs hidden within manufacturing. This is important for government policies which target manufacturing jobs. We therefore consider whether protecting ‘manufacturing’ is a meaningful policy target.

This analysis uses data from the UK official statistics system. However, given the methodological similarity across countries, particularly in the EU, the findings here are relevant for policy analysis in many countries.

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1 Introduction

The size of the manufacturing sector is a major policy concern for developed economies; see, for example, BIS (2010c). Although manufacturing as a proportion of GDP has been declining for many years in such economies, the political stock of manufacturing remains high.

This paper considers whether this popular treatment of manufacturing as a distinct and unique sector is helpful in understanding the economy. The stereotype of ‘the’ manufacturing firm as a single-purpose monolith appears to have less relevance in the modern economy. For example, in the UK in 2005, 99.5% of businesses are identified as belonging to a single industrial classification; however, almost 16% of employment is in businesses which operate in more than one of the manufacturing, services or other sectors (see section 4). Kneller et al (2010) estimate that 14% of service exports in 2005 were accounted for by the ‘manufacturing’ sector. In this context, to discuss impacts on ‘manufacturing industry’ without considering what this means for complex firms seems a little incautious.

Determining the size of the manufacturing sector is a function of the industrial classification system. In Europe, classification of companies is largely determined by common regulation, designed to ease the production of comparable statistics across 27 disparate nations; in other countries rules vary but the underlying approach is similar. These rules are subject to extensive scrutiny and negotiation between and within countries, to provide national and international consistency in defining what any business, on the whole, does. The difficulty is that ‘on the whole’ is becoming an increasing important qualifier.

This is not just a methodological issue for specialists. Manufacturing employment and output are high-profile topics in industrial nations. Manufacturing is an easy concept to place in the public arena. However, from a technical perspective, the definition of manufacturing is not at all straightforward; and even if a firm is classified as ‘manufacturing’ or not, this reflects a specific definition which needs to be interpreted.

This paper is not a critique of classification systems or the business registers used in official statistics. Instead, it considers the way the classification system is used by analysts, particularly those outside the originating statistical organizations; for example across government, media and academia.

The paper uses manufacturing to show how business classification works, and illustrates the potential for unexpected outcomes in interpretation. The paper concentrates on manufacturing as defined in aggregate statistics, as this is a key policy driver: the paper demonstrates how popular policy goals may be counter-productive. However, the results are clearly applicable to any analysis of business sectors.

An increasingly important part of the policy debate, particularly in respect of productivity, innovation and growth, is informed by econometric studies on the microdata on which the aggregate statistics are based. Whilst many micro-data analysts are aware of the limitations of classification and reporting structure (eg Harris, Li and Robinson, 2006), use of simple ‘industry dummies’ at the level of the enterprise remains a popular econometric tool. The arguments of this paper suggest this assumption may need to be reconsidered. A review of industrial micro-econometrics is beyond the scope of this

paper, but a companion paper (Ritchie, Thomas and Welpton, 2012) questions whether multivariate analyses on microdata might also be enhanced by modelling the classification decisions more explicitly..

The paper uses data from the UK official statistics system, managed by the Office for National Statistics (ONS). However, the results are more widely applicable because similar National Accounting standards, and similar policy interests, can be found in other industrialised nations.

The next section provides context by examining the political and economic importance of simple measure of 'manufacturing'. Section three describes how businesses are registered in the UK and how industrial classification works, and demonstrates why the classification of a complex business is not necessarily 'obvious'. Section four then reviews the impact on aggregate estimates of the size of manufacturing of allowing for complexity, at a static and dynamic level. Finally, section 5 considers whether the focus on employment as a measure of size increases the scope for misunderstanding, and shows how simple policy goals can be misdirected or counter-productive. Section six concludes.

2. Perceptions of manufacturing in the political and economic landscape

2.1 The importance of manufacturing as a sector

'Manufacturing' has a degree of political capital unmatched by other sectors in the UK. The decline of the manufacturing sector in the last thirty years, and more recently its potential as a 'white knight' to 'rescue' the economy from the financial crisis, has focused the attention of policymakers on ways to assist this sector.

It is often taken for granted that employment in manufacturing is essential. For example, the Director-General of the British Chambers of Commerce commented that:

"I have a very, very real concern about the loss of our manufacturing capacity [...] Unless we have a strong manufacturing base, this will be a very protracted recession. [...] Once manufacturing businesses have gone, they have usually gone for good. We have no choice but to look after them." (Frost, 2009)

And the department with responsibility for business in the UK states in its Manufacturing Policy (although note the subtle difference between the 2009 and 2010 statement):

"...a thriving modern manufacturing sector is central to the future success of the British economy" (BERR, 2009)

"Manufacturing has been, and continues to be an important part of the UK economy. The Government has placed the sector at the heart of its policy to rebalance the economy and to deliver strong, sustainable long term growth." (BIS, 2010a)

Manufacturing employment has declined in most industrial countries since its post-war peak in the early 1970s, and the share of GDP has fallen (Singh, 1988); but these countries have also become considerably richer overall. As Singh (1977) asks:

“What is so special about industry that one should be concerned with de-industrialization? There has also been a considerable loss of employment from agriculture, but not much has been said [by economists] about de-ruralization”

Some of the arguments put forward for the value of manufacturing are clearly spurious; for example that manufacturing is more “real” because physical things are made, or that manual work is inherently more worthwhile. Nevertheless, there are some valid arguments to be considered:

- The supply chain for manufacturing businesses generates strong multiplier effects
- Rates of productivity growth in manufacturing have historically exceeded rates of growth in the service sector, possibly because goods face international competition and so the incentives to innovate are much higher than for services
- Innovation in manufacturing pushes the economy’s production frontier out, increasing the productive capacity of the economy
- For most countries the visible trade balance is dominated by manufactured goods and so there is a need to have a significant manufacturing base to maintain the exchange rate; it could be argued that visible trade deficits in many OECD economies have exacerbated the financial crisis by fuelling a credit boom with cheap sovereign bonds
- Manufacturing creates a demand for high-wage skilled labour, particularly as technology develops; the shrinking number of skilled manual jobs has been blamed for the polarization of the labour market
- There is value per se in having a diverse economy better able to withstand sector-specific and systemic shocks

Greenhalgh (1994) explores the interconnectedness between manufacturing and services, concluding that any decline in the former will reduce the demand for various services that manufacturers consume, with the result that employment in both sectors will fall. There are also spillover effects which occur in other sectors as a result of technological innovations in the manufacturing sector (Greenhalgh, 1994; Harris and Robinson, 2004).

These arguments can be complex and have unintended consequences. For example, the productivity gains in manufacturing seem to have manifested themselves into lower labour inputs, rather than higher outputs. Similarly, an extended supply chain means a greater knock-on effect on suppliers if production is transferred abroad. Nevertheless, there are some theoretical and empirical foundations for the idea that ‘manufacturing’ does have some special characteristics which make it worthy of study.

2.2 Manufacturing: declining or changing?

The size of the manufacturing sector is a regular source of news reporting, particularly in the context of job losses. A search of the BBC website for ‘manufacturing jobs’ generated five pages of results, dating back to 2003, before a positive story occurs; yet the search was carried out in 2008, and covered a

period of continual economic growth. Articles not directly reporting job losses were largely concerned about the general decline of manufacturing and the impact on the economy.

Policymakers are interested in ‘manufacturing’ as a concept, but academic studies tend to focus on specific aspects of productivity, rather than studying the apparent decline in manufacturing per se; see, for example, Haskel (1996), Driffield and Munday (2000), Barnes and Haskel (2002), Harris, Li and Robinson (2006) and Webber and Horsfield (2009) for the UK. As a result, most research interest is focused on explaining changes rather than considering whether those changes are being accurately reported. For the analysis here it is worth noting that there might be statistical reasons for the apparent decline in manufacturing, independent of any structural changes.

For example, one area which leads to both ‘real’ change and ‘statistical’ impact is the increase in outsourcing activity. BIS (2010b) estimates that 40% of R&D in the pharmaceuticals industry is now carried out by third-party “contracting research organisations”. Contracting out parts of an operation allows those parts to be identified more clearly than if the units were hidden in a complex business, producing an apparent reallocation of employment. If a steelworks contracts out cleaning services currently carried out in-house, the net effect will be to see a fall in employment in the steel industry and a rise in cleaning even though there has been no change in fundamental economic activity¹. On a cross-sectional basis, contracting out would seem to improve identification of businesses; however, much analysis is concerned with changes over time and the statistical impact may mask or exaggerate the real effect.

Understanding how businesses are described and how that information can be used to analyse them can provide insights into real changes in the economy; but studies of manufacturing which simply count the number of firms, employees or value-added over time may not be comparing like-with-like. This is the case even if the source of the data, such as ONS’ business register, has notionally been unchanged. The importance of manufacturing, and its decline, is clearly of concern to policymakers. What is less obvious is how an enterprise is identified as being ‘manufacturing’ or otherwise – this has implications for how policies can effectively target manufacturers. Addressing this requires studying classification processes in statistics, using the UK model as an example.

3 How are companies classified?

This section reviews how businesses are classified on ONS’ Interdepartmental Business Register (IDBR). ONS collect records of businesses primarily through administrative information from the UK tax office, plus company registration and ownership data. The IDBR is maintained by ONS but is also made available to other government departments for analysis; in particular the Business Department makes extensive use of it for research. The IDBR is also the sampling frame for almost all ONS business surveys, and for surveys carried out by other departments. Finally, the IDBR is used directly for some official estimates of business demography.

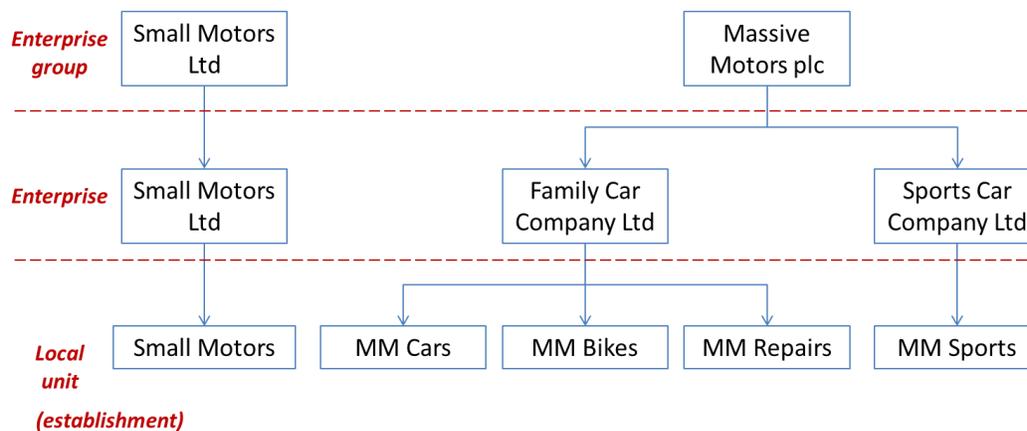
¹ Note however that if a household survey asks employees the nature of their employer, the information may not change.

There are three key levels of classification:

- Economic activity is generated at the **local unit (LU)**: a physical location representing an economic entity's place of activity, for example, a factory, shop, office building etc. In other countries and economics literature, the LU is often referred to as the plant or establishment.
- Local units are grouped into **enterprises**, which is normally the smallest unit that can meaningfully report on economic variables. For limited companies, this will often be the level of legally registered status. ONS is required by European legislation to maintain the integrity of the enterprise-level statistics, and is required to report at this level.
- Several enterprises under common ownership will form an **enterprise group**.

For single site operations, the LU, enterprise and enterprise group are synonymous. However, for large operations, several enterprises may belong to one enterprise group. In turn, each enterprise may consist of many local units. Figure 1 illustrates two example business structures:

Figure 1 Examples of business structure



On the left-hand side is an example of a single-site enterprise “Small Motors Limited”. The IDBR records a local unit, which is also the enterprise, and in turn is also the enterprise group. The right-hand side provides an illustration of a more complex organisation. Massive Motors Plc is the enterprise group. Two enterprises exist which are owned by Massive Motors: Family Car Co and Sports Car Co. In turn, Family Car Co has three plants (local units), while Sports Car Co has only one. Economic variables are recorded at the enterprise level; the local units only report employment, location and type of activity. Our methods exploit this, as discussed later.

ONS classifies enterprises using the Standard Industrial Classification (SIC) according to their dominant activity at the local unit level: the level of employment is used as a proxy measure for the volume of activity being undertaken at that site. For single site enterprises such as Small Motors or Sports Car Co in Figure 1, classification is straightforward. The self-reported main activity of the business is used for the enterprise as a whole.

The classification of Family Cars in Figure 1, and complex businesses generally, is more complicated. In principle, classification reflects the activity with the most number of employees. However, the determination of ‘dominant activity’ is a top-down process; that is, the classification of the company is considered at the 2-digit ‘division’ level first, then by increasingly small subdivisions. This can result in some unexpected outcomes. Table 1 provides examples:

Table 1 Enterprise classification

Enterprise	LU Reference	LU SIC	Classification level splits	LU Employment
ABC LTD	A	33500	33 - 5 - 0 - 0	45
	B	52111	52 - 1 - 1 - 1	20 < dominant category
	C	52112	52 - 1 - 1 - 2	10
	D	52212	52 - 2 - 1 - 2	25
123 PLC	1	33500	33 - 5 - 0 - 0	50 < dominant category
	2	52111	52 - 1 - 1 - 1	27
	3	52212	52 - 2 - 1 - 2	14
Family Car Co	MM Cars	33500	33 - 5 - 0 - 0	45
	MM Bikes	29401	29 - 4 - 0 - 1	30
	MM Repairs	52481	52 - 4 - 8 - 1	50 < dominant category

Consider ABC LTD. At the 2 digit level of SIC, the largest number of employees (55) are working within local units that are classified to SIC 52 (20+10+25 in sectors 52111, 52112 and 52212). Despite A being the LU with the highest number of employees (45), SIC 52 is larger (in terms of employment) than SIC 33. Within SIC 52, 5211 (35 employees) is larger than 5221 (25); within this, 52111 is larger than 52112. SIC is allocated on a four-digit basis, and so the dominant SIC is 52110. By the same principle, enterprise 123 PLC would be allocated SIC 33500.

Family Car Co would be allocated SIC 52480, despite the majority of employees working in ‘manufacturing’ local units (33 and 29). Because SIC is allocated by division, 33 and 29 are considered different sectors – so we return to the largest local unit, which happens to be ‘service’. Despite a significant level of manufacturing activity, as proxied by employment, Family Car Co would in fact be classified as a service enterprise by SIC allocation.

Kind-of-activity units

There is an important qualification to the business structure as defined above. There is an additional sub-enterprise classification, the ‘kind-of-activity unit’ or KAU. This recognizes that enterprise-wide classifications cannot reflect all the activities of a business, and so allows for survey-specific sampling units. Surveys are conducted at the level of these ‘reporting units’ – an accounting or legal identity which is the section of the enterprise that can most reliably report information at the required level of detail. For example, a business might have retail and manufacturing operations in the same legal entity, but may be subdivided for the purposes of reporting if it is possible to provide survey responses for the

different subunits. The choice of whether to have sub-enterprise reporting units is left up to the business but for the largest organisations ONS, in common with other statistical agencies, directly engages with the company to define a reporting structure which meets both statistical and business goals.

This distinction between reporting and enterprise units adds complexity but does not fundamentally address the classification. For the purposes of this article, it is sufficient to note that there is some fine-tuning below the enterprise level; and to keep the analysis clear the next section assumes that the enterprise unit and KAU are the same².

4 The impact of classification: diversification and specialisation

This section considers how the statistics at different levels of identification can generate different results. Data are from the BSD (Business Structure Database), a panel dataset constructed from annual snapshots of the IDBR taken each March. For the purposes of exposition, only two years (1997 and 2005) were analysed; analysis on other years produces similar results.

Activities of enterprises and local units are classified into three broad sectors: manufacturing (SIC codes 15000 to 38000); services (SIC codes from 50000 onwards); and non-services (SIC codes 0 to 15000 and 40000 to 46000), referred to as 'other'. This third grouping of sectors is not meant to signal any coherence between activities in the 'other' sector (such as agriculture, mining and construction). This is done to simplify exposition where the focus is on manufacturing and services.

Observations for enterprises and local units are available separately, but can be combined to examine the entire structure of an enterprise. Employment and activity (sector) variables are available for both enterprises and local units. The next subsection considers what can be said about activity at any point in time; the following one shows how classification changes can lead to misperceptions of industrial change.

4.1 Static estimates of the impact of multisector firms

The vast majority of enterprises consist of only one local unit, as shown in Table 2. In these cases, defined as 'simple' enterprises, the enterprise and the local unit are synonymous. By contrast, 'complex' enterprises exist which control more than one local unit. Only a very small percentage of enterprises own more than five local units, although these large complex enterprises account for around one third of employment.

The classification of a local unit may not equal the classification of the enterprise. Table 3 displays the number of enterprises and the number of local units by sector for each enterprise sector. For example, in 1997, just over 181,000 manufacturing firms 'specialised' (that is, only recorded manufacturing activity). Around 4,000 'diversified' enterprises existed, which at the enterprise level were recorded with

² This is true in most data collection: 99% of KAUs in ONS' main business survey are also the enterprise unit (author's calculations). For some specific surveys (such as R&D) a higher proportion firms only report on relevant business activity.

manufacturing SIC codes. In total, these ‘manufacturing’ enterprises were made up of about 12,000 manufacturing, 10,000 service and 1,000 other local units.

Table 2 Constitution of enterprise by local unit

Number of local units	Number of enterprises (thousands)		Proportion of total employment	
	1997	2005	1997	2005
1	1841.2	2065.9	50.4%	48.2%
2 to 5	69.5	50.2	16.2%	13.4%
6 to 10	4.1	3.5	5.3%	4.6%
11 to 20	1.9	1.6	5.6%	4.3%
21 to 50	1.2	1.0	5.7%	5.4%
51 to 100	0.4	0.3	3.2%	4.4%
100+	0.4	0.4	13.7%	19.8%

Source: authors’ calculations from BSD

Table 3 Specialised and Diversified Enterprises and their Local Units

	Enterprise classification	Specialist enterprises (thousands)	Diversified enterprises (thousands)	Classification of LUs in diversified enterprises		
				Manuf.	Services	Other
1997	Manuf.	181.2	4.0	12.3	9.9	1.1
	Other	384.5	1.3	0.9	2.9	7.0
	Services	1343.1	4.5	4.6	65.2	2.4
2005	Manuf.	158.9	3.0	10.0	7.4	1.1
	Other	386.8	1.1	0.9	1.9	6.1
	Services	1570.3	2.8	2.6	60.0	1.8

Source: authors’ calculations from BSD

It is notable that, in terms of local units, diversified manufacturing businesses have almost as many service units as manufacturing ones, whereas service businesses have a very small proportion of manufacturing units. Interestingly, this does appear to be diminishing over time, with fewer diversified businesses and less diversification within diversified businesses. This would appear to be consistent with the trend towards outsourcing, which can lead to the new identification of the distinct parts of a business.

Manufacturing local units tend to be larger than service units and diversified businesses tend to be larger than specialized ones, and so a natural question arises over the relative importance of this diversification. Table 4 directly compares the activity of each local unit with the enterprise category, to determine engagement in more than one sector.

Table 4 Enterprises by type of activity and share of employment

Type of activity	Enterprises, thousands		Enterprises, share		Employment, share	
	1997	2005	1997	2005	1997	2005
Manufacturing	181.2	158.9	9.4%	7.5%	15.1%	11.1%
Other	384.5	386.8	20.0%	18.2%	7.1%	7.1%
Services	1,343.1	1,570.3	70.0%	74.0%	61.8%	66.6%
Manuf. & other	0.8	0.5	0.0%	0.0%	0.6%	0.4%
Manuf. & services	6.4	4.5	0.3%	0.0%	9.4%	8.2%
Services & other	2.2	1.5	0.1%	0.1%	2.4%	4.4%
All	0.5	0.3	0.0%	0.0%	3.6%	2.4%

Source: authors' calculations from BSD

Only 0.5% of enterprises operate in more than one sector but they account for around 16% of employment, implying that a significant minority of employment is classified to some sector different to its local unit classification. Preliminary estimates suggest that up to 2.5% of manufacturing employment estimated using enterprise classifications, and rather less than 1% of services employment, should be allocated to another sector.³

Although these figures are small in relative terms, they are not insignificant; and the direction of classification into alternative sectors remains constant over time, despite the proportion of diverse enterprises declining.

4.2 Do enterprises change classification over time? Dynamic estimates

The previous analysis concentrated on interpreting the static estimates of employment. However, a natural consequence of enterprise-level classification is that small changes in parts of the organization can have disproportionately large effects.

Table 5 describes an imaginary business which operates in both manufacturing and services and which sheds employment over a two-year period:

In this example, enterprise-level classification appears to show a large drop in manufacturing and an increase in services employment. At the local unit level, manufacturing employment has not fallen as much, and service employment has also fallen. It can be seen that relatively small changes can have enterprise-wide effects. As noted in the introduction, an overly simplistic interpretation of results at the enterprise level can mask true changes in economic activity. How relevant is this for the UK economy? Table 6 shows changes in employment when enterprise classification changed.

³ Note however, that this does not mean that manufacturing employment figures reported by ONS are overestimated by 2.5%; as noted above, official statistics for workforce jobs use kind-of-activity unit to fine-tune data below the enterprise level.

Table 5 Changing employment in a complex business - example

	Manufacturing	Service
Employment in 2004	100	80
Employment in 2005	50	70
Enterprise classification in 2004	X	
Enterprise classification in 2005		X
Notional employment in 2004	180	0
Notional employment in 2005	0	120
Apparent change in employment	-180	+120
Actual change in employment	-50	-10

Source: authors' calculations from BSD

Table 6 Changes in enterprise classification and local unit employment (thousands)

	Change from....	No of enterprises	Change in employment			
			Enterprise	Local unit Manuf.	Local unit Other	Local unit Services
1997/ 1998	Manuf.	2,855	-125	-90	9	49
	Other	5,114	-55	18	-44	26
	Services	5,149	-119	78	34	-82
2004/ 2005	Manuf.	4,383	-72	-56	6	44
	Other	4,356	-50	33	-32	31
	Services	7,487	-85	65	31	-50

Source: authors' calculations from BSD

Between 1997 and 1998, the classification of just under 3000 enterprises changed from manufacturing to service and 'other'. At the enterprise level, this could be interpreted as a loss of approximately 125,000 jobs in manufacturing jobs; but at the local unit level, only 90,000 jobs in manufacturing seemed to disappear, and 58,000 jobs were created in other sectors. Interestingly, a change in classification from services seems to be associated with a net increase in employment overall; this however might be an artefact of 'services' being a large and disparate grouping.

As for the static estimates, these numbers are small in the context of overall employment. However, they are large relative to the growth or decline in employment in sectors, and it is easy to consider a situation where mis-interpretation of data could lead to unwarranted panic about declining sectors - or misplaced confidence in the growth of employment.

5 Classification, aggregate statistics and the policy debate

5.1 Limits to employment-based classification

The classification system described above focuses on employment as a measure of economic activity. The implicit assumption is that labour productivity is the same across all sectors. This is unlikely to be the case, and may lead to underestimation of the relative importance of capital-intensive industries.

Consider Table 7, showing a manufacturing company with a smaller retail operation, on two sites:

Table 7 A low-productivity manufacturing firm

	Site 1 Manufacturing	Site 2 Retail
Employees	84	56
Units made/sold	336	336
Labour productivity (units)	4	6
Classification of overall business	Primary	Secondary

Assume the company invests in new machinery which doubles labour productivity in the manufacturing plant operation; retailing productivity is unaffected. Assume, for arguments sake, that overall staff numbers remain the same; staff are transferred to the retail operation to deal with the increased output. The resulting equilibrium is in Table 8.

Table 8 The effect of increasing labour productivity

	Site 1 Manufacturing	Site 2 Retail
Employees	60	80
Units made/sold	480	480
Labour productivity (units)	8	6
Classification of overall business	Secondary	Primary

In this example, the result of the increase in labour productivity due to the capital investment has been to turn a manufacturing business into a retail one, despite the increase in output of manufactured goods. The more productive the manufacturing process becomes, the less likely is any contribution to the 'manufacturing sector' to be noted. In extremis, a single person is required to turn the machines on and off, and the other 139 work on sales.

This example has been constructed to provide this outcome: that increases in labour productivity could lead to the disappearance of manufacturing activity. Nevertheless, the general principle still stands. Similar hypothetical outcomes could be constructed using knowledge capital, for example. Consider a diamond preparation and sales business: the more proficient the diamond cutter becomes, the more support in distribution is needed. Where a business consists of several legal entities, financial planning and ownership structures may also lead to outcomes which do not accord with 'common sense'.

Of course, at the macroeconomic level the relative importance of the sector to the economy is generally measured by gross value added (GVA) rather than employment. However, the point is that the allocation of businesses to sector is done through employment alone⁴. Therefore it is likely that, ceteris paribus, sectors with the highest/lowest labour productivity are the most likely to be under/overestimated, respectively, in multi-sector firms.

⁴ For very large or complex companies, statistics offices may discuss sector classification directly with the companies concerned, and so the example in the table is unlikely to occur; but in general, businesses classification is automatic.

5.2 Are alternatives to site-employment-based measures viable?

Business classification is a technical issue which demands a lot of resources from statistical agencies. An accurate model of the business universe is essential for making use of the other data that statistical agencies collect; and so the bulk of statistical resources is spent on getting the best register of business at any point in time. While there are exceptions (for example, Statistics New Zealand's 'IBULDD' register was designed from the beginning as an analytical tool), the ability to produce business demography statistics often is constrained by the need to service the register's primary function – of being a register.

In one sense, the choice of employment alone for classification reflects the Marxist theory of value: that all value is ultimately derived from labour input. In practice the choice of employment as the measure of relative activity is more pragmatic. Estimates of employment and main activity at a site are relatively easy to acquire from administrative records. Other measures of relative sector value (such as balance sheets, turnover, or GVA) do not have the same data availability, are volatile, can be subject to financial planning, or present bootstrapping problems. For example, allocation to sector by GVA requires making assumptions about the relationship between employment and GVA for unsurveyed businesses, which in turn requires knowledge of the business' sector...

Alternatively, a business could be classified not by the number of employees but by what those employees are doing. Scheffel and Thomas (2011) took this approach to assess the size of the 'creative industries' in the UK, using the Standard Occupational Classification (SOC) system. However, there are extensive data issues with this approach; for example, there exists no register of all employees matched to employers, and it may be possible for employers and employees to define a job differently depending on who is responding to a survey. Moreover, this still fails to address the focus on employment at the expense of other factors of production.

6 Conclusion

Is it appropriate to consider companies as either 'manufacturing' or 'services' any longer? The analysis presented here suggests this is a complex issue, with implications for policymakers and researchers alike. Factors such as outsourcing, changing capital intensity and financial planning can produce substantive changes in economic activity without changes in statistics, and vice-versa. Depending upon whether interest is in businesses or employment, and at the local unit, KAU or enterprise level, the same data can produce contradictory results. Interpretation of data without being clear of the structure could lead to errors in conclusions – in some cases minor, in some cases, such as growth levels, potentially much more significant.

The above discussion shows that questions such as "is manufacturing growing or declining?" does not have an unambiguous answer. It is possible for both of these statements to be 'proved', using the same data over the same period:

- "employment in the manufacturing sector is declining"
- "employment in manufacturing is increasing"

The contradictory statements describe views of the world; each might be important under specific circumstances. This ambiguity is convenient for soundbites but not helpful for economic analysis.

Statistical agencies generally try to avoid producing multiple results which may give rise to ambiguity; instead, they take methodological decisions, often in consultation with other statistical agencies, and report a preferred view. For example, in the UK aggregates statistics may be branded as 'National Statistics', intended to demonstrate statistical quality. However, the sanction of an official statistic can give the impression that there is a 'right' answer, rather than just a 'preferred' answer. If there is an official answer, analysts may not inquire too closely into whether the statistics agency is answering the same question that the analyst is asking.

These findings contribute to the public debate on the place of the manufacturing sector. Rather than considering manufacturing as a declining industry, could it be more fruitful to examine how manufacturing enterprises have evolved? Is it permissible for public funds to support 'manufacturing', when it may no longer be easy to define? Should the focus be on occupations independent of the sector of activity? These are not abstract questions but increasingly part of the policymaker's frame of reference.

References

Barnes M. and J. Haskel (2002) *Job creation, job destruction and the contribution of small businesses: evidence for UK manufacturing*. Queen Mary College Department of Economics working paper no. 461 <http://www.econ.qmul.ac.uk/papers/doc/wp461.pdf>

BERR (2009) Manufacturing policy statement <http://webarchive.nationalarchives.gov.uk/+/web.bis.gov.uk/policies/business-sectors/manufacturing-and-materials/manufacturing/manufacturing-in-the-uk>

BIS (2010a) Manufacturing policy statement <http://www.bis.gov.uk/policies/business-sectors/manufacturing-materials-and-engineering/manufacturing>

BIS (2010b) *Life Sciences in the UK – Economic analysis and evidence for 'Life Sciences 2010: Delivering the Blueprint'* Department for Business, Innovation and Skills Economics Paper No. 2 <http://www.bis.gov.uk/assets/biscore/economics-and-statistics/docs/10-541-bis-economics-paper-02.pdf>

BIS (2010c) *Manufacturing in the UK: an economic analysis of the sector*, Department for Business, Innovation and Skills Economics Paper no. 10A <http://www.bis.gov.uk/assets/biscore/business-sectors/docs/m/10-1333-manufacturing-in-the-UK-an-economic-analysis-of-the-sector>

Driffield N. and M. Munday (2000) "Industrial Performance, Agglomeration, and Foreign Manufacturing Investment in the UK," *Journal of International Business Studies*, Palgrave Macmillan, vol. 31(1), pages 21-37, March. <http://www.palgrave-journals.com/jibs/journal/v31/n1/pdf/8490897a.pdf>

Frost D. (2009) "Action, investment and planning - how to beat the recession" *Business Works* interview http://www.biz-works.net/index.php5?&fl=yPHPSESSID=4cd878b3ae997cdd81072c6f0ddb8769&pgid=ar&art=0804_01

Greenhalgh C. (1994) "Why manufacturing still matters" *The Economic Review*, pp11-15

Harris R. and C. Robinson (2004) "Industrial policy in Great Britain and its effect on total factor productivity in manufacturing plants, 1990-1998," *Scottish Journal of Political Economy*, Scottish Economic Society, vol. 51(4), pages 528-543, 09

Harris R., Li Q. and Robinson C. (2006) *The productivity impact of skills in English manufacturing, 2001: evidence from plant level data*. Discussion paper 2006-16, Department of Economics, University of Glasgow.

HMT (2006) *Productivity in the UK 6: Progress and new evidence*, HM Treasury, March. http://www.hm-treasury.gov.uk/d/bud06_productivity_513.pdf

Kneller R., Upward R. and Wright P. (2010) *A study of the impact of exporting on service traders: Final report* University of Nottingham Department of Economics; prepared for UK Trade and Investment www.ukti.gov.uk/download/file/115742.html

Ritchie F., Thomas A.D. and Welpton R (2012) Alternative specifications of industrial classifications in business analyses, mimeo,

Robjohns J. (2006) 'ARD2: the new Annual Respondents Database', *Economic Trends* 630, pp43-51, <http://www.ons.gov.uk/ons/rel/elmr/economic-trends--discontinued-/no--630--may-2006/ard2--the-new-annual-respondents-database.pdf>

Scheffel E. and Thomas A.D. (2011) "Employment and intangible spending in the UK's creative industries" in *Economic & Labour Market Review*, January pp79-104 <http://www.ons.gov.uk/ons/rel/elmr/economic-and-labour-market-review/no--1--january-2011/employment-and-intangible-spending-in-the-uk-s-creative-industries---a-view-from-the-micro-data.pdf>

Singh A. (1977) "UK industry and the world economy: a case of de-industrialization?" *Cambridge Journal of Economics*, v1(2) pp113-116

Singh A. (1989) "Third-world competition and de-industrialization in advanced economies" *Cambridge Journal of Economics*, v13(1) pp103-120

Webber D. and Horswell M. (2009) *Microeconomic foundations of geographical variations in labour productivity* University of the West of England, Department of Economics Discussion Papers no. 0913 <http://carecon.org.uk/DPs/0913.pdf>